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Lifestyle and Dietary Risk Factors Associated with Renal Stones in Duhok City

Niwar Saleem Ali[1], Dr. Miaad Hussein Kadhim[2]

[1]College of Health and Medical Technology-Shekhan, Duhok Polytechnic University, Kurdistan, Iraq.

[2]College of Nursing, University of Duhok, Kurdistan, Iraq.

Email: niwar.ali@dpu.edu.krd

Email ID: miaad.kadhim@uod.ac

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ABSTRACT

Background: Renal stones also called nephrolithiasis or urolithiasis, is a medical issue involves the formation and sometimes the passage of crystalline within the urinary tract. The aim of present study to assess the lifestyle and dietary factors associated with renal stones in Duhok City.

Methods: A cross-sectional design was conducted, data were collected during period from September 1, 2024, to December 31, 2024. A convenience sample of patients with renal stones who were admitted to the Urology Ward and visited the Urology Consultation Unit at Azadi Teaching Hospital was chosen for inclusion in the present study.

Results: The present study revealed a total of 260 participants. The age distribution indicated a predominance of younger individuals, with 59.23% falling within the 18 to 44 years' age group. The highest number of participants were males (156; 60%). The majority of participants (98.08%) walked for 1–74 minutes daily, while only 18.08% in moderate physical activities and 26.92% in vigorous activities. Additionally, most participants consumed calcium (25.48%), sodium (25.48%), and sugar (23.46%), 1–3 times per week, respectively.

Conclusions: Several lifestyle factors and various dietary habits that play the crucial role for renal stone formation. Also, regular exercise, adequate drinking water, and less consuming of sodium, calcium, sugar that help to prevent stone formation.

Keywords: Renal stones, renal calculi, nephrolithiasis, lifestyle and diet.

1. INTRODUCTION

Renal stones (RS), often referred to as kidney stones (KS), is a medical issue involves the formation and sometimes the passage of crystalline within the urinary tract. It is also called nephrolithiasis or urolithiasis from the Greek words nephros, for kidney, uro-, for urinary, and lithos, for stone Stamatelou and Goldfarb (2023) . However, RS represent a major health issue, affecting an estimated 1% to 15% of the worldwide population (Cheraghian et al., 2024). There are various types of RS, which include calcium oxalate, calcium phosphate, uric acid, struvite, and mixed stones. Among these varieties, calcium stones are the most common, constituting about 70% to 80% of all instances (Moftakhar et al., 2022). Furthermore, pathophysiology of the renal stones formation (RSF) is complex and influenced by various factors such as age, race, pre-existing medical conditions, geographical location, genetic predispositions, and dietary habits (Coello et al., 2023).

Various lifestyle elements have been linked to RS, including habits such as smoking, the intake of coffee, the amount of sleep, and levels of physical activity (Liu et al., 2023). Smoking is one behavioral factor that appears to be linked with renal stones disease (RSD) (Jones et al., 2021). In contrast, the consumption of coffee and caffeine has been correlated with a reduced risk of RS (Yuan and Larsson, 2022). Additionally, poor sleep quality can weaken the immune system and elevate the likelihood of certain malignant diseases. Factors such as sleep duration, posture, and overall sleep quality are also crucial in influencing RS (Yan et al., 2024). Furthermore, increased physical activity has been found to decrease the risk of developing RS (Feng et al., 2020).

Dietary habits significantly influence the metabolic functions of various organs, including the kidneys (Remer et al., 2023). Although, research has identified several dietary factors linked to the onset of symptomatic RS, such as inadequate fluid intake, low calcium consumption, excessive sodium, and high levels of animal protein. Conversely, a diet rich in potassium and phytate, along with low oxalate intake, appears to reduce the risk of developing symptomatic RS (Chewcharat et al., 2022). To maintain hydration, it is essential to balance fluid intake with fluid loss. Dehydration can occur when water loss exceeds intake or when insufficient fluids are consumed, which adversely affects kidney function as they work

to conserve water. The body produces only a limited amount of water daily through metabolic processes approximately 250 mL making it imperative to drink enough water to sustain proper hydration levels and mitigate the risk of RS (Travers et al., 2023).

Balanced calcium intake is essential for preventing recurrent of RS as it helps lower oxalate levels in both the intestines and urine. However, consuming calcium supplements between meals may lead to increased urinary calcium levels without providing the same protective benefits against oxalate (Bargagli et al., 2021). Calcium oxalate (CaOx) is the predominant component found in nephrolithiasis or urolithiasis, and a high dietary salt intake is generally recognized as a factor that elevates the risk of these conditions (Huang et al., 2024). Additionally, protein consumption, which is rich in purines and contributes to an acid load, can result in higher excretion of urinary calcium and oxalate, thereby potentially increasing the risk of RS (Ferraro et al., 2020).

To decrease the occurrence of RS, key strategies involve enhancing fluid consumption, embracing healthier living practices, altering dietary choices, and using medications that prevent the development of CaOx crystals (Wang et al., 2024).

2. MATERIALS AND METHODS

Design of study:

A cross-sectional design was conducted to explore the different lifestyle and dietary elements that could lead to the development of RS among individuals living in Duhok City.

Study sample:

Study population consisting of 260 male and female patients aged between 18-65 years and older who have been diagnosed with RS. The patients had different medical and socio-demographic characteristics.

Setting of study:

The study conducted at the Urology Ward and Urology Consultation Unit at Azadi Teaching Hospital in Duhok city.

Sampling Procedure:

Convenience sampling method was done.

Inclusion criteria:

In current study, the inclusion criteria are diligently clarified to confirm a concentrated and applicable participant selection. First, only patients diagnosed with RS who are in a stable condition will be considered, and who agree to participate in the study. Second, participants must be aged between 18 to 65 years old and older with both genders. Lastly, only residents of Duhok city will be included in the study.

Statistical analyses:

The general and medical characteristics of the patients with renal stones were presented in mean (Sta. deviation) or number (percentage). The prevalence of lifestyles and dietary factors in patients with renal stones were determined in number and percentage. The relation of the lifestyles and dietary factors with socio-demographic aspects in patients was examined in Pearson Chi-squared test. The significant level of difference was identified in a $p<0.05$. The statistical calculations were performed using JMP®, Version 18.0. SAS Institute Inc., Cary, NC, 1989–2023.

Ethical Considerations:

To ensure the ethical consideration of the study, ethical approval was obtained from the Duhok General Directorate of Health and the Ethical Scientific Committee to verify that the research adhered to all relevant ethical standards and guidelines (Code of Ethics: 31072024-6-46). Additionally, verbal informed consent was obtained from each participant prior to data collection.

3. RESULTS

This study demonstrates a comprehensive overview of the sociodemographic characteristic of patinate diagnosed with RS, encompassing a total of 260 participants (n = 260). The mean age of the patients was 41.67 years (SD: 13.18), ranging from 18 to 65 years and older. The age distribution indicated a predominance of younger individuals, with 59.23% falling within the 18 to 44 years age group, while only 5% were 65 years and older. The majority of the participants were males (156; 60%) compared to females (104; 40%), most were married (80%), and 23.46% were illiterate. Employment status revealed that a significant portion were housewives (33.46%) and workers (26.54%). Finally, residency patterns showed that most patients lived in suburban areas (52.69%), followed closely by urban residents (45.39%), with minimal representation from rural areas (1.92%; Table 1).

Table 1: Sociodemographic characteristics of patients with renal stones

Sociodemographic characteristics (n=260)	Number	Percentage
Age (18-65 years and older) Std Err Mean: 0.82	Mean: 41.67	SD: 13.18
Age category 18-19 20-29 30-39 40-49 50-59 60-69 70-older	 10 43 62 70 46 22 7	 3.85 16.54 23.85 26.92 17.69 8.46 2.69
Age group 18-44 years 45-64 years 65 years and older	 154 93 13	 59.23 35.77 5.00
Sex Male Female	 156 104	 60 40
Marital status Single Married Divorced Widowed	 49 208 1 2	 18.85 80.00 0.39 0.77
Education level Illiterate Read and write Primary school Secondary or High school Post graduated	 61 47 47 55 50	 23.46 18.08 18.08 21.15 19.23
Employment status Housewife worker Employed Retired Student Unemployed	87 69 64 15 14 11	 33.46 26.54 24.62 5.77 5.39 4.23
Socioeconomical status Poor Middle Rich	 92 162 6	35.39 62.31 2.31
Residency Rural Sub. Urban Urban	5 137 118	1.92 52.69 45.39

Table 2: Lifestyle factors and dietary habits among patients with renal stones

Lifestyle and dietary Factors (n=260)		Number	Percentage
Walking	Yes	255	98.08
Walking (min)	No 1-74 min 75-150 min 151-300 min	6 164 35 55	2.31 63.08 13.46 21.15
Walking (freq)	No 1-3 days 4-7 days	6 9 245	2.31 3.46 94.23
Moderate physical activities	Yes	47	18.08
Moderate physical activities (min)	No 1-74 min 75-150 min 151-300 min	213 31 2 14	81.92 11.92 0.77 5.39
Moderate PA (freq)	No 1-3 days 4-7 days	211 12 37	81.15 4.62 14.23
Vigorous physical activities	Yes	70	26.92
Vigorous physical activities (min)	No 1-74 min 75-150 min 151-300 min	187 25 8 40	71.92 9.62 3.08 15.39
Vigorous PA (freq)	No 1-3 days 4-7 days	186 24 50	71.54 9.23 19.23
Smoking cigarettes	Never smoker Light smoker Moderate smoker Heavy smoker	180 23 24 33	69.23 8.85 9.23 12.69
Drinking alcohol	Never- Once a day Once a week Twice a week More than twice a week-	232 4 15 6 3	89.23 1.54 5.77 2.31 1.15
Consuming caffeine	Yes	250	96.15
Sedentary lifestyles	Yes	184	70.77
Sleeping per night	< 6 hours 6-8 hours > 8 hours Irregular sleep	78 151 27 4	30.0 58.08 10.39 1.54
Urinating per day?	1-4 times 5-8 times More than 8 times Irregular	105 58 93 4	40.39 22.31 35.77 1.54

Table 2 showed that the most of participants (98.08%) walked for 1–74 minutes daily, and 94.23% walked 4–7 days a week. In contrast, only 18.08% participated in moderate physical activities, while 26.92% were involved in vigorous activities. Regarding smoking habits, light, moderate, and heavy smokers accounted for 8.85%, 9.23%, and 12.69%, respectively. Alcohol consumption was notably low, with 89.23% of individuals never drinking and only 1.54% consuming alcohol daily. In contrast, caffeine intake was high, as 96.15% reported regular consumption. Regarding fatty food consumption, the study showed that most patients consumed foods with moderate fat (43.08%) or high fat (23.85%). A significant portion of the patients engaged in sedentary lifestyles (70.77%). Most of the patients had normal sleeping hours (58.08%), but a considerable percentage had less than 6 hours of sleep (30.0%). The patients reported urinating 1–4 times per day (40.39%),

5–8 times per day (22.31%), or more than 8 times per day (35.77%).

Table 3: Dietary habits among patients with renal stones

Dietary Habits (n=260)		Number	Percentage
Daily consumption of calcium-rich foods	Never 1-3 times/day 1-3 times/month 1-3 times/week 4-7 times/week	21 14 4 66 154	8.11 5.41 1.54 25.48 59.46
Consuming oxalate-rich foods	Never 1-3 times/da 1-3 times/month 1-3 times/week 4-7 times/week	27 7 11 148 67	10.39 2.69 4.23 56.92 25.77
Consuming sodium-rich foods	Never 1-3 times/day 1-3 times/month 1-3 times/week 4-7 times/week	21 14 4 66 154	8.11 5.41 1.54 25.48 59.46
Consuming sugar-sweetened beverages	Never 1-3 times/day- 1-3 times/month- 1-3 times/week 4-7 times/week-	64 6 13 116 61	24.62 2.31 5.00 44.62 23.46
glasses of water do you drink per day	Less than 4 glasses- 4-6 glasses 7-8 glasses More than 8 glasses-	43 34 30 153	16.54 13.08 11.54 58.85
Eating red meats per week	Never Once a week Twice a week More than twice a week	47 144 38 31	18.08 55.39 14.62 11.92
Eating poultry meats per week	Never Once a week Twice a week More than twice a week	8 32 53 167	3.08 12.31 20.39 64.23
Drinking energy drinking	Never Once a day Twice a day Triple a day Once a week Twice a week- Triple a week- More than triple week-	170 24 6 4 34 12 7 3	65.39 9.23 2.31 1.54 13.08 4.62 2.69 1.15

Most of the patients consumed calcium-rich foods daily, with 59.46% consuming them 4–7 times per week and 25.48% consuming them 1–3 times per week. In terms of oxalate-rich foods, most patients (56.92%) consumed them 1–3 times per week, while 25.77% consumed them 4–7 times per week. A significant portion of the patients consumed sodium in their meals, with 25.48% consuming it 1–3 times per week and 59.46% consuming it 4–7 times per week. Regarding sugar-sweetened beverages, 44.62% and 23.46% consumed them 1–3 times per week and 4–7 times per week, respectively. Most of the patients (16.54%) drank less than four glasses of water daily, while a high percentage (58.85%) drank eight glasses per day. Additionally, 14.62% of the patients consumed red meat twice a week, while a high percentage (64.23%) ate poultry more than twice weekly. Lastly, most of the participants (63.39%) consumed energy drinks (Table 3).

Table 4: Medical comorbidities of patients with renal stones

Medical Disease (n=260)		**Number**	**Percentage**
Do you have the kidney stone previously?	Yes	210	80.77
Family history of kidney stones	Yes	150	57.69
Medical Disease			
Hypertension	Yes	59	22.69
Diabetes	Yes	30	11.54
Cardiovascular disease	Yes	18	6.90
Arthritis	Yes	24	9.2
Hyperparathyroidism	Yes	19	7.31
Gastrointestinal Disorders	Yes	4	1.54
Urinary tract infections	Yes	24	9.23

The study showed that a significant majority of patients (80.77%) had a history of RS. Notably, 57.69% reported a family history of the condition. Regarding medical diseases, 22.69% of RS patients had hypertension, while only 11.54% had diabetes. A small fraction had a history of cardiovascular disease (6.9%), arthritis (9.2%), hyperparathyroidism (7.31%), gastrointestinal disorders (1.54%), or urinary tract infections (9.23%) (Table 4).

Table 5: Relation of physical activities and Smoking cigarettes factors with gender in patients with renal stones

physical activities & smoking (n=260)		**Gender no (%)**		
		Male (n=156)	**Female (n=104)**	**p**
Walking physical activities	No Yes	3 (1.92) 153 (98.08)	3 (2.88) 101 (97.12)	0.0002
Moderate physical activities	No Yes	122 (78.21) 34 (21.79)	91 (87.50) 13 (12.5)	0.0400
Vigorous physical activities	No Yes	95 (60.90) 61 (39.10)	92 (88.46) 12 (11.54)	<0.0001
Smoking cigarettes	No Yes	82 (52.56) 74(47.44)	98 (94.23) 6 (5.77)	<0.0001

The results of the study, presented in Table 5, showed that the male to female patients were small percentages engaged in the walking physical activities (98.08% vs. 97.12%; p = 0.0002). However, males were more likely to have engaged in moderate physical activity compared to females (21.79% vs. 12.5%; p=0.0400). Moreover, the majority of male patients were more likely to have engaged in Vigorous physical activities compered to females (39.10% vs. 11.54%; p<0.0001). Furthermore, a higher percentage of males smoking cigarette compered to females (47.44% vs. 5.77%; p<0.000)

Table 6: Relation of dietary factors with age groups in patients with renal stones

Dietary factors (n=260)	Age groups 18-44 years (n=154)	45-64 years (n=93)	> 65 years (n=13)	p
Consuming sugar-sweetened beverages				
Never-	26 (16.88)	31 (33.33)	7 (53.85)	
1-3 times/day	5 (3.25)	1 (1.08)	0 (0.00)	
1-3 times/month-	8 (5.19)	5 (5.38)	0 (0.00)	0.0136
1-3 times/week-	70 (45.45)	42 (45.16)	4 (30.77)	
4-7 times/week-	45 (29.22)	14 (15.05)	2 (15.38)	
Drinking energy drinking				
Never	78 (50.65)	79 (84.95)	13 (100)	
Once a day	23 (14.94)	1 (1.08)	0 (0.00)	
Once a week	25 (16.23)	9 (9.68)	0 (0.00)	
Triple a day	4 (2.60)	0 (0.00)	0 (0.00)	0.0001
Triple a week	6 (3.90)	1 (1.08)	0 (0.00)	
Twice a day	5 (3.25)	1 (1.08)	0 (0.00)	
Twice a week	11 (7.14)	1 (1.08)	0 (0.00)	
More than triple week	2 (1.30)	1 (1.08)	0 (0.00)	

The results of the study, presented in Table 6 showed that a significant majority of patients aged 18-44 consumed sugar-sweetened beverage one to three times a week compared to those aged 65 years and older (45.45% vs. 30.77%; p = 0.0136). Regarding consuming energy drinks, showed a significant relationship with age (p = 0.0001), only 1.08% of the 45-64 age group and none of the patients aged 65 years and older reported consuming them once a day, in contrast to an increased rate of 14.94% in the younger age group.

Table 7: Relation of lifestyle and dietary factors with gender in patients with renal stones

lifestyle and dietary factors (n=260)	Gender		
	Female (n=104)	Male (n=156)	p
Waking up at night for urination			
Never	13 (12.50)	36 (23.08)	
Once a night	17 (16.35)	54 (34.62)	<0.0001
Twice a night	29 (27.88)	33 (21.15)	
More than twice a night	45 (43.27)	33 (21.15)	
Color of your urine			
Bright yellow	11 (10.58)	24 (15.38)	
Brown	3 (2.88)	1 (0.64)	
Clear or light	2 (1.92)	10 (6.41)	0.0022
Cloudy	2 (1.92)	6 (3.85)	
Other	0 (0.00)	1 (0.64)	
Red or pink	20 (19.23)	7 (4.49)	
Yellow	66 (63.46)	107 (68.59)	
Drinking water per day			
Less than 4 glasses	27 (25.96)	16 (10.26)	
4-6 glasses	12 (11.54)	22 (14.10)	0.0106
7-8 glasses	10 (9.62)	20 (12.82)	
More than 8 glasses	55 (52.88)	98 (62.82)	
Drinking energy drinking			
Never-	81 (77.88)	89 (57.05)	
Once a day-	6 (5.77)	18 (11.54)	
Once a week-	8 (7.69)	26 (16.67)	
Triple a day-	3 (2.88)	1 (0.64)	0.0043
Triple a week-	0 (0.00)	7 (4.49)	
Twice a day-	2 (1.92)	4 (2.56)	
Twice a week-	2 (1.92)	10 (6.41)	
More than triple week	2 (1.92)	1 (0.64)	

Table 7 revealed that a significant majority of female's patients woke up More than twice at night for urination compered to males (43.27%, 21.15%; p < 0.0001). However, color of urine also differed by gender, with 68.59%, of males having yellow-colored of urine compered to females (63.43%; p = 0.0022). Moreover, the most of female's patients drank less than four glasses of water compered to males (25.96% vs. 10.26), but the highest rate of male's patients drank four to eight glasses of water daily compered to female patients (62.82% vs. 52.88%; p = 0.0106). Furthermore, a significant majority of male patients consumed energy drinks once a day compered to females (11.54% vs. 5.77%; p = 0.0043).

4. DISCUSSION

The present study found that the majority of RS cases occurred in the younger age group of 18-44 years, suggesting that RS predominantly affects younger to middle-aged patients, with a decreasing prevalence in the elderly. A study by Moftakhar et al. (2022) in Kharameh found that the age group of 40-70 years constituted the highest proportion among other age groups. Furthermore, the review conducted by Liu et al. (2018) indicated that, in most countries, males were predisposed to RS, with a male-to-female ratio ranging from 1.3 to 5; the current study's findings revealed that the majority of RS patients were males compared to females (60% vs. 40%). However, a substantial majority of patients were married compered to single patients. The study conducted by Safdar et al. (2021) in Saudi Arabia indicated that married patients had a slightly higher prevalence

of RS compared to single patients. Additionally, a notable proportion of patients were illiterate 23.46%, compared to lower percentage of postgraduate degrees. Similarly, a Xue et al. (2024) in Chin revealed that a postgraduate patients exhibited a significantly higher prevalence 23.3% compared to illiterate patients. Moreover, in term of employment status, the present study revealed that unemployed patients being significantly more affected than employed patients, consistent with Wu et al. (2023) in a Taiwanese Population, which reported identical prevalence rates for employed 22% and unemployed 64.5% individuals. Moreover, middle-income patients being the most affected at 62.31%, compared to the wealthy patients, while rural residents exhibiting a notably lower incidence of RS compared to urban residents at 45.39%. Meanwhile, the study conducted by Cheraghian et al. (2024) in in southwest Iran it founded that rural residency was associated with a higher prevalence of RS compered to urban residency. In constant, the current study findings suggested that marital status, education, occupational, economic, and environmental factors likely played a role in the development of RS.

Several lifestyle factors that could be significantly impact in development and recurrence of RS, in term of physical activity, the current study findings indicated a significant prevalence of sedentary lifestyles among patients, with 70.77% engaging in minimal physical activity. This contrasts with the moderate and vigorous physical activity levels reported (18.08% vs. 26.92%). These findings align with those of Zhang et al. (2023b), who observed that only 45.2% of their patients engaged in moderate physical activities and 31.3% in vigorous activities. These studies highlight a high prevalence of physical inactivity and sedentary behavior, which may contribute to an increased risk of RSF. However, the current study findings reported that a prevalence of alcohol consumption among patents were notably low, while 30.27% of participants smoked cigarettes. A similar study conducted by Yin et al. (2023), who observed a much higher rate of alcohol consumption and smoking in United States, as well as another similar study indicated a balanced prevalence of alcohol consumption and smoking in Taiwan (Wu et al., 2023). Moreover, according to the American Urological Association guidelines, there is no definitive threshold for urine volume concerning increased risk. Even if the 24-hour urine volume does not reach the specified goal of 2.5 L (Conroy et al., 2024). The current study found that, the majority of RS patients urinated more than four times per day. These findings suggest that increase urinary frequency may help flush out excess minerals or maintain hydration and may reduce risk of stone formation. Furthermore, in the current study, the majority of participants consuming caffeine, which aligns with the findings of Geng et al. (2022), where 89% of participants in China also affirmed similar consumption patterns. The formation of stones is influenced by various dietary habits, the current study findings revealed that a significant majority of participants consuming calcium-foods 4-7 times per week, a known risk factor for calcium stones, the AUA and EAU consistently recommend that patients with calcium stones should consume dietary calcium at 1000–1200 mg/d (Peerapen and Thongboonkerd, 2023). Thus, a reduction in calcium intake may be useful for the prevention of stone formation. Additionally, the highest rates of participants consuming foods rich in oxalate, like almonds, potatoes, and spinach, contributing to oxalate stone formation. RS can be avoided by controlling the production of oxalate stones through a low-oxalate diet. (Alhamdi and Alimah, 2024). Furthermore, current study showed that a significant proportion of participants (59.46%) reported consuming sodium. Results from observational study revealed that, the combination of dietary sodium and potassium intake was linked to be higher prevalence of RS formation (Tang et al., 2024). Moreover, these results showed that 44.62% of participants consumed sugar-sweetened beverages 1-3 times per week. In a similar findings, consume sugars was significantly associated with a higher prevalence of RS (Yin et al., 2023). The current study, suggest that a reduction of calcium, sodium, and sugar intake may be useful for the prevention of stone formation.

Regarding medical comorbidities, the current study revealed that a significant majority of patients (80.77%) reported a history of RS. Similarly, the review literature showed that older age is associated with a significantly higher probability of having had at least one episode of urolithiasis in the past (Basiri et al., 2024). Additionally, 57.69% of participants reporting a familial predisposition to RS formation. These finding align with existing study, most of participants reported a family history of RS (Shahidi et al., 2022). However, present research found that hypertension was a highly significant association with RS at 22.69%, followed by diabetes. Similarity, the study reported that hypertension was the most common comorbidity observed in 50.3% of patients followed by diabetes (Xue et al., 2024). The present findings suggest that chronicity, family history, and medical disease may play a role in the risk RS formation.

In the present study, significant gender differences were observed in lifestyle factors among patients with RS $p = 0.0002$. Males demonstrated a few differences of walking physical activity compared to females. In similar study, no significant gender difference was observed in physical activity, in both gender reported similar levels of activity ($p = 0.655$) (Shafiei et al., 2024). Additionally, smoking was highly significant among males, compared to females ($p < 0.0001$). This finding aligns with present study that reported a highly significant of smoking among males compared to females (Huang et al., 2023).

In the current study, the findings indicated a significant association between the consumption of sugar-sweetened beverages and the prevalence of RS among different age groups (0.0136). Younger individuals were more likely to consume sugar-sweetened beverages compared to older age groups. A Zhang et al. (2023a) reported that a higher dietary sugar intake from beverages was significant associated with a risk of RS. Regarding energy drinks, the present study's findings identified a significant association between age groups and the consumption of energy drinks among RS patients, with a p-value = 0.0001. In fact, energy drinks contain high amounts of B vitamins it is risk of RS development (Bentz, 2023). The researcher suggests that younger age groups may be more prone to dietary habits associated with an increased risk of stones formation.

The current findings regarding water intake revealed a significant gender difference that may impact the prevention of RS.

This data suggests that males tend to maintain better hydration levels. Similar study, revealed that a daily fluid intake of 1500 to 2000 mL was significantly associated with a reduction in the incidence of RS ($p = 0.023$) (Wu et al., 2023). Another, similar study revealed that higher water intake was associated with a significant reduction in the prevalence of RS (Gui et al., 2023)

Several lifestyle factors like physical inactivity, alcohol consumption, and smoking habits that could be significantly impact in development and recurrence of renal stones. However, the formation of stones is influenced by various dietary habits, like sugar, sodium, and calcium intake. Additionally, adequate drinking water, eating healthy diet, and regular exercise play the crucial role for preventing renal stone development.

5. CONCLUSIONS

Several lifestyle factors, such as physical inactivity, alcohol consumption, and smoking habits, could significantly impact the development and recurrence of renal stones. However, the formation of stones is influenced by various dietary habits, while increased sodium and animal protein intake have an equivocal impact on stone risk. Changing inappropriate habitual eating patterns and generalizing the use of portioning dietary intake should be the main measures to prevent renal stones. Increased fluid intake, as well as consumption of fruits and foods high in fiber, was associated with a lower risk of developing a first renal stone. Further research is needed to better understand the complex interplay between genetics, diet, lifestyle, and the risk of renal stones. The current study mainly underscores the important role of lifestyle factors in stone development and serves to promote education, awareness, and lifestyle changes.

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