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Knowledge and Attitude of Patients with a History of Nephrolithiasis on Avoiding Recurrence Among Patients Attending Al-Hussain Teaching Hospital in Kerbala City

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Abstract: Background: Nephrolithiasis has high recurrence rates and is a severe health burden in the world, but patient knowledge and habits regarding prevention are not investigated properly, especially in regions with high risks, such as the Middle East. The paper evaluated knowledge, attitude, and practices (KAP) of nephrolithiasis recurrence prevention in patients who visit Al-Hussain Teaching Hospital in Karbala, Iraq. Methods: The survey was carried out between January and June of the year 2017, in 250 patients (age 18 and above) who received renal stone treatment either through extracorporeal shock wave lithotripsy (ESWL) or through visits to a urology clinic. The structured questionnaire that was used to collect the data included sociodemographics, a history of nephrolithiasis, KAP scores (assessed through the 3-point Likert scale: good/satisfactory/poor), and prevention measures. The Chi-square tests, correlations (Pearson/Spearman), and significance set at $p<0.05$ were used to analyze using SPSS v24. Findings: The participants were mostly male (54.8%), ranged between the ages of 31-40 years (24%), overweight/obese (69.2%), and married (87.6%). General knowledge was excellent (71 percent; mean 0.71) with the highest level on animal protein sources (0.83) and water intake (0.69). The satisfaction with practices was satisfactory (0.65; 47.2% satisfactory), though excellent at fruits/vegetables/water (100), but poor at dairy/red meat reduction. The response towards the attitudes was good (44.4; mean 0.81). Significant associations were found with better knowledge with overweight BMI (p=0.026), poor economic status (p=0.020), rented housing (p=0.006), and cigarette smoking (p=0.001); better practices with younger age (p=0.035), male gender (p=0.03), free jobs (p=0.011), and waterpipe smoking (p=0.004). There was a positive correlation between knowledge and practice (r=0.271, p=0.007). Conclusion: In spite of good knowledge, preventive practices are still suboptimal, which indicates a gap in knowledge and practice that is dependent on sociodemographic and comorbidities. Specialized education on diet (e.g., dairy/oxalate restriction) and fluid intake during hot weather would help to prevent recidivism among this high-risk group.

Keywords: Knowledge, attitude, patients, sociodemographic, questionnaire, nephrolithiasis (kidney stone disease).

INTRODUCTION

Nephrolithiasis (kidney stone disease) is a global disease whose clinical and economic burden is very high. Nephrolithiasis affects all the environmental, educational, and ethnic groups. It has a likelihood of approximately 10 to 15 percent in the urban world and is approximately 20 to 25 percentage in the Eastern countries. The increased danger of dryness in high-temperature situations, combined with the diet (50% reduced in calcium and 25% increased in oxalates) over Western diets, calculations of the increase potential risk in the East (Arora, P. 2021).

Nephrolithiasis may consist of uric acid, cysteine, xanthine, magnesium phosphate, calcium phosphate, magnesium carbonate, calcium carbonate, or calcium oxalate. About (85 -95) percent of nephrolithiasis include calcium in some form, and (70-80) percent of the nephrolithiasis are composed of calcium oxalate (Alsuwaida, A. O. *et al*., 2010). Men are 4-5 times affinity to belong to calcium or uric acid stone. The Struvite stone mostly develops in women (Alobaidi, S. 2021).

The changes in the nutritional behavior and the alteration in the general lifestyle cause nephrolithiasis, which is revealed by the repetitive medical symptoms and the possible cause of structural harmful of the renal and of the urinary system, besides the possible increase in systemic blood pressure. Moreover, the patient is vulnerable to the side effects of such managements due to various requirements medical treatment requirements and invasive urological surgeries. Nephrolithiasis is one of the significant common urological diseases. (Khalil, A., & Abdalrahim, M. 2014)

The condition and its consequences are not severe in the majority of nephrolithiasis patients, and being sick of the disease may result in morbidity,

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hospitalization, and loss of time spent working each day, as well as, approximately half of all patients with nephrolithiasis have been predicted to have recurrent development of the stone (Sa'adeh, H. H. *et al*., 2018). In order to understand what lifestyle factors these might be, it helps to be familiar with the basic causes of nephrolithiasis development. Nephrolithiasis will only manifest itself in the situation when the urine is over-saturated with the stone-forming minerals that can be dissolved in the urine (Al-Husayni, F. *et al*., 2021). It has been established that the rate of nephrolithiasis recurrence among various groups 20 years after the initial nephrolithiasis is up to 70%, and half of them will happen before the age of 5 years (Johnson, D. W. *et al*., 2013). It has been informing that in the nations of the Arabian Gulf (United Arab Emirates (UAE)), Kuwait, and Saudi Arabia, the rate of nephrolithiasis is up to 20% of men in the country who would have experienced one or multiple urinary stone disease upon their age of 60 years old (Yusoff, D. M. *et al*., 2016).

Nephrolithiasis occurs in many types, and they differ in their pathogenesis and chemical composition. The calcium oxalate type of nephrolithiasis that is the widest is associated with metabolic abnormalities and can be treated most of the time (Alateeq, F. A. *et al*., 2018).

Many people often cause nephrolithiasis due to a combination of multifactor causes, not due to a single distinct cause. Nephrolithiasis is more common in individuals whose diet intake is mostly rich in animal protein or does not consume a large dose of fluid or a high calcium diet (Stanifer, J. W. *et al*., 2016). The observation in tropical areas was that the incidence of the loin pain (renal colic) is higher during warm months of the year and did not depend on the fasting of Ramadan in Iran (Almutary, H. H. 2021).

Nephrolithiasis are an increasing health issue of the population. Nephrolithiasis may be seen as a chronic pathophysiologic process, which caused mineral deposition, primarily calcium oxalate and calcium phosphate, in the kidneys. Nephrolithiasis is as common as diabetes mellitus, with the incidence being 1: 11 individuals per lifetime (AlSogair, A. A. *et al*., 2019).

Particularly, there is some evidence on the severity of nephrolithiasis in patients and the health sector, in which the lifetime prevalence of 13% (men) and 7% in women, and the 5-year risk of recurrence of approximately 35-50%, and the risk is time-dependent (Agustiyowati, T. H. R. 2020).

The nephrolithiasis rate has increased almost twice in the last 15 years and is increasing faster in the lower-risk populations, including blacks, children, and women. The prevalence of nephrolithiasis prevalence among women has risen by 75% since 1994; it has risen 120 per cent among blacks (AlSogair, A. A. *et al*., 2019). The incidence of nephrolithiasis in children appears to be escalating to 4-6 percent per year, with the majority being adolescents. In children of 10 years of age, girls are more likely to be affected with nephrolithiasis, as compared to adult men (Wolf, G. *et al*., 2011).

The reasons behind the rising cases of nephrolithiasis need more clarification; likely, the contributing factors are some changes in diet, fluid status, body habitus, and the environment (Khalil, A. A. *et al*., 2011). In addition, the transformations of socioeconomic factors have produced the variations in the prevalence, incidence, and distribution of sex, age, and type of nephrolithiasis in both site and chemical and physical makeup of the stone. Previous reviews of epidemiological surveys have indicated that in economically developed countries, the prevalence rate ranged between 4% and 20% (McCloskey, B., & Heymann, D. L. 2020). The influence of geography on the incidence of nephrolithiasis formation has been shown to be either direct or indirect, with high temperatures elevating perspiration and consequently allowing increased urinary crystallization (McEachan, R. *et al*., 2016). The latest prevalence rate of nephrolithiasis formation has been reported to have increased in a linear way in U.S. adults over the past years, with the most recent prevalence rate of 8.8 percent

MATERIALS & METHODS

Study Design:

The cross-sectional study survey, investigating general knowledge, attitudes, and practices regarding the Nephrolithiasis risk factors and prevention methods among the treated cases of nephrolithiasis who reported to the Extra-Corporal Shock Wave Lithotripsy (ESWL) department and urology consultation clinic in Al Hussainy teaching hospital in Karbala city, was conducted. The sample was chosen in Al-Hussainy Teaching Hospital. This was done by collecting data using a special questionnaire by conducting interviews directly with the respondents.

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Study Population :

The research targeted the patients with nephrolithiasis, who refer to Extra Corporal Shock Wave Lithotripsy (ESWL) department and the urology consultation clinic and received treatment of Nephrolithiasis between 1 st of January and 30 st of June, 2017.

Inclusion Criteria:

The inclusion criteria were 18 years and above, willingness to be involved, the ability to speak and understand, and treated with lithotripsy or a visit to a urology clinic because of nephrolithiasis.

Exclusion Criteria:

The only exclusion criterion was any other stone, as opposed to a renal stone.

Sampling Strategy

The study involved all 250 patients who visited the Extra-Corporal Shock Wave Lithotripsy (ESWL) department and urology consultation clinic, between 1 st January and 30 th of June 2017.

Study Instruments

The application of a semi-structured questionnaire that comprised of two sections, the first section, Sociodemographic data form, and the second section, factors contributed to recurrent nephrolithiasis, through a direct interview method, with the patients affected by nephrolithiasis.

Data collection. The data were gathered by means of the developed questionnaire and by using the method of structured interview. The survey was made up of close and open ended questions.

Variables

The main dependent variable in the study was the practice score regarding the prevention of nephrolithiasis (following the physician's recommendation regarding preventive behavior). The knowledge score was regarded as the primary independent variable of interest, whereas the control variables were age, sex, occupation, education, marital status and co-morbidities (diabetes mellitus, chronic kidney disease, intestinal abnormalities, and thyroid diseases).

Ethical Considerations

The approval of the study protocol was done by the Kerbala Health Directorate/Ministry of Health. Any respondent who took part in the survey was under voluntary participation and was free to avoid answering any question, and/or he/she could pull out of the research at any point. There was no incentive that the respondents got to take part, and all the data given were treated as confidential.

Statistical Analysis

The statistical package used to analyze and enter the data of the patients was version 24 of the statistical package with social sciences (SPSS), 2015. The statistical data cleaning methods were used to check for any errors or inconsistency in all the data. Descriptive statistics given in terms of mean, standard deviation, frequencies (No.), and proportions (%) as well. The scores were assessed and computed based on the 3-point Likert scale analysis, with the analysis of correct response as 1 and the incorrect, don't know, or undecided response as 0. The total scores of each area of knowledge and that of practice and attitude were obtained by summation of correct responses of a particular area; the mean score of a particular domain was obtained by dividing the total score of an area by the number of items of that area. The overall knowledge score was also calculated using a similar calculation method. Mean score was calculated as the score of each individual item of knowledge, practice, or attitude, which was the result of dividing the number of all patients who were correct with the total number of them (250). The knowledge scores were evaluated by dividing the score of 1 (correct response score) by 3 to come up with three categories (good, satisfactory, and poor). Thus, the cutoff was 0.333, i.e., patients whose mean knowledge was below or equal to 0.333 had poor knowledge, 0.34 -0.67 had satisfactory and above knowledge. Equally, the practice was grouped under three groups, and the attitude was grouped under positive, neutral, or negative categories, with the same cutoff of 0.333.

The data regarding the correlation between the various variables and each of knowledge, practice, and attitude were evaluated in two ways: firstly, through cross-tabulation and analysis through the Chi-square test (Use of Fisher's exact test as an alternative when Chi-square could not be applied), and secondly, the inter-correlations through the bivariate analyses by the Pearson and Spearman correlation tests. The level of significance was set to 0.05 and below to be regarded as significant, and lastly, all the findings that were presented in the tables and/or figures with a description of each in an explanatory paragraph using the Microsoft Office (Word) version 2010.

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RESULT

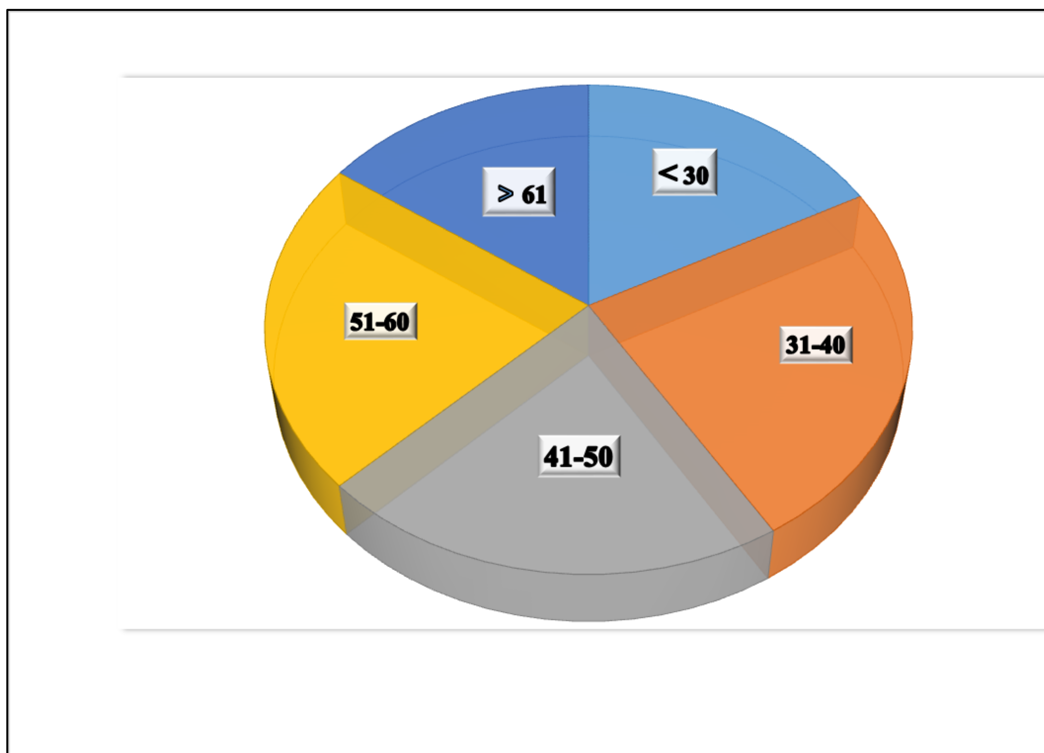

Figure 1: Age Distribution of patients (years)

Table 1: Socio-demographic characteristics of the studied group (N = 250)

Variable		No.	%
Age (year)	≤ 30	43	17.2
	31 - 40	60	24.0
	41 - 50	54	21.6
	51 - 60	55	22.0
	> 60	38	15.2
	Mean ± SD*	46.14 ± 14.7	-
Gender	Male	137	54.8
	Female	113	45.2
BMI	Normal	77	30.8
	Overweight	93	37.2
	Obese	80	32.0
	Mean ± SD*	27.9 ± 4.4	-
Marital status	Married	219	87.6
	Single	19	7.6
	Widowed and divorced	12	4.8
Education	Illiterate	20	8.0
	Read and write	66	26.4
	Primary	74	29.6
	Secondary	54	21.6
	Institute and higher	36	14.4
Occupation	Housewife	87	34.8
	Free job	67	26.8
	Employed	53	21.2
	Retired	21	8.4
	Unemployed	22	8.8
Economic status	Poor	31	12.4
	Middle	139	55.6

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	Good	64	25.6
	Excellent	16	6.4

Table 2. Living at home and family members' distribution at home of the study participants (N = 250)

Variable		No.	%
Number of rooms in the Home	2	135	54.0
	3	105	42.0
	4	10	4.0
Number of persons living in the home	2 - 3	18	7.2
	3 - 4	87	34.8
	5 - 6	95	38.0
	7 and more	50	20.0
	Total	250	100.0
Distribution of the family at home per room	One person	67	26.8
	Two persons	169	67.6
	All the family	14	5.6
Crowded index	≤ 3	166	
	> 3 (**Overcrowded)**	84	

Table 3: History of having diseases besides the kidney stone disease (N = 250)

Variable		No.	%
Hypertension	Yes	121	48.4
	No	129	51.6
Diabetes mellitus	Yes	85	34.0
	No	165	66.0
Chronic kidney disease	Yes	68	27.2
	No	182	72.8
Intestinal abnormalities	Yes	17	6.8
	No	233	93.2
Thyroid diseases	Yes	75	30.0
	No	175	70.0

Table 4. Kidney Stone Disease: History of the study participants (N = 250)

Variable		**No.**	**%**	**mean**	**S.D**
Frequency of having renal stones	First time	167	66.8		
	Second time	73	29.2		
	Third time or more	10	4.0		
Duration since first diagnosis with renal stone (year)	≤ 3	28	11.2		
	4	59	23.6		
	5	67	26.8		
	6	68	27.2		
	≥ 7	28	11.2		
Times of getting lithotripsy	Once	44	17.6		
	Twice	103	41.2		
	Three times	58	23.2		
	Four times	45	18.0		
Family history of renal stone	Yes	135	54.0		
	No	115	46.0		

Table 5: History of Using and Types of Medications to Prevent the Development of New Kidney Stones

Variable	No.	%
Not Use Medication To Prevent Development Of New Kidney Stones	107	42.8
Use Medication To Prevent the Development Of New Kidney Stones	143	57.2
Medications		
Alkaline citrates (Uralit-U)	53	21.2

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Potassium (kalinor)	30	12
Allopurinol (hyporic / zyloric)	16	6.4
Phytotherapy (Cyston, Urinex)	44	17.6

Table 6: Receiving and source of information about kidney stone disease prevention of the study participants (N=250)

Variable		No.	%	Mean	S.D
Receive information about kidney stone disease prevention	Yes	87	34.8		
	No	163	65.2		
Source of information	Family physician/GP	23	26.4		
	Internet	22	25.3		
	Urologist	21	24.1		
	Mass media, printed brochures	11	12.6		
	Paramedical staff	10	11.5		
	Total	87	100.0		
Information received helped to make diet and lifestyle changes	Yes	76	87.4		
	No	11	12.6		
	Total	87	100.0		

Table 7: Knowledge of the study participants about the recommendations of health experts for consumption of different food items (N = 250)

Knowledge about health expert recommendations *						
Item	Correct		Incorrect		mean score	Evaluation
	No.	%	No.	%		
Vegetables	227	90.8	23	9.2	0.91	Good
Dairy product	110	44.0	140	56.0	0.44	Fair
Sugary foods / carbonated beverages	248	99.2	2	0.8	0.99	Good
Fish and seafood	56	22.4	194	77.6	0.22	Poor
Red Meat	199	79.6	51	20.4	0.80	Good
Greens (Leaf vegetables).	176	70.4	74	29.6	0.70	Good
Nuts (almond, walnut, peanut)	157	62.8	93	37.2	0.63	Fair
Salty foods	250	100.0	0	0.0	1.00	Good
Fruit	250	100.0	0	0.0	1.00	Good
Water	250	100.0	0	0.0	1.00	Good
Fatty foods	161	64.4	89	35.6	0.64	Fair
Beans	136	54.4	114	45.6	0.54	Fair
Spinach	49	19.6	201	80.4	0.20	Poor
Eggs	48	19.2	202	80.8	0.19	Poor
Overall, the knowledge for this domain					0.66	Fair

* Correct answers are available in Appendix 2

Table 8: Knowledge of the study participants about the source of animal protein (N = 250)

Knowledge about the source of animal protein						
Item	Correct		Incorrect		**mean score**	Evaluation
	No.	%	No.	%		
Red meat	239	95.6	11	4.4	0.96	Good
Chicken	207	82.8	43	17.2	0.83	Good
Greens (Leaf vegetables).	250	100.0	0	0.0	1.00	Good
Cheese	58	23.2	192	76.8	0.23	Poor
Fruits	250	100.0	0	0.0	1.00	Good
Beans	223	89.2	27	10.8	0.89	Good
Overall, the knowledge for this domain					0.82	Good

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Table 9: Knowledge of the study participants about drinking water and kidney stone disease (N = 250)

Knowledge about drinking water and kidney stone disease						
item	Correct		Incorrect		mean score	Evaluation
	No.	%	No.	%		
Drinking plenty of water is necessary to prevent renal stones	237	94.8	13	5.2	0.95	Good
Amount of drinking water in Winter	97	38.8	153	61.2	0.39	Fair
Amount of drinking water in the summer	222	88.8	28	11.2	0.89	Good
working at hot climate will lead to renal stones	137	54.8	113	45.2	0.55	Fair
Overall, the knowledge for this domain					0.69	Good

Table 10: Distribution of the study participants according to their working in hot conditions

Variable		No.	%	**score**
Work in a hot condition/under the sun (more than 30 C°)	Yes	29	11.6	
	No	221	88.4	
	Total	250	100.0	
Kind of work	Building worker	17	58.6	
	Baker	12	41.4	
	Total	29	100.0	
Change the work after being diagnosed with renal stones	Yes	6	20.7	
	No	23	79.3	
	Total	29	100.0	
Mean duration of working in hot conditions/under the sun (years)		5.7 ± 2.7	-	

Table 11: Distribution of the study participants according to their overall and different knowledge domains (N = 250)

	Good		Satisfactory		Poor		mean score	Evaluation
	No.	%	No.	%	No.	%		
knowledge about Health experts recommendations	51	20.4	125	50.0	74	29.6	0.66	Fair
knowledge about sources of animal protein	178	71.2	68	27.2	4	1.6	0.83	Good
Knowledge about the risk of working in hot conditions	157	62.8	29	11.6	64	25.6	0.69	Good
Overall, Knowledge	71	28.4	109	43.6	70	28.0	0.71	Good

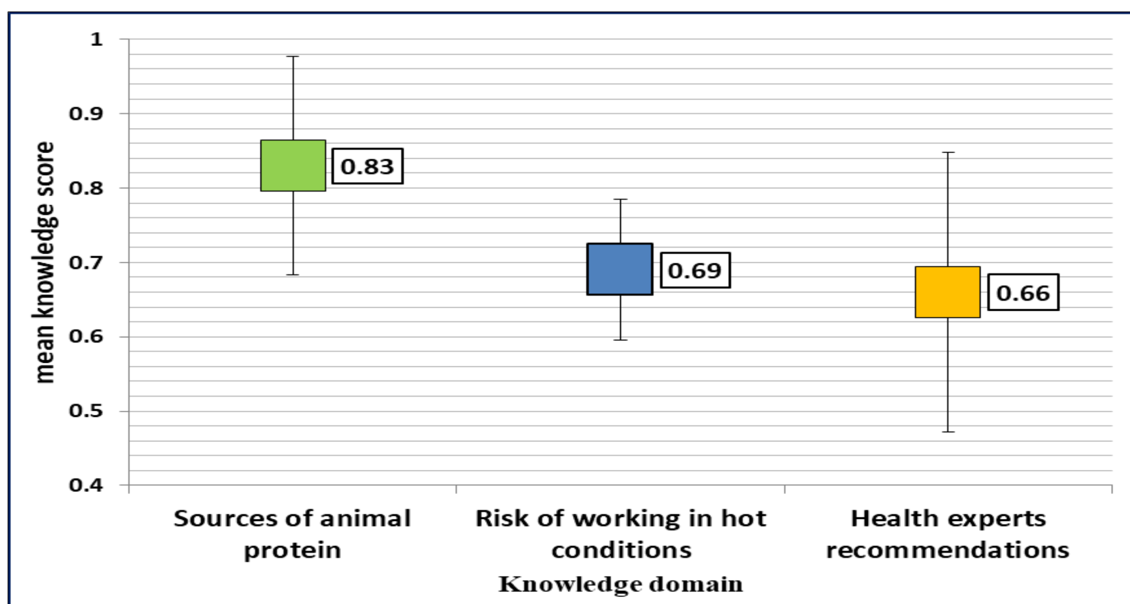

Figure 2: Mean knowledge score for different domains vertical lines represented (mean ± standard deviation) values

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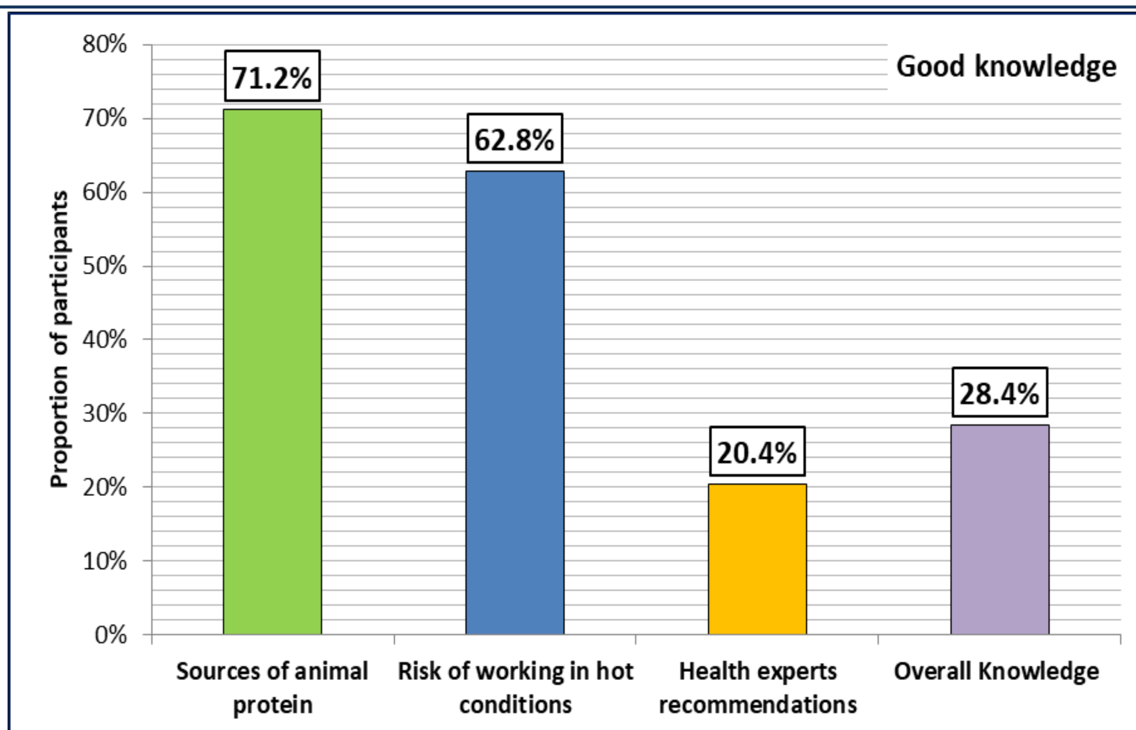

Figure 3: Proportional distribution of study participants with good knowledge for the overall and different domains

Table 12: Practice of the study participants regarding the frequency of consuming the food items

Practice for frequency of food consumption						
Food item	Correct		Incorrect		mean score	Evaluation
	No.	%	No.	%		
Milk and dairy product	30	12.0	220	88.0	0.12	Poor
Egg	186	74.4	64	25.6	0.74	Good
Red meat	64	25.6	186	74.4	0.26	Poor
Fish and seafood	216	86.4	34	13.6	0.86	Good
Fresh fruits	250	100.0	0	0.0	1.00	Good
Vegetables	250	100.0	0	0.0	1.00	Good
Dark Chocolate	248	99.2	2	0.8	0.99	Good
Beans	52	20.8	198	79.2	0.21	Poor
Nuts	127	50.8	123	49.2	0.51	Satisfactory
Tea	52	20.8	198	79.2	0.21	Poor
Salty food	113	45.2	137	54.8	0.45	Satisfactory
Fatty foods	161	64.4	89	35.6	0.64	Satisfactory
Water - more than 2 liters	250	100.0	0	0.0	1.00	Good
Spinach	238	95.2	12	4.8	0.95	Good
Overall Practice for this domain					0.65	Satisfactory

** Correct answers are available in Appendix 2

Table 13: Distribution of the study participants according to their overall practice score evaluation (N = 250)

Practice	No.	%
Good	30	12.0
Satisfactory	118	47.2
Poor	102	40.8
Total	250	100.0

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Table 14: Attitude of the treated patients toward prevention of the kidney stone disease (N = 250)

Question	Attitude				Mean score	Evaluation
	Positive		Negative			
	No.	%	No.	%		
Renal stone prevention is expensive	217	86.8	33	13.2	0.87	Positive
Obesity is a sign of good health	174	69.6	76	30.4	0.70	Neutral
It is unlikely that a certain diet could prevent renal stone development	201	80.4	49	9.6	0.80	Positive
There is no need to make efforts to prevent renal stones	210	84.0	40	16.0	0.84	Positive
Overall attitude for this domain					0.81	Positive

Table 15: Distribution of the study participants according to their overall attitude score evaluation (N = 250)

Attitude	No.	%
Positive	111	44.4
Negative	54	21.6
Neutral	85	34.0
Total	250	100.0

Association of knowledge, practice, and attitude with different patients' variables

Table 16: Association between knowledge about prevention of kidney stone disease and socio-demographic characteristics of study participants (N = 250)

Variable	grouping	Knowledge						P. value
		Good		Satisfactory		Poor		
		No.	%	No.	%	No.	%	
Age (year)	≤ 30	12	27.9	20	46.5	11	25.6	0.41
	31 - 40	16	26.7	27	45.0	17	28.3	
	41 - 50	22	40.7	21	38.9	11	20.4	
	51 - 60	11	20.0	23	41.8	21	38.2	
	> 60	10	26.3	18	47.4	10	26.3	
Gender	Male	36	26.3	63	46.0	38	27.7	0.64
	Female	35	31.0	46	40.7	32	28.3	
BMI category	Normal	16	20.8	36	46.7	25	32.5	0.026
	Overweight	36	38.7	40	43.0	17	18.3	
	Obese	19	23.8	33	41.3	28	35.0	
Marital status	Married	60	27.4	97	44.3	62	28.3	0.21
	Single	4	21.1	9	47.4	6	31.6	
	Widowed/divorced	7	58.3	3	25.0	2	16.7	
Education	Illiterate	5	25.0	8	40.0	7	35.0	0.93
	Read and write	16	24.2	33	50.0	17	25.8	
	Primary	22	29.7	30	40.5	22	29.7	
	Secondary	17	31.5	21	38.9	16	29.6	
	Institute/higher	11	30.6	17	47.2	8	22.2	
Occupation	Housewife	29	33.3	34	39.1	24	27.6	0.18
	Free job	18	26.9	27	40.3	22	32.8	
	Employed	13	24.5	24	45.3	16	30.2	
	Retired	9	42.9	9	42.9	3	14.3	
	Unemployed	2	9.1	15	68.2	5	22.7	
Economic status	Poor	15	48.4	12	38.7	4	12.9	0.020
	Middle	34	24.5	60	43.2	45	32.4	
	Good	20	31.3	31	48.4	13	20.3	
	Excellent	2	12.5	6	37.5	8	50.0	
Home ownership	Owned	49	28.8	65	38.2	56	32.9	0.006
	Rented	22	32.4	34	50.0	12	17.6	
	Fathers home	0	0.0	10	83.3	2	16.7	

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Crowding index	Low	37	29.8	50	40.3	37	29.8	0.87
	Moderate	11	26.2	19	45.2	12	28.6	
	Overcrowding	23	27.4	40	47.6	21	25.0	
Smoking	Cigarette	13	17.8	45	61.6	15	20.5	0.001
	Waterpipe	11	22.9	24	50.0	13	27.1	0.55

Table 17: Correlation between Practice for prevention of kidney stone disease and socio-demographic characteristics of study participants

Variable	grouping	Practice						P. value
		Good		Satisfactory		Poor		
		No.	%	No.	%	No.	%	
Age (year)	≤ 30	10	23.3	19	44.2	14	32.6	0.035
	31 - 40	9	15.0	31	51.7	20	33.3	
	41 - 50	1	1.9	30	55.6	23	42.6	
	51 - 60	4	7.3	25	45.5	26	47.3	
	> 60	6	15.8	13	34.2	19	50.0	
Gender	Male	21	15.3	68	49.6	48	35.0	0.03
	Female	9	8.0	50	44.2	54	47.8	
BMI category	Normal	10	13.0	40	51.9	27	35.1	0.33
	Overweight	7	7.5	44	47.3	42	45.2	
	Obese	13	16.3	34	42.5	33	41.3	
Marital status	Married	22	10.0	104	47.5	93	42.5	0.077
	Single	4	21.1	10	52.6	5	26.3	
	Widowed and divorced	4	33.3	4	33.3	4	33.3	
Education	Illiterate	2	10.0	9	45.0	9	45.0	0.12
	Read and write	6	9.1	25	37.9	35	53.0	
	Primary	10	13.5	34	45.9	30	40.5	
	Secondary	10	18.5	26	48.1	18	33.3	
	Institute and higher	2	5.6	24	66.7	10	27.8	
Occupation	Housewife	7	8.0	40	46.0	40	46.0	0.011
	Free job	12	17.9	32	47.8	23	34.3	
	Employed	0	0.0	29	54.7	24	45.3	
	Retired	6	28.6	7	33.3	8	38.1	
	Unemployed	5	22.7	10	45.5	7	31.8	
Economic status	Poor	6	19.4	13	41.9	12	38.7	0.026
	Middle	22	15.8	63	45.3	54	38.8	
	Good	2	3.1	31	48.4	31	48.4	
	Excellent	0	0.0	11	68.8	5	31.3	
Ownership of the home	Owned	20	11.8	83	48.8	67	39.4	0.87
	Rented	8	11.8	31	45.6	29	42.6	
	Fathers home	2	16.7	4	33.3	6	50.0	
Crowding index	Low	19	15.3	58	46.8	47	37.9	0.24
	Moderate	6	14.3	21	50.0	15	35.7	
	Overcrowding	5	6.0	39	46.4	40	47.6	
Smoking	Cigarette	12	16.4	33	45.2	28	38.4	0.38
	Waterpipe	10	20.8	28	58.3	10	20.8	0.004

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Table 18: Correlation between Practice for prevention of kidney stone disease and socio-demographic characteristics of study participants

Variable	grouping	Attitude						P. value
		Positive		Negative		Neutral		
		No.	%	No.	%	No.	%	
Age (year)	≤ 30	16	37.2	17	39.5	10	23.3	0.10
	31 - 40	30	50.0	8	13.3	22	36.7	
	41 - 50	27	50.0	8	14.8	19	35.2	
	51 - 60	21	38.2	13	23.6	21	38.2	
	> 60	17	44.7	8	21.1	13	34.2	
Gender	Male	58	42.3	29	21.2	50	36.5	0.64
	Female	53	46.9	25	22.1	35	31.0	
BMI category	Normal	39	50.6	16	20.8	22	28.6	0.43
	Overweight	43	46.2	18	19.4	32	34.4	
	Obese	29	36.3	20	25.0	31	38.8	
Marital status	Married	95	43.4	45	20.5	79	36.1	0.20
	Single	8	42.1	7	36.8	4	21.1	
	Widowed/divorced	8	66.7	2	16.7	2	16.7	
Education	Illiterate	5	25.0	5	25.0	10	50.0	0.49
	Read and write	32	48.5	18	27.3	16	24.2	
	Primary	32	43.2	14	18.9	28	37.8	
	Secondary	25	46.3	10	18.5	19	35.2	
	Institute and higher	17	47.2	7	19.4	12	33.3	
Occupation	Housewife	37	42.5	21	24.1	29	33.3	0.88
	Free job	29	43.3	12	17.9	26	38.8	
	Employed	25	47.2	9	17.0	19	35.8	
	Retired	10	47.6	6	28.6	5	23.8	
	Unemployed	10	45.5	6	27.3	6	27.3	
Economic status	Poor	18	58.1	5	16.1	8	25.8	0.002
	Middle	55	39.6	43	30.9	41	29.5	
	Good	31	48.4	6	9.4	27	42.2	
	Excellent	7	43.8	0	0.0	9	56.3	
Ownership of the home	Owned	70	41.2	36	21.2	64	37.6	0.10
	Rented	33	48.5	14	20.6	21	30.9	
	Fathers home	8	66.7	4	33.3	0	0.0	
Crowding index	Low	49	39.5	31	25.0	44	35.5	0.29
	Moderate	23	54.8	9	21.4	10	23.8	
	Overcrowding	39	46.4	14	16.7	31	36.9	
Smoking	Cigarette	41	56.2	8	11.0	24	32.9	0.013
	Water pipe	25	52.1	6	12.5	17	35.4	0.21

Table 19: Inter-correlation of comorbidities and nephrolithiasis-related variables with knowledge, practice, and attitude of study participants toward prevention of nephrolithiasis

Variable	Statistics	Knowledge	Practice	Attitude
Hypertension	R	0.024	0.069	0.010
	P. value	0.706	0.278	0.877
Diabetes mellitus	R	-0.018	0.035	0.054
	P. value	0.773	0.582	0.398
Chronic kidney disease	R	-0.045	-0.087	0.049
	P. value	0.479	0.168	0.443
Intestinal abnormalities	R	0.080	-0.016	0.078
	P. value	0.206	0.796	0.219
Thyroid diseases	R	0.108	-0.037	-0.004
	P. value	0.089	0.560	0.947

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Frequency of having kidney stones	R	-0.038	-0.102	-0.078
	P. value	0.545	0.106	0.221
Duration since the first diagnosis with kidney stone	R	0.022	0.093	-0.186*
	P. value	0.734	0.141	0.003
Times of getting lithotripsy	R	-0.025	0.083	-0.090
	P. value	0.699	0.189	0.157
Family history of renal stone	R	-0.064	-0.149*	0.071
	P. value	0.315	0.019	0.265
Work in a hot condition	R	0.560*	0.056	0.003
	P. value	0.002	0.377	0.961
Correlation is significant at the 0.05 level (2-tailed).				

Table 20 Inter-correlation between knowledge, practice, and attitude of the study participants toward prevention of kidney stone diseases

	Statistics		
		Knowledge	Practice
Knowledge	R		0.271*
	P		0.007
Attitude	R	0.022	0.061
	P	0.733	0.334
* Correlation is significant at the 0.05 level (2-tailed).			

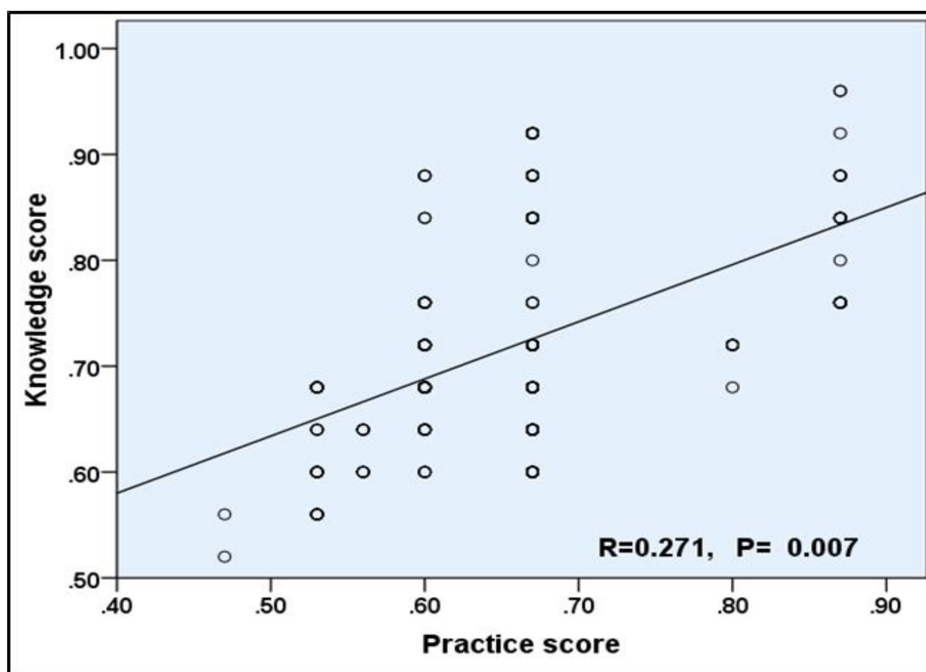

Figure 4: The significant direct (positive) correlation between knowledge and practice of the study participants toward the prevention of kidney stone disease

DISCUSSION

Most of the sample (24.0) was in the 31 -40 years age bracket, as indicated by the results of the study. The findings align with those of Ansari and Gupta (2003), who said that the prevalence of nephrolithiasis between males and females can be observed, where in the fourth and fifth decades of life, there was a major occurrence.

According to the study, 54.8 percent of the sample under study were male, with the results supported by Soller (2004), who opined that the incidence of nephrolithiasis is higher in males than females by the ratio of 1.3.

In terms of level of education, the research shows that (29.6%) of the sample in the study had only primary school education, which means that (29.6) of the patients had some form of education, which is significant in determining the risk factors of recurrent urinary stone and preventive measures against stone formation. Comparing the periods of

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recurrence of 29.2 of the sample with first-time recurrence, Avinash *et al*. (2010) noted that a high number of patients will have experienced a number of stones in their age, with half of them expected to recur within 5-10 years and 75% of them within 20 years.

With respect to body mass index, the outcome indicates that (37.2) percent of the sample were at the borderline of Overweight status, the outcome consistent with the findings of Ross and McGill (2006), who explained that the escalation of body weight could be the cause of the escalating cases of patients with nephrolithiasis. Individuals who are centrally adipose or possess high waist-to-hip ratios are at the great risk.

Approximately 50 percent of the total number of patients were having hypertension, that goes along with rising blood pressure are associated with nephrolithiasis. The rising number of signs that a connection exists between nephrolithiasis and metabolic syndrome is concerning, given the rising incidence of obesity among the American population. Probably, the same pathophysiologic processes associated with metabolic syndrome may explain the growing occurrence of hypertension and the growth of stones.

Both of the conditions can be treated using lifestyle modification to avoid weight gain and hypertension. A lower-sodium diet with increased intake of fruits, vegetables, and low-fat dairy products, including the dietary approaches to stop hypertension (DASH) diet, might prove effective in preventing stones and hypertension. The fact that large amounts of fluid intake should reduce urine volume and concentration, as well as the rate of urine elimination and lower urinary supersaturation, thereby reducing the crystallization and stone formation of the salts.

Diet may have an etiologic role, treatment or prevention of recurrence of nephrolithiasis, since dietary content and watery intake can influence the volume, pH and the degree of minerals in the urine, the dietary composition can influence the biochemical compounds like oxalate, uric acid, calcium and sodium etc., thus, quantity along with quality dietary regulation specifically with oxalate, animal protein and minerals may have the likelihood of recurrent stone formation.

Approximately 29 (11.6) of patients who are employed in a hot climate, and these are risky to constant dryness as a result of elevated environmental temperatures, heavy work involving physical exertion, and not substituting the lost fluids, have a predominantly rise rate of rise and prevalence of nephrolithiasis.

With regards to medication intake, the finding was that there is a gap in the knowledge of the patient when it comes to medication intake. Findings of this paper show that the respondents were quite knowledgeable about the risk factors of developing nephrolithiasis (the average overall knowledge score was 0.71 out of one which was deemed as good, but better knowledge score was observed when it concerned the knowledge about the sources of animal protein, then Knowledge about risk of working in hot conditions and the lower score when it concerned Knowledge about health expert recommendations,). Simultaneously, the general practice score was 0.65 out of one, presenting an evaluation of satisfactory (The distribution of the study participants based on their practice score evaluation showed that (47.2%) had satisfactory practice.

This correlation between good knowledge and BMI was statistically significant; overweight patients tended to have good knowledge. Patients who had poor economic status and those who lived in rented houses were also likely to have good knowledge. The smokers of cigarettes had much higher knowledge scores (good) than non-smokers. Two-thirds of the patients had owned homes, and more than half of the patients were living in non-crowded households. On the other hand, approximately one third of the patients in the same household with 5-6 people had reported in the 2001 National Health Survey, a significantly lower average number of health conditions, than those living in non-crowded households.

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