Effect of Teaching Program on Adherence of Healthy Lifestyle Behaviors and Clearance of Small Lower Ureteric Stone

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Abstract

Background: Urinary stone affects about 12% of the world's population and has become a worldwide health problem. Lifestyle behaviors can contribute to the risk of urinary stone formation; addressing these behaviors adequately can provide a simple and more cost-effective measure for the prevention of urinary stones and the reduction of their recurrence among urinary stone patients. **The current study aimed to** evaluate the effect of the teaching program on adherence of healthy lifestyle behaviors and clearance of small lower ureteric stone. **Research design:** Quasi-experimental design (two groups pre-test, post-test) was used to achieve the aim of this study. **Sample:** A purposive sample of 60 patients was divided into two groups (30 patients in the study group and 30 patients in the control group). **Tool (I):** A structured interviewing questionnaire that includes part one: demographic characteristics of the patients, part two: included present medical history and previous medical history. **Tool (II):** Adherence of healthy lifestyle behaviors scale: it was divided into three subscales regarding consumption of restricted foods, consumption of fluids, and healthy usual self-activities. **Tool (III):** Patients' outcome sheet. **Results:** There are statistically significant differences between both groups post-teaching program regarding satisfactory adherence level of healthy lifestyle behaviors. The clearance of a small lower ureteric stone occurred in the study group more than in the control group and there was a statistically significant difference. **Conclusion:** The study concluded that the teaching program has a positive effect on adherence of healthy lifestyle behaviors to enhance stone clearance and prevent its recurrence. **Recommendations:** Creation of an educational unit for urinary tract stone patients in the nephrology and urology hospital. Conducting similar studies on a larger probability sample is recommended to achieve generalization of the findings

Keywords: Adherence, Clearance, Lifestyle, Program, Ureteric Stone.

Introduction

Urolithiasis specifically refers to calculi in the urinary tract. Ureteral stones almost always originate in the kidneys, and although they may continue to grow once, they lodge in the ureter. Most urinary stones contain calcium. The pain generated by renal colic is primarily caused by dilation, stretching, and spasms because of the acute ureteral block **(Toole et al., 2021)**.

The prevalence of urolithiasis is estimated at 3% of all individuals and affects up to 12% of the general population during their lifetime **(Abdelwahab et al., 2021)**. Most patients with urolithiasis form calcium stones (80%), most of which are composed primarily of calcium oxalate or calcium phosphate. The other main types include uric acid, struvite (magnesium ammonium phosphate), and cystine stones **(Nojaba & Guzman, 2020)**.

The typical presentation for a patient with acute renal colic is the sudden onset of intense pain originating in the flank and radiating inferiorly and anteriorly; at least 50% of patients will also have nausea and vomiting. Patients with urinary stones may report pain, infection, or hematuria **(Baseskioglu et al., 2018)**.

The primary goal of the management of urinary stones is to detect complications and prevent or decrease recurrence. Lifestyle modification is therefore the first line of intervention for all patients to improve their health outcomes and prevent a recurrence. Therefore, lifestyle modification related to dietary habits, fluid intake, weight reduction, physical activity, smoking cessation, follow up and compliance with the therapeutic regimen is particularly an important strategy for self-management of urinary stones **(Abdelwahab et al., 2021)**.

Community health nurses must be a cornerstone in the care and education of adult patients with the urinary stone disease for a successful treatment outcome, improving quality of life and preventing the disease complications and its recurrence for those patients through assessment, planning, implementation, and evaluation of educational guidelines for helping patients to learn or relearn healthy lifestyle behaviors **(Abdelwahab et al., 2021)**

Significance of the study

Urinary stone is one of the oldest disorders of humans and one of the major health burdens. Of all the urinary tract stones 20% are ureteral stones, of which 70% are found in the distal ureter **(Cholaraju et al., 2020).** In the Middle East, a high incidence rate is reported at 20-25% due to hot climate with increased chances of dehydration. In Egypt, according to the WHO data, kidney disease deaths reached 15,820 (3.41%) of total deaths. Egypt is ranked the 12th country in the world had a high death rate of kidney diseases **(Graham-Knight et al., 2019).**

As a consequence of the increase in the prevalence of the stone disease, the cost associated with diagnosis, treatment, and follow-up of individuals with stones has risen accordingly. Also, urolithiasis has been associated with an increased risk of chronic kidney diseases, end-stage renal failure, cardiovascular diseases, diabetes, and hypertension. Consequently, prophylactic management is important to manage urolithiasis **(Saboula et al., 2019)**. So, teaching program on urinary stones is a practical strategy to make the

patients aware of their disease and to reduce the recurrence of the disease and thus reduce complications and help them to take self-responsibility for their health. Therefore, increasing knowledge and adherence of healthy lifestyle behaviors for such patients regarding the disease can help them to prevent the recurrence of the disease **(Christy Kamalam, 2018).**

Aim of the Study

This study aimed to evaluate the effect of the teaching program on adherence of healthy lifestyle behaviors and clearance of small lower ureteric stone.

Research hypothesis:

H1- Patients' healthy lifestyle behaviors will be higher in the post-teaching program than the pre-teaching program among the study group.

H2- Patients who will receive the teaching program will have increased clearance of small lower ureteric stone.

Subject and Methods
Research design:

Quasi-experimental design (two groups pre-test, post-test) was used to achieve the aim of this study.

Setting:

The study was conducted at the urology outpatient clinic in the nephrology and urology hospital, Minia university which covers Minia governorate

Sample

A purposive sample was approached. According to the Minia university hospital census, the yearly average of patients with small lower ureteric stone and undergoing only medical treatment attending urology outpatient clinic were 400. The sample size was determined using the Epi info 7 program; the calculation was based on the following:

- Population size= 400
- Acceptance Error = 5.1%
- Confidence coefficient= 95%
- Response distribution = 95%

Sixty patients were divided into two groups (30 patients in the study group and 30 patients in the control group).

Inclusion criteria:

1- Diagnosis with unilateral lower ureteric stone smaller than 10mm.
2- Age above 18 years.
3- Patients who are undergoing only medical treatment.

Exclusive criteria:

1. Patients who are suffering from deafness, or with a mental disorder or severe cerebral vascular diseases that may affect cognitive ability.
2. Bilateral and multiple lower ureteric or other urinary stones.

Tools of data collection:

Structured interview questionnaire: it was developed by the investigator after an extensive review of related literature with the consultation of the experts in the field of community health nursing and medical surgical nursing at the faculty of nursing; at Minia university to test its content validity and feasibility.

The tool I: Structured interviewing questionnaire: it included two parts:
Part One: Demographic characteristics of the patients; included age, gender, education, marital status, residence, occupation, workplace, and source of water supply

Part Two:
- A- **Present medical history:** It involved the type of associated chronic diseases, the side of the ureteric stone, the current complaint, and the numerical rating pain scale ('0-10' point pain intensity scale) **(Boonstra, 2016).**
- B- **Previous medical history:** It involved family history, previous history with urinary tract stones, number of recurrences, side of the previous stone, number of removed stones, and methods of previous treatment.

Tool II: Adherence of healthy lifestyle behaviors scale, was adapted by the investigator after a distinctive review of the current literature **(Mahmoud, et al., 2019)**. It was divided into three subscales as the following:
1. **Adherence regarding consumption of restricted foods.**
2. **Adherence regarding consumption of fluids.**
3. **Adherence regarding healthy usual self-activities.**

Scoring system

By using the Likert scale **(Mahmoud, et al., 2019)** with three responses: usually done (two marks), sometimes done (one mark), and never (zero marks). The total marks were summed, and the percentage was calculated for all patients and judged as the following :
- Satisfactory adherence level $\geq 70\%$
- Unsatisfactory adherence level $< 70\%$

Tool III: Patients' outcome sheet:

It was adapted by the investigator after a distinctive reviewing of the current literature. It included the following:
- **Part (A):** Numerical Rating Pain Scale (Post teaching program); ('0-10' point pain intensity scale) which Zero indicates the absence of pain, (1-3) indicates mild pain, (4-6) indicates moderate pain and (7-10) indicates severe pain **(Boonstra, 2016).**
- **Part (B):** Current complaints (Renal colic, hematuria, nausea, vomiting, dysuria, anorexia, fever, oliguria, increase the frequency of voids per day, and urine discoloration) **(Awasthi, M. 2010)**
- **Part (C):** It involved three questions regarding adherence to medical treatment, it was adopted by **(Thompson et al, 2000)** and modified by the investigator.
- **Part (D):** Follow up for clearance of small lower ureteric stone after 6 weeks from providing teaching program and prescribing medications by X-rays, Ultrasound or CT.

Validity and Reliability

The content validity of the data collection tools was determined through an extensive review of national and international literature. The tools were submitted to five experts in community health nursing and medical-surgical nursing at the faculty of nursing; Minia university to test their validity. The tools were examined for content coverage,

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sequence of items, clarity, relevance, applicability, wording, length, format, and overall appearance. Based on experts` comments and recommendations; minor modifications had been made. The internal consistency of the interview questionnaire was assessed with Cronbach's alpha coefficient. Cronbach's alpha for reliability testing was performed and the result was 0.873 and it is considered perfect reliability.

Ethical consideration:

Written initial approval was obtained from the research ethics committee of the Faculty of Nursing, Minia University. Informed oral consent was obtained from the patients who were included in the study after informing them about the purpose and nature of the study. Each assessment sheet was coded, and the patient's name has not appeared on the sheets for privacy and confidentiality. Patients were assured that they could withdraw at any time from the current study without any rationale and this data will not be reused without second permission from them.

Study procedure

The study was accomplished through four phases: preparatory, assessment, implementation, and evaluation.

1- Preparatory phase

This phase pertains to the construction of the study tools and the production of the teaching program by the investigator based on an extensive review of current related literature. It was written in the Arabic language. Teaching aids that were used include visual materials such as photos and a personal laptop were used. The booklet was prepared and written in simple Arabic language supported by illustrative pictures.

2- Assessment phase (pre-test)

After obtaining the acceptance from patients to participate in the current study, the investigator provided an overview and clarification about the tool questions. A structured interviewing questionnaire was filled out by the investigator to assess the demographic characteristics of the patients and present and previous medical history. Then the investigator assessed adherence of healthy lifestyle behaviors regarding restricted food, consumption of fluids, and usual healthy self-activities.

3- Implementation phase

Each patient was interviewed face-to-face and individually at the urology outpatient clinic by the investigator. Randomly, the investigator started to make individual interviews with each patient (number 1 usually for the study group and number 2 for the control group, number 3 for the study group, number 4 for the control group, etc.). The investigator has started collecting data by using the tools, which consist of tools (I) and (II).

The teaching program was applied individually for each patient in two sessions; the first session ranged between 30-40 minutes and included (How do the kidneys and urinary system work? - What is meant by urinary tract stones? - What are the components of urinary tract stones? - What are the causes of urinary tract stones?) The second session ranged between 30-40 minutes and included (signs and symptoms - How is the diagnosis made for urinary tract stones? – treatment methods - How do you protect yourself from getting urinary tract stones?).

The investigator used the face-to-face method to achieve the proposed goal and allow patients to ask questions, have discussions, and reach a high level of understanding. The investigator used illustrations, lectures, teaching videos, and a colored booklet.

4- Evaluation phase

It is the last phase carried out for both groups after 6 weeks of implementing the teaching program and prescribing medical treatment by using the adherence of healthy lifestyle behaviors scale (Tool II) and patients' outcome sheet (Tool III).

Statistical design:

The collected data were tabulated, analyzed, and computerized by using SPSS (statistical package for the social science version 28). Descriptive and inferential statistics will be utilized to present study data. Descriptive data were expressed as numbers and percentages. Quantitative data were presented by mean and standard deviation. Quantitative continuous data were compared using (T-test, Mann-Whitney U test, and Wilcoxon test) in case of comparison between two groups. Chi-square and Fisher's exact test was used to test the association between two qualitative variables or to detect the difference between two groups. The level of significance was accepted at a p-value < 0.05

Results:

Table (1): Distribution of the study and control groups according to their demographic characteristics at the urology outpatient clinic, 2022, (n=60).

Demographic Characteristics	Groups				X^2	P – value
	Study (n=30)		Control (n=30)			
	No	%	No	%		
Age						
• 20-<30	7	23.3	6	20.0	0.386	0.943
• 30-<40	9	30.1	8	26.7		
• 40-<50	7	23.3	7	23.3		
• >=50	7	23.3	9	30.0		
Mean ± SD	38.63±10.091 years		41.33±10.911 years			
Gender						
• Male	19	63.3	21	70.0	0.300	0.584
• Female	11	36.7	9	30.0		
Educational level						
• Illiterate	10	33.3	6	20.0	3.111	0.375

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Demographic Characteristics	Groups				X²	P – value
	Study (n=30)		Control (n=30)			
	No	%	No	%		
● Secondary Education	2	6.7	6	20.0		
● Diploma	8	26.7	9	30.0		
● University Education	10	33.3	9	30.0		
Occupation						
● An employee	9	30.0	14	46.7	**2.179**	**0.536**
● Housewife	8	26.7	5	16.7		
● Farmer	6	20.0	4	13.3		
● Worker	7	23.3	7	23.3		
Workplace	**(n = 22)**		**(n = 25)**			
● Outdoors	12	40.0	13	43.3	**0.30**	**0.861**
● Indoors	10	33.3	12	40.0		
Work in hot climate (n = 22)		**(n = 25)**				
● Yes	11	36.6	13	43.3	**0.019**	**0.891**
● No	11	36.6	12	40.0		

Table (1) shows that the mean age for the study and control groups are 38.63 and 41.33 years, respectively. Regarding gender, 63.3% and 70.0% of the study and control groups are male. Regarding occupation, 30.0% and 46.7% of the study and control groups are employees. Concerning the workplace, 40.0% and 43.3% of the study and control group are working outdoors. More than one-third (36.6% and 43.3%) of both groups respectively are working in the hot climate. Lastly, there are no significant differences between the study and control groups regarding demographic characteristics.

Table (2): Distribution of the study and control groups according to their present medical history at the urology outpatient clinic, 2022, (n=60).

Present medical history	Groups				X²/ Fisher exact test	P – value
	Study (n=30)		Control (n=30)			
	No	%	No	%		
Type of associated chronic diseases #						
● Hypertension	6	20.0	12	40.0	2.857	0.091
● Diabetes mellitus	3	10.0	8	26.7	-	0.181
● Recurrent urinary tract infections	4	13.3	6	20.0	-	0.731
● Gout	3	10.0	5	16.7	-	0.706
Side of ureteric stone						
● Right side	19	63.3	18	60.0	0.071	0.791
● Left side	11	36.7	12	40.0		
Current complaint related to ureteric stone #						
● Renal colic	30	100.0	30	100.0		
● Hematuria	9	30.0	10	33.3	0.077	0.781
● Nausea	11	46.7	13	54.2	0.287	0.598
● Dysuria	26	86.7	28	93.3	0.741	0.389
● Anorexia	10	33.3	11	36.7	0.073	0.787
● Fever	5	16.7	7	23.3	0.417	0.519
● Vomiting	13	43.3	7	23.3	2.700	0.100
● Oliguria	21	70.0	25	83.3	1.491	0.222
● Increase frequency of voids per day	26	86.7	24	80.0	0.480	0.488
● Urine discoloration	16	53.3	18	60.0	0.271	0.602

 # There is more than one answer.
Fisher exact test is used when 25% or more of the cells are less than 5.

Table (2) shows that, hypertension is the most common chronic disease among the study group (20%), followed by recurrent urinary tract infections (13.3%) and diabetes mellitus (10%). As compared to the control group, hypertension is the most common chronic disease (40%), followed by diabetes mellitus (26.7%) and recurrent urinary tract infections (20%). Concerning the side of the ureteric stone, the right side has the highest percentage for the study and control groups (63.3% and 60%, respectively).

Relating to current complaints related to the ureteric stone pre-teaching program, all study and control groups (100%) reported renal colic. Dysuria, increased frequency of voids per day, oliguria, and urine discoloration are the most prevalent complaints

among the study group (86.7%, 86.7%, 70%, and 53.3%, respectively). As compared to the control group, dysuria, oliguria, increased frequency of voids per day, and urine discoloration are the most prevalent complaints (93.3%, 83.3%, 80%, and 60%, respectively).

Table (3): Distribution of the study and control groups according to their previous medical history at the urology outpatient clinic, 2022, (n=60).

Previous medical history	Groups				X^2/ Fisher exact test	P – value
	Study (n=30)		Control (n=30)			
	No	%	No	%		
Family history of urinary tract stones						
● Yes	9	30.0	10	33.3	0.077	0.781
● No	21	70.0	20	66.7		
The degree of kinship (n = 9) (n = 10)						
● Sister	1	3.3	1	3.3		
● Mother	1	3.3	1	3.3	-	0.973
● Father	6	20.0	6	20.0		
● Grandfather	1	3.3	2	6.6		
Previous history of urinary tract stones						
● Yes	11	36.7	10	33.3	.073	.787
● No	19	63.3	20	66.7		
If yes , site (n = 11) (n = 10)						
● Kidney stone	1	3.3	2	6.7		
● Ureteral	8	26.7	5	16.7	-	.562
● Kidney & ureteral	2	6.7	3	10.0		
Times of its recurrence (n = 11) (n = 10)						
● Only one time	7	23.3	5	16.7		
● Two times	2	6.7	3	10.0	-	.843
● More than 2 times	2	6.7	2	6.7		
Side of a previous stone (n = 11) (n = 10)						
● Right side	2	6.7	6	20.0		
● Left side	6	20.0	3	10.0	-	.190
● Both sides	3	10.0	1	3.3		
No. of removed stones (n = 11) (n = 10)						
● Only one time	7	23.3	7	23.3		
● Two times	1	3.3	1	3.3	-	0.961
● More than 2 times	3	10.0	2	6.7		

Fisher exact test is used when 25% or more of the cells are less than 5.

Table (3) reveals that, 30% and 33.3% respectively of the study and control groups have a family history of urinary tract stones. More than one-third (36.7%) and 33.3% respectively of the study and control groups have previous histories of urinary tract stones. Regarding the site of a previous urinary tract stone, the ureteral site has the highest percentage for the study and control groups (26.66% and 16.66%, respectively).

Table (4): Comparison of satisfactory adherence level for study and control groups pre and post-teaching program at urology outpatient clinic, 2022, (n=60).

Healthy lifestyle behaviors / Adherence level	Pre-teaching program				Post teaching program			
	Study (n=30)		Control (n=30)		Study (n=30)		Control(n=30)	
	No	%	No	%	No	%	No	%
Consumption of restricted foods								
Satisfactory adherence level	1	3.3	2	6.7	28	93.3	1	3.3
Unsatisfactory adherence level	29	96.7	28	93.3	2	6.7	29	96.7
Fisher exact test (P – value)	(0.935)				(0.0001*)			
Consumption of fluids								
Satisfactory adherence level	8	26.7	6	20.0	28	93.3	7	23.3
Unsatisfactory adherence level	22	73.3	24	80.0	2	6.7	23	76.7
X2 / *Fisher exact test* (P – value)	0.373 (0.542)				(0.0001*)			
Healthy usual self-activities								
Satisfactory adherence level	22	73.3	20	66.7	29	96.7	20	66.7
Unsatisfactory adherence level	8	26.7	10	33.3	1	3.3	10	33.3
X2 / Fisher exact test (P – value)	0.317 (0.573)				(0.006*)			
Total adherence level								
Satisfactory adherence level	3	10.0	2	6.7	28	93.3	2	6.7
Unsatisfactory adherence level	27	90.0	28	93.3	2	6.7	28	93.3
Fisher exact test (P – value)	(0.925)				(0.0001*)			

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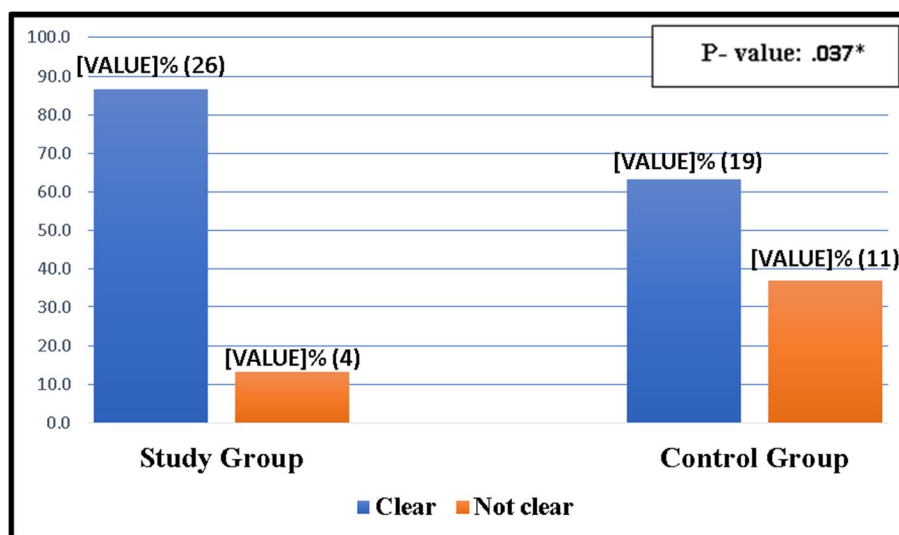*** p = ≤ 0.05 (statistical significance)**

Table (4) presents that, there are no statistically significant differences between both groups regarding satisfactory adherence level (consumption of restricted foods, consumption of fluids, healthy usual self-activities, and total adherence level) pre-teaching program, while there are statistically significant differences between them post teaching program.

Table (5): Comparison of the mean score of the rating pain scale of the study and control groups pre and post-teaching program at urology outpatient clinic, 2022, (n=60).

Rating pain scale	Groups		Test of significance
	Study (n=30)	Control (n=30)	
	Mean ± SD	Mean ± SD	
● Pre- Intervention	7.87±1.961	7.87±1.737	z (-0.129) 0.897
● Post - Intervention	0.87± 2.374	2.67±3.642	z (-2.103) 0.035*
Test of significance	z (-4.722) 0.0001*	z (-4.488) 0.0001*	

* p = ≤ 0.05 (statistical significance)

Table (5) presents that, there are statistically significant differences between the mean scores of the rating pain scale pre- and post-teaching program of both groups, as presented by the p-value for both (0.0001). Also, there are statistically significant differences between the study group and control group regarding mean scores of the rating pain scale after implementing the teaching program presented by the p-value (0.035).

* p = ≤ 0.05 (statistical significance)

Figure (1): Distribution of the study and control groups according to their clearance of small lower ureteric stone post-teaching program at urology outpatient clinic, 2022, (n=60).

Figure (1) reveals that the distribution of the study and control groups according to their clearance of small lower ureteric stone are 86.7% and 63.3%, respectively, and there is a statistically significant difference presented by the (P-value 0.037).

Table (6): Comparison between total adherence level of healthy lifestyle behaviors and the clearance of small lower ureteric stone post-teaching program for the study and control groups at urology outpatient clinic, 2022, (n=60).

Total adherence level of healthy lifestyle behaviors		Clearance of small lower ureteric stone				P – value By Fisher Exact
		Clear stone		Not clear stone		
		No	%	No	%	
● Study	Satisfactory level	26	86.6	2	6.7	0.014*
	Unsatisfactory level	0	0.0	2	6.7	
● Control	Satisfactory level	2	6.7	0	0.0	0.520
	Unsatisfactory level	17	56.7	11	36.7	

The percentage is calculated by the total number
* p = ≤ 0.05 (statistical significance)

Table (6) shows that, 86.6% of the study group have satisfactory adherence level of healthy lifestyle behaviors and clearance of small lower ureteric stone. While 56.7% of the control group have an unsatisfactory level of healthy lifestyle behaviors and clearance of small lower ureteric stone. There is a statistically significant difference between total adherence level and ureteric stone clearance for the study group, as presented by the p-value (0.014).

Discussion

Urolithiasis is a multifactorial condition with a prevalence that depends on geographic, socio-economic, and dietary factors. Its incidence has increased persistently, partly due to improvements in diagnosis but also due to obesity, and dietary and fluid intake changes. A high rate of recurrence is still a real problem. Of all the urinary tract stones 20% are ureteral stones, of which 70% are found in the distal ureter. Ureteric stones occupy an important place in daily urological practice, and clinicians are frequently asked to choose adequate treatment **(Boarin et al., 2018)**.

The present study aimed to evaluate the effect of the teaching program on adherence of healthy lifestyle behaviors and clearance of small lower ureteric stone.

Concerning demographic characteristics of the studied sample; the current study showed that, **the mean age** for the study and control group was 38.63±10.091 and 41.33±10.911 respectively. Regarding **gender**, two-thirds of the studied sample was male. These come in agreement with **Shivanna et al., (2018)** who studied " The Efficacy of Tamsulosin as Medical Expulsion Therapy in Ureteric Calculus of < 8 mm Size" and reported that the mean age among the study and control groups was 36.74±13.07 years and 35.10±12.66 years respectively. There were (80 %) male patients and (20 %). were female patients. In the same context, this finding was supported by a study conducted by **Hassan & Rashid, (2021))**, who studied "Prediction of the ureteric stone outcome by CT scan" and reported that the mean age was 39.22 (±13.5963) years with an approximate male: female ratio of 3.34:1.

In contrast to the current results **(Raja et al., 2020)**, who studied "The impact of urinary stone disease and their treatment on patients' quality of life: a qualitative study" found that a mean age of 51 years but the same authors agreed with the current study is reporting that 67% of participants were male and 33% were male.

Concerning the **marital status** of the study and control groups, the majority of both groups were married (93.3% and 83.3%) respectively. Regarding **residence**, 76.7 & 70% respectively of the study and control groups have resided in rural areas. These results were advocated by **Salah El-din Amin et al., (2022)** who studied " Self-Care Management of Kidney Stone Patients" and reported that nearly three-quarters of the studied patients (72%) were married While 64 % of them lived in rural.

Concerning the **side of ureteric stone**, the right side had the highest percentage for the study and control groups (63.3% and 60% respectively). This result is in accordance with **Bokka & Jain, (2019)** who studied "Hounsfield unit and its correlation with spontaneous expulsion of lower ureteric stone" and stated that more than half of the studied patients (56%) had right lower ureteric stone while 44% of the studied patients had left lower ureteric stone.

In addition, this result comes consistent with **Basnet et al., (2018)** who studied "Prospective Study on the Efficacy of Tamsulosin in Medical Management of Distal Ureteric Stones" and reported that The total number of distal stones on the right ureter was found to be 18 (60%) of the studied sample and 40% on the left ureter. In contrast to the current results **(Singh & Shakya, 2018)** who investigated "Medical Treatment of Distal Ureteric Stone" and indicated that more than half of patients (55%) had left distal ureteric stone and 45% of patients had right distal ureteric stone.

Regarding the **family history of urinary tract stones**, around one-third (30% and 33.3%) respectively of the study and control groups had a positive family history. This result is in agreement with **El-Shishtawy & Mohammed, (2022)** who examined the "Effect of Self-Management Protocol on Dietary Adherence for Patients with Kidney Stones undergoing Shock Wave Lithotripsy Technique" and showed that about one-third (34%& 30%) of patients in study and control groups respectively had a positive family history for kidney stone formation.

Concerning satisfactory adherence levels for healthy lifestyle behaviors. The current study revealed that most patients in the study group were satisfactory adherents to the **consumption of restricted foods**, while only one-tenth of the patients in the control group were satisfactory adherents, with statistically significant differences between them post-teaching program. This is supported by **El-Shishtawy & Mohammed, (2022)** who showed that over half of the patients in the study group had a satisfactory score of practice post protocol while, less than one-tenth of patients in the control group. These results revealed a statistically significant difference between both groups.

The current study showed that the majority of patients in the study group had a satisfactory level of adherence to the **consumption of fluids** while nearly one-fourth of patients in the control group had a satisfactory level of adherence with statistically significant differences between them post-teaching program. This is compatible with **Mahmoud et al., (2019)** who presented that there was progress in self-care practices score regarding drinking fluid among the study group post-intervention compared to pre-intervention. There were no statistically significant differences between both groups pre-intervention regarding drinking fluid, while there were statistically significant differences between them post-intervention.

As well this finding also is in agreement with **Binsaleh et al., (2020)** who assessed " Knowledge, attitudes, and practice patterns of recurrent urinary stones prevention in Saudi Arabia", they noted that most of the study's respondents agreed with the recommendations of increasing fluid intake for prevention of stone recurrence and apply them in their practice.

The current study indicated that most patients in the study group had a satisfactory level of adherence to **healthy usual self-activities** while more than half of patients in the control group had a satisfactory level of adherence with statistically significant differences between them post-teaching program. This is consistent with **Salmeh et al., (2018)** who analyzed "Evaluation of health behaviors in patients with kidney stones in Sari/Iran", they concluded that by correction of unsafe health behaviors and supervision of health personnel on a regular and continuous exercise, getting enough fluid and healthy diet, can be effective in preventing of the disease and reducing the recurrence of urolithiasis.

The current study illustrated that most patients in the study group and the control group had an unsatisfactory adherence level to the **total healthy lifestyle behaviors** pre-teaching program. After implementing the teaching program, most patients in the study group had satisfactory adherence level, while most patients in the control group had unsatisfactory adherence level with statistically significant differences between them. This result is supported by **Mahmoud et al., (2019)** who stated that the minority of the study and control groups 19% & 21.4% respectively have

satisfactory total self-care practices score pre-intervention, while post-intervention the majority of the study group only 73.8% have a satisfactory score.

In addition, this result was further supported by **Qaseem et al., (2018)** who studied "Dietary and Pharmacologic Management to Prevent Recurrent Nephrolithiasis in Adults: A Clinical Practice Guideline From the American College of Physicians", they revealed that more than half of the studied patients had adequate practice regarding stone formation.

According to the investigator`s point of view, this improvement in adherence to healthy lifestyle behaviors regarding (restricted foods, fluids, and healthy usual self-activities) reflects the positive effect of the teaching program. So, the hypothesis was supported which stated that patients' healthy lifestyle behaviors will be higher in the post-teaching program than in the pre-teaching program among the study group.

The current study showed that there were statistically significant differences between **the mean scores of the rating pain scale** pre and post-teaching program of both groups. Also, there are statistically significant differences between the study group and control group regarding mean scores on the rating pain scale after implementing the teaching program.

This finding is congruent with **Elsayed, (2019)** who indicated that the differences were highly statistically significant within both groups and between the two groups regarding pain severity. In the same line **(Badawy, 2019)** showed that there was a significant lowering of pain scores for the study group to the control group when comparing pain scores post-procedure.

The current study revealed that the **clearance of a small lower ureteric stone** occurred in the study group more than in the control group and there was a statistically significant difference. This is consistent with **Elsayed, (2019)** who assessed "Impact of Nursing Protocol on Stone Clearance Rate and Acute Complications Following Extracorporeal Shock Wave Lithotripsy" and presented that there was a statistically significant difference between the success-free rate of stones by ESWL in both groups, in which stone clearance rates occurred in the study group more than the control group.

This result also had been agreed with another study by **Mohammed et al., (2015)** who studied "Impact of Health Education Program for Elderly Patients Undergoing Extracorporeal Shock waves Lithotripsy on Clearance of Urolithiasis", they revealed that successful free rate of stones by ESWL occurred in the study group more than the control group and there was statistically significantly different.

In addition, this finding is in agreement with **Badawy, (2019)** who analyzed "The Effect of Pre-Procedure Teaching Module for Patients Undergoing Shock Wave Lithotripsy on Anxiety, Claustrophobia, Pain Perception, and Urolithiasis Clearance" and showed that the rate of successful treatment sessions and clearance of urinary stone in the study group was more than the control group after two sessions of SWL with significant difference between both groups.

From the investigator`s perspective, this enhancement regarding the clearance of small lower ureteric stone among the study group compared to the control group demonstrates the positive impact of the teaching program. Therefore, hypothesis (II) was supported which stated that

patients who will receive the teaching program will have increased clearance of small lower ureteric stone.

The current study found that after the teaching program, more than three-quarters of the study group had a satisfactory **adherence level of healthy lifestyle behaviors** and clearance of small lower ureteric stone, while more than half of the control group had an unsatisfactory level of healthy lifestyle behaviors and clearance of small lower ureteric stone. There was a statistically significant difference between the total adherence level of healthy lifestyle behaviors and ureteric stone clearance for the study group.

This result is supported by **Badawy, (2019)** who indicated that the pre-procedure teaching module increases the percentage of successful treatment and urolithiasis clearance among the patients in the study group than the control group at the equal number of SWL sessions. The current study result agreed with another study done by **Mohammed et al., (2015)** who revealed that patients who got freestone after ESWL in the study group had a mean knowledge score more than patients in control group who get freestone after ESWL. There was a statistically significant difference between stone clearance rate and total knowledge score for the study and control group.

From the investigator's point of view, the improvement in adherence level of healthy lifestyle behaviors and clearance of small lower ureteric stone in the study group compared with the control group reflects the significant effect of the teaching program in adopting healthy lifestyle behaviors to enhance stone clearance.

Conclusion:

Based on the findings of the present study, it can be concluded that most patients in the study group and the control group had unsatisfactory adherence level to healthy lifestyle behaviors in the pre-teaching program. After implementing the teaching program, the most study group had satisfactory adherence level while most patients in the control group had unsatisfactory adherence level with statistically significant differences between them. Therefore, the teaching program has a positive effect on adherence of healthy lifestyle behaviors to prevent its recurrence.

Recommendations:

Based on the results of the present study the following can be recommended:

1- Recommendations for patients:

- Participate in health education courses regarding urinary tract stones and other aspects of lifestyle changes to treat and prevent stone formation.
- Encourage patients to continue following evidence-based practices to prevent stone recurrence.

2- Recommendations for nursing:

- Participate in the creation of an educational unit for urinary tract stone patients in the nephrology and urology hospital.
- Engage in the development of evidence-based guidelines regarding urinary tract stones and other aspects of lifestyle changes to treat and prevent stone formation.
- Home visits or phone consultations are essential for evaluating the progress of patients' conditions and motivating them to adopt healthy lifestyle behaviors to prevent stone recurrence.

3- Recommendations for the community:

- Providing Arabic booklets with easy language and numerous simple photos. They should be accessible in urologic outpatient clinics and also given to each patient for free.

4- Recommendations for nursing research:

- Performing more studies to evaluate the effect of long-term follow-up of healthy lifestyle behaviors modification guidelines on urinary tract stone recurrence.
- Conducting similar studies on a larger probability sample is recommended to achieve the generalization of the findings

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