

The Efficacy of a Nurse-Led Program in Improving the Dietary Knowledge and Practice of Patients with Kidney Stone

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Background

Renal stone disease is a major public health concern all over the world. Improving patients' awareness can influence disease progression and the quality of life. **Aim:** The study aimed to explore the efficacy of a nurse-led program in improving dietary knowledge and practice for patients with kidney stones. **Design:** Quasi-experimental research design was used in this study. **Setting:** The research was carried out in the Urology Outpatient Clinic at Damanhour University Hospital, Egypt. **Sample:** Non-probability purposive sampling technique was used to select a sample of 200 patients with kidney stones who were randomly assigned into two groups, 100 for each of the study and control groups. **Tools:** Three tools were used for data collection: Tool (I): Patients' interview questionnaire sheet, Tool (II): Perceived dietary adherence questionnaire, and Tool (III): Barriers to consuming a healthy diet questionnaire. **Results:** The study found that 74% of patients in the study group adhered to the diet post- nurse-led program, while the majority (92.0%) of patients in the control group did not. After implementation, the high barriers decreased to 35% in the study group compared to the control group, with a statistically significant difference between the two groups at $p < 0.01$. There was a highly statistically significant difference between the study and control groups after the implementation of the nurse-led program in total knowledge and practice of fluid drink and total practice of food at $p < 0.001$. **Conclusion:** The study results concluded that a nurse-led program was an effective and feasible approach to improving the dietary knowledge and practice of patients with kidney stones. **Recommendations:** the study recommended a continued nurse-led program regarding the renal stone for patients that might be geared to enhance their knowledge, reported practices, and quality of life.

Keywords: Knowledge and practice, Nurse-led program, kidney stone

1. Introduction

Urolithiasis is the third most common disorder of the urinary tract. Globally, the prevalence and recurrence of kidney stone disease are growing, despite a lack of effective treatments (Alblowi et al., 2022). It affects around 12% of the world's population at some point in their lives (Alelign & Petros, 2018). It influences people of all ages, genders, and races, but men are more affected than women with a recurrence rate of 50% within 5-10 years and 75% within 20 years (Eisner & Goldfarb, 2014). The incidence of urolithiasis is increasing in developing countries due to multifactorial causes of stones like metabolic, anatomic and/or recurrent Urinary Tract Infections (Zakaria et al., 2012). Urinary stones are projected to affect approximately 12% of the Indian population (Alelign & Petros, 2018). It is estimated to be 14% in England and 10.1% in the United States and 5.8% among Chinese adults with 50% of those affected losing kidney function

(Chewcharat & Curhan, (2021) and Zeng et al., 2017). Urinary stones have plagued mankind and are the most prevalent illness of the urinary tract (Soni, 2021). Kidney stones, also known as urolithiasis, are solid pieces of material within the urinary tract. Kidney stones are primarily formed in the kidney and exit the body via the urine stream (Frassetto & Kohlstadt, 2019).

Stone formation includes everything that causes urine stasis or oversaturation. Immobility and a sedentary lifestyle contribute to stasis. Supersaturation is caused by dehydration (Hughes et al., 2020). Disruptions in metabolism result in an increase in calcium or other ions in the urine. Urinary calculi have been present in the past. Living in stone-belt areas, drinking water with high mineral content, a diet high in purines, oxalates, calcium supplements, animal proteins, urinary tract infections, prolonged indwelling catheterization, neurogenic bladder, and a history of female genital mutilation all play a role in kidney stone formation (Kapukotuwa, 2017).

Although the etiology of kidney stones is complex, food appears to be an essential role due to its potential to influence urine composition. In addition to fluid intake, several dietary components can modify crucial parameters that raise the incidence of kidney stones (Ferraro et al., 2020). Because dietary habits influence the formation and recurrence of kidney stones, food modification has become an essential strategy in the medical treatment of nephrolithiasis. Dietary advice attempts to reduce the majority of lithogenic risk factors by lowering urine supersaturation, specifically calcium oxalate, calcium phosphate, and uric acid (Prieto et al., 2019).

Effective kidney stone prevention requires addressing the underlying cause of stone development. In general, careful food management and medication use are essential to avoid the first episodes of kidney stone formation or its sequel episodes (Keddis & Rule, 2019). Dietary intervention for the primary prevention of kidney stone disease is a low-cost public health program with far-reaching societal effects. Thus, dietary control is the most effective urolithiasis prevention method (Alelign & Petros, 2018).

Good voiding habits, particularly frequent urine, and regular exercise can help avoid the formation of stones. Most essential, a high fluid intake should be maintained at all times, especially during hot, dry weather when the danger of kidney stone formation is greatest (Joyce, 2019, and Almuhanha 2018). As a result, the most important prevention prescription for persons with any sort of kidney stone is. As a result, raising knowledge about the avoidance of renal stones is critical to preventing their occurrence and also to changing one's lifestyle (Adinkrah et al., 2020).

Nurses are crucial in health education because they assist and persuade patients to self-medicate (Mohamed et al., 2017). Adopting excellent self-care practices that play a beneficial impact in reducing patient hospitalization and mortality rates is one of the most appropriate approaches to minimizing the emergence and progression of problems (Aghamohammadi et al., 2019).

Significance of the study:

Renal stones raise the risk of chronic kidney disease and end-stage renal disease, regardless of risk factors shared by stone formers and chronic kidney disease patients, such as high blood pressure and diabetes (Frassetto & Kohlstadt, 2019). It is estimated that stone formers have a twice as high risk of chronic renal disease than non-stone formers (Keddis & Rule, 2019). More than 10 percent of patients could experience more relapses (Scales et al., 2012). The probability of symptomatic stone recurrence in children approached 50% within 3 years (Tasian et al., 2017) Additionally, the recurrence rate of urinary calculi in patients with specific stone mineral compositions and

morphologies can reach 82.4% (Daudon et al., 2018). Kidney stones are putting an increasing clinical and budgetary strain on the world's healthcare systems (Hughes et al., 2020). Stone disease and associated treatment(s) can reduce patients' health-related quality of life, increase hospitalizations, and even cause kidney damage or infection, resulting in poor health outcomes and a higher financial burden (Abdelwahab et al., 2021).

Operational definitions

- **Knowledge:** is a psychological result of perception, learning, and reasoning
- **Practice:** is the act of doing exercise habitually to improve the performance
- **Nurse-led program:** It is an organized set of learning activities designed to enable patients to develop knowledge, understanding, skills and attitudes
- **kidney stone** is a solid, pebble-like piece of material that can form in one or both of the kidneys

Aim of the study

The study aimed to explore the efficacy of a nurse-led program in improving the dietary knowledge and practice for patients with kidney stones through:

- Assessing the knowledge level of the patients regarding kidney stones
- Determine the level of patients' adherence to diet and the most common barriers affecting dietary adherence towards current food choices.
- Designing and implementing a nurse-led program based on the patient's needs.
- Evaluating the effect of the nurse-led program on patients' knowledge and practice.

Research hypothesis:

Hypothesis 1: Following the implementation of the nurse-led program, patients in the study group's knowledge and practices will improve in comparison to patients in the control group.

Hypothesis 2: Following the implementation of the nurse-led program, the mean score of dietary adherence of patients in the study group will be higher than that of patients in the control group.

2. Subjects and Method

I-Technical Design

The technical design of the study includes research design, setting, subjects, and tools for data collection.

Research design

A quasi-experimental research design (study and control) was utilized to conduct the study. A quasi-experimental design is a useful tool in situations where true experiments cannot be used for ethical or practical reasons as a non-random method is used to

assign subjects to groups (Thomas, 2020).

Setting

The research was applied in the Urology Outpatient Clinic at Damanhour University Hospital, Egypt. This setting was selected because it provides services for a high number of patients with kidney stones, and it serves the most populated region of the country.

Subjects

Non-probability purposive sampling technique was used to select a sample of 200 patients with kidney stones who were randomly assigned into two groups, 100 for each of the study and control groups.

Sample calculation

The sample was calculated using a power and sample size calculation tool to have 95% power. The participants in the trial were separated into two equal groups: the study group (100 patients) and the control group (100 patients). At a 95% confidence level (Thompson, 2012).

Inclusion criteria included:

- Adult patients their age more than 18 years.
- Adult patients from both sexes
- Presence of stone confirmed by Computed tomography of kidneys
- Agree to participate in the study

Exclusion criteria included

- Patients are suffering from other chronic illnesses and mental diseases.
- Pregnancy
- Stones not confirmed by Computed tomography of kidneys

3. Data collection tools

Tool (I): Patients' interview questionnaire sheet: it was developed by the researchers after analyzing related literature and expert comments for content validity to avoid misunderstandings, it was translated into the Arabic language. It is composed of four parts:

Part (1): Patients' demographic characteristics: It consisted of four items related to age, gender, educational level, and residence.

Part (2): Patients' medical history: It involved six questions about the medical history of the patients such as previous hospitalization, duration, family history, anatomical site, number of stones, and stone size. It was adapted from Abd El-Wahid et al., (2016) & Mahmoud et al., (2019).

Part (3): Patients' knowledge assessment questionnaire regarding kidney stones: To assess patients' knowledge. It was adopted from (Aghamohammadi et al., (2019). Almutairi et al., (2019) & Mahmoud et al., (2019,). There were 20 total items. These products were divided into two categories, which are as follows:

The first component assesses patients' knowledge about kidney stones: It was used for all patients in the (study and control groups) and was completed by the

researchers. It consisted of seven questions. Multiple choice questions (MCQ) about the definition of a kidney stone, risk factors for stone development, different forms of kidney stones, symptoms, diagnosis, preventative strategies, factors that increase stone formation, and treatment procedures.

The second section: Assessment of patients' knowledge of stone development and diet: four multiple-choice questions (MCQ) about the relationship between stone formation and diet, foods that reduce the chance of forming stones, foods that increase the chance of stone formation, and amount of water that must be consumed throughout the day.

Scoring system

The following response scores were assigned

One score for the correct answer, a zero was assigned for an erroneous response or I do not know, and all selected options were tallied and a score was assigned. The scores ranged from 0 to 38. Based on the statistical analysis, the overall grades were summed together, the percentage computed for all participants, and knowledge level was regarded as satisfactory at the cut of point 60%, and unsatisfactory at less than 60%.

Part (4): Patients' practices assessment scale regarding kidney stones: It was adapted from Mahmoud et al., (2019) and modified by the researchers after a thorough review of the current literature. It was separated into three sub-items, which are as follows: behaviours connected to permissible food consumption (eight points) on consuming white meat, fresh fruits and vegetables, fish and sea foods, fiber such as oats/bran, egg, liver, veggies such as spinach/turnips, and whole grains ten points for eating canned food, salty foods, quick foods, sweetened foods, carbs, milk and dairy products, red meat, chocolate, citrus foods like lemon and orange, foods high in oxalates like tomatoes and legumes, Drinking plenty of fluids in hot weather, fever, diarrhea, exercises, intense physical activity, avoid drinking water from unsafe resources for health reasons, avoid drinking cola, avoid consuming stimulants such as tea and coffee, drinking fresh water from harmful resources for health reasons, avoid drinking cola, avoid taking stimulants, as tea and coffee, drinking fresh fruit juice as cranberry juice, control the amount of urine which should not be less than (2.5) liters / 24 hours, replenish fluid loss when working in heated locations such as the kitchen and oven for extended periods of time Drink plenty of fluids before and after meals, particularly before and after you wake up. It's a three-point Likert scale: always (three), usually (two), and never (one degree).

Scoring system

Total patient practices were 28 items including practices relating to approved food consumption (eight points): scores varied from 8 to 24. Patients' practices regarding restricted food consumption (ten points): ratings ranged from 10 to 30. Fluid drinking

practices of patients (10 points): values varied from 10 to 30. Total patient practice ratings varied from 28 to 84. Based on statistical analysis, this score was translated into a percentage and categorized as follows: good level of practices 70%, unsatisfactory level of practices 70%.

Tool (II): Perceived dietary adherence questionnaire "PDAQ": The PDAQ was adopted from **Asaad et al., (2015)**. The questionnaire included nine questions designed to cover nutrition therapy standards, such as "How many fiber-rich meals did you eat in the last seven days?" How many times in the last seven days did you consume dairy products or salty foods? The response was based on a seven-point Likert scale in response to the question "How many of the last seven days did you?" Higher scores indicated greater adherence, except for items, which indicated harmful choices (foods high in sugar or fat).

Scoring system

Because greater scores indicated lower adherence for these items, the scores for these items were inverted and grouped as follows for computing a total PDAQ score: According to a statistical study, the adherence level is 70%, not adherence less than 70%. Although based on a weekly time scale, the PDAQ was expected to reflect typical dietary patterns based on the notion that most people consumed comparable items from week to week.

Tool (IV): The barriers towards consuming an adherence to healthy diet questionnaire: it was adopted from **Bishop et al., (2019)**. The questionnaire was used to measure the barriers to healthy eating as well as the participants' attitudes on current food choices. The goal of this segment was to obtain insight into the motivations for certain eating patterns as well as patients' attitudes regarding embracing a healthier diet. It's a Likert scale with three options: always (three degrees), occasionally (two degrees), and never (one degree). It includes 22 possible perceived hurdles to healthy eating, such as irregular work hours, a hectic lifestyle, willpower, a lack of education, and a lack of appetite for a recommended diet. Total scores ranged from 22 to 66. Based on statistical research, the score was assigned as follows: high barriers 22 low barriers 66.

Operational Design

The operational design included a preparatory phase, content validity, reliability, pilot study, and fieldwork.

A-Preparatory phase: It includes reviewing the literature, different studies, and theoretical knowledge of various aspects of the problems using books, articles, the internet, periodicals, and magazines.

B-Content and face validity: A jury of five expert professors, three from the field of medical surgical nursing and two from the medical field, reviewed the tool's content for clarity, relevance, comprehensiveness, understanding, and ease of implementation, and changes were made based on their feedback, and the final form was developed.

C- Test of reliability

The internal consistency technique was used to assess the instruments' dependability. Cronbach's alpha reliability coefficient for patient knowledge was determined to be 0.733, practice fluid consumption score was .972, total practice food consumption score was .941, barrier score was .917, and dietary adherence was dependable at .759.

Pilot Study

A pilot study was conducted on 10 % of the study subjects (20 patients) to test the applicability & feasibility of the tools of data collection, and to estimate the time required for filling the required forms. As needed modifications were done and patients involved in the pilot study were excluded from the current study.

Ethical considerations

Ethical approval was guaranteed from the Ethical committee Faculty of Nursing, Al Mansoura University. Official permission to conduct the study was obtained from hospital administrators. Before starting the study, explain the aim of the study to each participant, and oral consent was secured from each subject after being informed about the nature, purpose, and benefits of the study. Patients were also informed that participation was voluntary and about their right to withdraw at any time without giving reasons. Confidentiality of any obtained information was ensured through the coding of all data. The researchers reassured patients that the data would be used for only the research purpose. The control group received the same self-management intervention at the end of the study.

Fieldwork

The researchers acquired official authorization to perform the proposed study from the manager of the hospital, and the head of the urology outpatient clinic, at Damanshour University Hospital after explaining its aim. Patients in this study provided informed consent after being informed about the nature and purposes of the study. The primary researcher presented himself, as well as the nature and aims of the study, during the first interview.

The researchers questioned patients three days a week, pre and post-session, till discharge, to assess patients' knowledge and conditions. The control group received standard hospital care, whereas the study group received routine hospital care in addition to the researchers' nurse-led program (training booklet).

The research was conducted in four stages: preparatory, assessment, implementation, and evaluation. These phases were carried out over six months, commencing in July 2021 and ending in November 2021.

Preparatory phase

This phase involved the researchers creating study tools and creating the nurse-led program based on an exhaustive examination of current, related

literature (Bishop et al., 2019 & Abdelwahab et al., 2021). It was written in plain Arabic and included graphics for extra illustrations to help patients understand.

Assessment phase

Individual interviews were conducted with patients in the control and study groups by the researchers. During the preliminary interview, the researchers introduced themselves to establish a line of communication, explain the nature and aim of the study, fill out the study tools, and plan the instructional sessions with them (study group). The researchers began conducting individual interviews with each patient after the first 100 patients were assigned to the control group and the last 100 patients were assigned to the experimental group. The researchers visited with patients three times a week (Saturday, Monday, and Wednesday).

General objective

The general objective of the nurse-led program was to improve dietary knowledge and practice among kidney stone patients.

Specific objectives

By the end of the nurse-led program, kidney stone patients should be able to mention kidney function, define the meaning of kidney stones, enumerate the risk factors and causes of kidney stones, identify the signs & symptoms of kidney stones, identify the required investigations & methods of treatment of kidney stones, list the most common recurrent type of stone, and factors that increase stone formation, discuss the precautions to prevent a recurrence, management

Implementation phase

After completing the study tools, the researchers prepared the nurse-led program over six sessions using a PowerPoint presentation as well as video tapes and posters. The researchers then divided the patients in the study group into small groups of ten patients each and conducted the nurse-led program sessions in ten groups. Each session lasted from 30 to 45 minutes.

The program's material was spread out across six consecutive sessions, with both theoretical and practical components. The first session was an orientation session to clarify the program's aim and contents, general objectives, instructional methods, learner activities, and evaluation methods. The 2nd session focused on the theoretical portion and covered the necessary information about kidney stone definition, risk factors, causes, manifestations, diagnosis, investigations, and management. The 3rd session focused on improving patients' knowledge about the categories of forbidden foods as well as permitted foods and fluids.

The fourth session covered the precautions for preventing recurrence, management of stone recurrence, and methods of prevention. The fifth

session focused on practical aspects of self-management of renal colic, dysuria, fever, nausea/vomiting, hematuria (smoky-looking pee), exhaustion, and urinary tract infections. The sixth session focused on dietary adherence as a fundamental tool for the management of kidney stone recurrence. Each session finished with researchers summarizing the main points and reviewing the session's content with time for patients' inquiries. Furthermore, the researchers distributed a booklet of advice to each patient in the trial group.

Evaluation phase

The last phase was carried out on both groups one month after the nurse-led program was implemented to evaluate its effect by utilizing the same pre-test tools as patients' knowledge and practices.

III-Administrative Design

For the conduction of the study, written permission was taken from the Dean of the Faculty of Nursing, Damanhour University, and an official letter was sent to the selected area of the study. The director of the hospital was informed to obtain permission to include the patients in the present research.

IV-Statistical Design

Data were coded and transferred into specially designed formats for data entry then data were analyzed and computed. The collected data were done using SPSS 20.0 statistical packages for social science. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. Qualitative variables were compared using the person chi-square test and non-parametric chi-square test. All tests were two-sided. p -value < 0.05 was considered statistically significant (S), and p -value ≥ 0.05 was considered statistically insignificant (NS).

4. Results

Table 1 shows the mean age of the studied patients in the study group and the control group (43.1 ± 6.8) (41.9 ± 13) respectively. Concerning gender, it was observed that 72% of the studied patients were male in the study group compared to 65% in the control group. As regards the level of education, (55.0% & 52%) of them in the study and control groups respectively had a university education. Concerning residence, 80% of the studied patients in the study and 81% of the control group were living in urban areas. There were no statistically significant differences between the study and control group mothers regarding all aspects of demographic data. **Table 2:** Shows that (40% & 29%) of the studied patients in the study and control groups respectively had a family history of kidney stone formation. The same table Indicates that (75% & 71%) of patients in the study and control groups respectively had stones

in the kidney, while about two-thirds (60.0% & 62.0%) of the patients in the study and control groups respectively had ureter stones.

Figure 1: illustrates that all of the studied patients were not received any training regarding kidney stones.

Figure 2: portrays that 80% of the studied patients reported that their main source of knowledge about kidney stones was doctors.

Figure (3): Reveals that there was a highly statistically significant difference between the studied patients in the study and control groups post nurse-led program implementation regarding total knowledge about fluid drink and food at ($p \leq 0.001$).

Figure (4): Reveals that there was a highly statistically significant difference between the studied patients in the study and control groups post nurse-led program implementation regarding the total practice of fluid drink, and total practice regarding food at ($p \leq 0.001$).

Figure (5): Shows that more than two-thirds of patients in the study and control groups (69.0% & 72.0%) respectively had high barriers to consuming a healthy diet pre-nurse-led program implementation with no statistically significant difference $p > 0.05$. while, after nurse-led program implementation the high barriers diminished to (35%) in the study group than in the control group with a statistically significant difference between the two groups at ($p \leq 0.001$).

Table (3): Indicates that 74% of patients in the study group adhered to the diet post- nurse-led program, while the majority (90%) of patients in the control group did not with a highly statistically significant difference at ($p \leq 0.001$).

Table 4 illustrates that there was a significant correlation between the total knowledge and practices of the studied patient's pre and post-nurse-led program.

Table 1: Distribution of the studied patients regarding their demographic data in the study and control groups (N=200)

Demographic characteristics	Study (n=100)		Control (n=100)		X ²	p-value
	No	%	No	%		
Age (in years)						
(Mean ± SD)	43.1± 6.8		41.9±13		0.27	0.77
Gender						
Male	72	72.0	65	65.0	0.32	0.59
Female	28	28.0	35	35.0		
Educational level						
Read and Write Primary school	25	20	35	30	1.55	0.63
University education	52	55.0	46	52.0		
Residence						
Rural	20	20.0	19	19.0	1.8	0.17
Urban	80	80.0	81	81.0		

$\chi^2 =$ Chi-square test f= Fisher exact test non-significant $p > 0.0$

Table 2: Distribution of the studied patients regarding their medical history in the study and control groups (N=200)

Medical history	Study (n=100)		Control (n=100)		X ²	p-value
	No	%	No	%		
Previous hospitalization						
Yes	72	72.0	65	65.0	0.31	0.69
No	28	28.0	35	35.0		
Duration of disease						
	42.8±34.3 Mean± SD		44.6±34.6 Mean± SD		1.34	0.73
Family history						
Yes	40	40.0	29	29.0	1.8	0.17
No	60	60.0	71	71.0		
Number of stones						
Single	85	85.0	79	79.0	1.18	0.19
Multiple	15	15.0	21	21.0		
Anatomical site						
Kidney	75	75.0	71	71.0	1	0.33
Ureter	25	25.0	29	29.0		
Stone size						
	0.7 (0.11-1) Median(range)		0.6(0.11-1.8) Median(range)		1.3	0.18

$\chi^2 =$ Chi-square test f= Fisher exact test non-significant $p > 0.0$

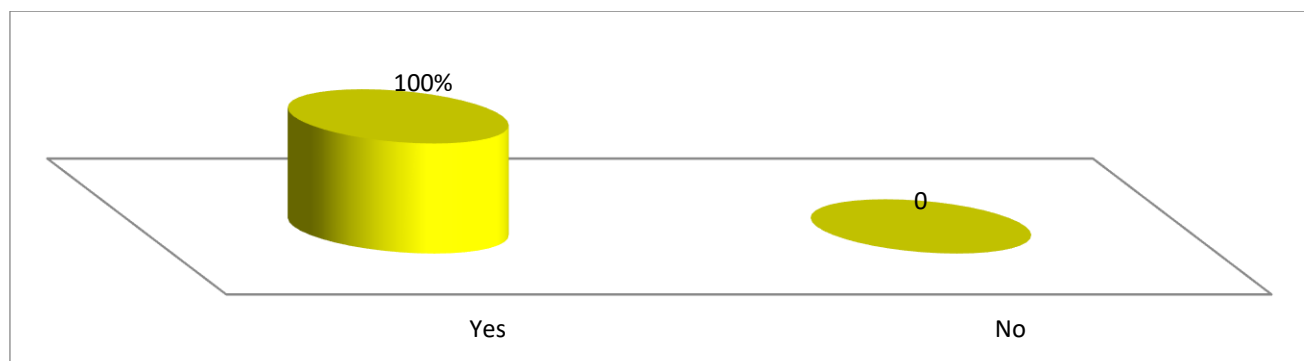


Figure 1. Percentage distribution of the studied patients regarding their previous training regarding kidney stones (n = 200)

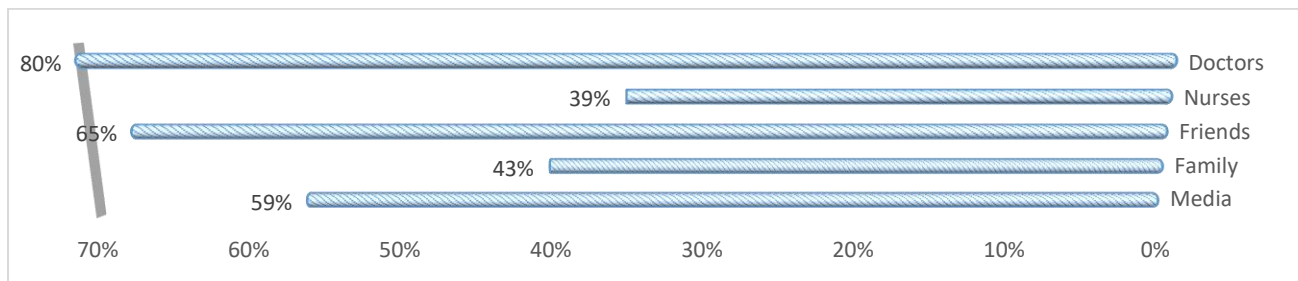


Figure 2. Percentage distribution of the studied patients regarding their source of knowledge about kidney stones (N=200)

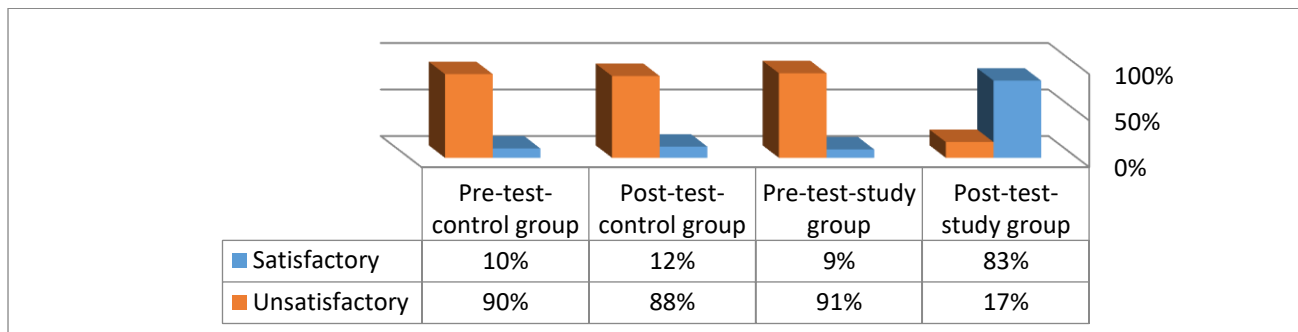


Figure (3): Comparison between practice levels among the studied patients in study and control groups regarding food& fluids pre and post-nurse-led program implementation (n= 200)

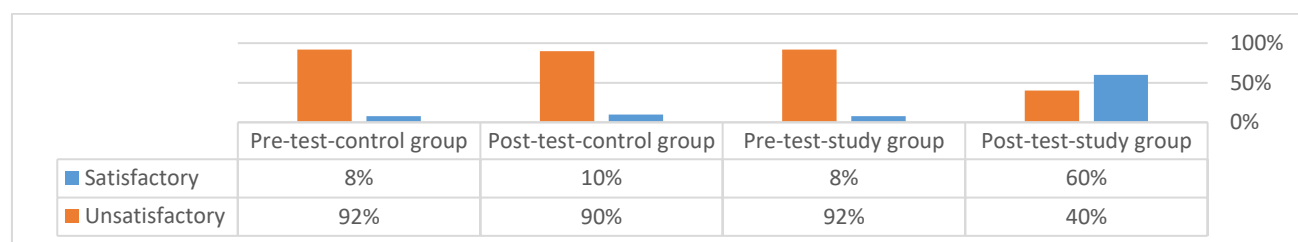


Figure 4. Comparison between knowledge levels among the studied patients in study and control groups regarding food& fluids pre and post-nurse-led program implementation (n= 200)

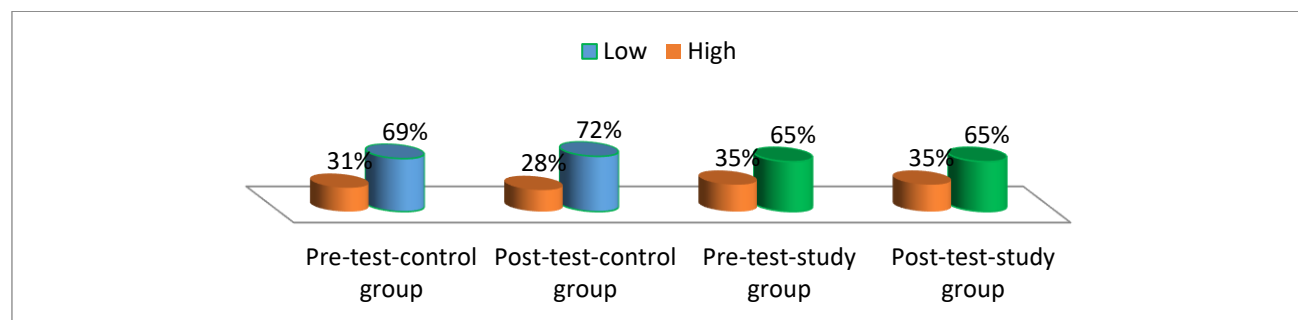


Figure (5): Comparison between patients in study and control groups regarding barriers to consuming a healthy diet

Table (3) Comparison between the studied patients in study and control groups regarding dietary adherence post nurse-led program implementation (n= 200)

Adherence	Study group(n=100)		Control group(n=100)		X ²	p-value
Adhered	74	74.0	10	10.0		
Not adhered	26	26.0	90	90.0	46.87	<0.001**

Significant = p<0.001 χ² = Chi-square test

Table (4) Correlation between total knowledge and practices of the studied patient's pre and post-nurse-led program

Correlation	Pearson correlation coefficient			
	Total practice score			
	Pre-nurse-led program		Postnurse-led program	
	R	P	R	P
Total knowledge score	.449	.000**	.633	.000**

Note ** Correlation is significant at the 0.001 level

5. Discussion

The lifetime risk of acquiring kidney stones is believed to be 1 to 15% in chronic conditions and varies by age, gender, race, and geographic area. life (Shahmoradi et al., 2021) Patient participation in nurse-led programs to enhance their health and awareness of risk factors (age, sex, geography, climate, race, dietary, and genetic factors) influencing disease progression in patients with urolithiasis are important variables in regulating and improving patients' quality of life (Shahmoradi et al., 2021, and Almuhanha et al., 2018).

The current study found that all of the studied patients were not received any training regarding kidney stones. From the researchers' point of view, it reflected the cause of knowledge deficit due to insufficient training. Therefore, there is a need for improving awareness and providing more insight about kidney stones for the target population.

According to the current study, doctors were the primary source of information for the majority of the patients surveyed. This demonstrated that patients seek information from the appropriate persons and medical assistance as a result of precise diagnosis and faith in the judgment of specialists. According to the researchers, this demonstrated the need for patients to develop their skills through nurse-led program training.

According to the current study's findings, there was a highly statistically significant difference in overall knowledge post-implementation of the nurse-led program between the investigated patients in the study and control groups. This may be rendered by gaining a higher level of knowledge allowing patients to better comply and manage their own care. This was consistent with the findings of Mahmoud et al., (2019) who discovered an improvement in the study group's degree of knowledge on urolithiasis after the intervention compared to before the intervention. The current study findings, on the other hand, are similar to the findings of Pethiyagoda et al., (2017) who found that the majority of investigated patients had enough knowledge of kidney stone problem prevention.

These findings are consistent with Khondoker et al., (2019) who discovered that study participant had a high degree of knowledge of renal stones after program implementation. This finding demonstrates the favorable impact of nurse-led program execution on knowledge, which fulfilled the patients' requirements and provided them with adequate information. This demonstrates the actual requirement of the investigated patients for the nurse-led program's implementation.

This was consistent with the findings of Mahmoud et al., (2019) who discovered an improvement in the degree of knowledge among the examined group regarding renal stones after the intervention compared to before the intervention. The current study findings, on the other hand, are similar to the findings of Pethiyagoda et al., (2017) who found

that the majority of the investigated sample had enough knowledge on kidney stones post-program. Concerning practice toward fluid consumption, there was a highly statistically significant difference between the studied patients in the study and control groups post-nurse-led program implementation regarding the total practice of fluid drink, and total practice regarding food, with the majority of the patients in the study group having a satisfactory level of practice post- nurse-led program implementation than control group patients with a highly statistically significant difference. According to the researchers, it demonstrated the positive influence of nurse-led program implementation on changing patients' practices. These proved the successful changes in patients' practices that represented the success of the key aims of the nurse-led program implementation. Thereby, refresher programs, and continuous feedback after education are necessary to update patients' knowledge, practice, and improve the quality of care.

This is consistent with the findings of Mahmoud et al., (2019) who found an improvement in self-care practices scores regarding fluid consumption in the study group after the intervention compared to before the intervention. Furthermore, Siener, (2021) found that, proper fluid intake was the most significant nutritional intervention to avoid kidney stone recurrence.

According to Bos et al., (2014) and Almutairi et al., (2019) less than half of the participants implemented their information effectively in clinical practice, and only one-fifth of respondents advocated for a urine output of 2 to 3 L per day for their kidney stone. Concerning food practice, the current study found that more than half of the patients in the study group had a sufficient score of practice post implementation of nurse-led program intervention, while less than one-tenth of the patients in the control group had a statistically significant difference.

According to Fakhoury et al., (2019) the design of an effective program focused on the prevention of stone formation, encouraging patients to be proactive in modifiable behavior modifications of stone-promoting risk factors, and adapting counseling to a patient's level of obstacles. According to the researchers, this change in knowledge and practice regarding fluid and food consumption among study group patients reflects the good influence of the nurse-led program. This finding is consistent with the findings of Shahmoradi et al., (2021), who discovered substantial variations in nurses' practice before and after post-educational smartphone-based self-care applications.

Concerning the barrier to eating a healthy diet, the current study indicated a statistically significant difference between the two groups after nurse-led program implementation. This is comparable to Bishop et al., (2019) and Mohammed et al., (2020) who identified the primary barriers to eating a healthy diet and discovered that the high barriers

were reduced following program implementation. Concerning dietary adherence, the current study found a highly statistically significant difference between the two groups after the implementation of the nurse-led program, with less than three-quarters of patients in the study group adhering to the diet and the majority of patients in the control group remaining non-adherent. This result was similar to the findings of a previous study conducted by **Bishop et al., (2019)** which found that the majority of individuals adhere to a diet. This study contrasts with **Mohammed and Sharew's, (2019)** findings, which showed that more than half of the participants did not follow the suggested dietary recommendations. From the researchers' point of view, this is reflected in the success of nurse-led program implementation and its positive effects on improving the dietary knowledge and practice among the patients in the study group.

Concerning the correlation between knowledge and practice, the current study discovered a significant correlation between the total knowledge and practices of the examined patients before and post-nurse-led program. This finding was contradicted by **Sedek et al., (2015)** who discovered that knowledge had no significant correlation with practices. Furthermore, the current study's findings were comparable to those of **Rasouli-Ghahroudi et al., (2016)** who demonstrated a strong substantial association between knowledge and attitude, as well as knowledge and practice.

This ensured that the nurse-led program was effective in enhancing knowledge and, as a result, patient practices. This reflected the necessity of enhancing patients' knowledge and practices to help them study, acquire, and use good information successfully. This association is explained as when patients have sufficient knowledge to practice properly. Furthermore, the current study's findings were comparable to those of **Shaju et al., (2021)** who discovered a link between knowledge level and practice. The current study's findings verified the study's goal and hypothesis, as well as confirmed that the knowledge and practices of the patients evaluated had improved.

6. Conclusion

According to study findings, the level of knowledge and practice regarding fluids and food consumption among the patients in the study group significantly improved post-nurse-led program intervention compared to pre-intervention. The study results concluded that nurse-led discharge program of care was effective in improving the dietary knowledge, practice of patients in adherence to guideline.

7. Recommendations

Based on the results of the current study it can be recommended that:

- The study recommended a continued

nurse-led program for patients is recommended to enhance their knowledge and reported practices as a routine instruction and health education of patients.

- Arabic booklet with easy language and various simple photos should be accessible and provided involving guidelines for dietary adherence.
- Further studies and replication of the current study with a larger sample in different settings are required for generalizing the results.

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