

Effect of Instructional Guidelines on Dietary Knowledge and Practices among Mothers of Children with Kidney Stones.

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Abstract

Background: kidney stones in children have been recognized as a major source of morbidity and are considered a significant health problem. Unhealthy lifestyle and dietary practices play a relevant role in the formation and recurrence of kidney stones. Therefore, dietary interventions through following instructional guidelines considered a primary prevention of pediatric kidney stone. **Aim:** The study aimed to determine the effect of instructional guidelines on dietary knowledge and practices among mothers of children with kidney stones. **Design:** A quasi-experimental research design was used in the current study. **Setting:** The research was carried out in Pediatric Urology Department and Urology Outpatient Clinic at Sohag University Hospital. **Subject:** Non-probability purposive sampling technique was used to select a sample of 50 mothers with their children having kidney stones who were randomly assigned into two groups, 25 in each group (the study and control groups). **Tools:** Tool (I): Mothers' interview questionnaire, it was composed of five parts: Part (1): Mothers' data, Part (2): Children's data, Part (3): Children's medical history, Part (4): Mothers' knowledge assessment questionnaire regarding kidney stones, and Part (5): Mothers' practices assessment scale regarding kidney stones. Tool (II): Perceived dietary adherence questionnaire and Tool (III): Barriers towards consuming a healthy diet questionnaire. **Results:** There was a highly statistically significant difference and improvement between the studied mothers in the study and control groups regarding total dietary knowledge and practices pre and post instructional guidelines implementation. Additionally, there was a significant correlation between the total dietary knowledge and practices of the studied mothers' pre and post-instructional guidelines implementation ($P < 0.001$). **Conclusion:** According to the findings of the study, instructional guidelines have a positive effect on enhancing the dietary knowledge and practices among mothers of children with kidney stones. **Recommendations:** The study recommended that mothers of children with kidney stones should continue to receive instructional guidelines to improve their dietary knowledge and practices.

Keywords: Children with a kidney stone, Dietary knowledge and practices, Instructional guidelines, Mothers.

Introduction:

Pediatric kidney stone is a significant health problem that has experienced an increasing incidence worldwide and in developing countries (Metwally et al., 2021). Possible causes for this raising include, increase sodium intake, decreased calcium intake, low water intake, and increased use of antimicrobials, poor nutrition, obesity and sedentary life style (Tian et al., 2017). Another reason for the increasing diagnosis of pediatric kidney stones involves improved imaging techniques (Spivacow et al., 2020). Kidney stones can occur in children of all ages, including infants, but they are much more common in teenagers. While the usual time of occurrence is variable among children, as most initially present

between 5 and 15 years of age (Paloian & Penniston 2022). Although epidemiological data from some parts of world are unclear, it is estimated that the incidence of stone disease in children is about 2-3% (Zakaria et al., 2012). For instance, in the United States, the incidence has risen 6–10% annually over the last two decades. Population-based observational studies have estimated contemporary incidence to range from 36 to 145 per 100,000 children, whereas prevalence in a Turkish population under the age of 14 was 17% and annual incidence has been estimated to be 1.8 per 100,000 children per year in Kuwait (El Lekhlif et al., 2016).

Kidney stones are solid crystals that formed

from dissolved minerals (calcium, oxalate and phosphate) in urine and it is also termed as nephrolithiasis and urolithiasis. Kidney stones are classified into calcium oxalate, calcium phosphate, uric acid, cysteine, struvite, and mixed stones types, depending on the material of the stones (**Khalili et al., 2021**). Calcium oxalate is the most common stone worldwide, and accounts for 60-90% of pediatric urolithiasis (**Sharma 2010**). Moreover, the majority of pediatric kidney stones are caused by metabolic disorders or urinary tract infections with a consequently high lifetime risk of recurrence (**Sofia and Walter 2016**). In addition to many risk factors include children's susceptibility to form stones, such as familial predisposition as children who has a family history of kidney stones are more likely to develop it and children who previously had kidney stones are more likely to develop another kidney stone in the future (**Greeves et al., 2018**). Moreover, there are environmental factors such as local climate characteristics as well as dietary habits can facilitate stone formation.

Unhealthy lifestyle and dietary practices play a relevant role in the formation and recurrence of kidney stones such as drinking unhealthy type of fluid, such as sugary soft drinks or caffeine-containing beverages and some sports drinks. (**Aldaqdossi, et al., 2015**). Similarly, an increase in the number of sodium children consume through processed foods and table salt, many prepared foods, including restaurant meals, chips, sandwich meats and frozen foods. (**National Nutrient Database for Standard Reference, 2020**). Moreover, eating animal protein such as beef, chicken, and pork, especially organ meats, eggs shellfish, fish and dairy products such as milk, cheese, and yogurt was associated to acidic urine pH, negative calcium balance and can increase the risk of developing kidney stones (**Ferraro and Bargagli 2021**).

Children with kidney stones may present clinically with a spectrum of symptoms, depending on age including renal colic, nausea, vomiting, dysuria, distress, gross hematuria, and inability to relieve pain with position changes. While younger children may present with irritability, nonspecific abdominal pain, microhematuria, and urinary tract infection (**Yousefichaijan et al., 2018**). The treatment of

kidney stones are based on their size, location, age, and type as small one can pass through the urinary tract unnoticed but, the rate of this spontaneous passage is higher in older than younger children and with stones found in the lower ureter than kidney or upper ureter. Whereas, the obstructive stone need management options, in addition to pain control, include passage observation with medical expulsive therapy or surgery such as extracorporeal shockwave lithotripsy, retrograde intrarenal surgery with ureteroscopy, and percutaneous nephrolithotomy (**Chu et al., 2016**).

Since dietary knowledge and practices play a relevant role in the genesis and recurrence of pediatric kidney stones, carefully diet management has become a fundamental tool for the management of it. Effective kidney stone prevention requires dietary guidelines that aim to reduce the majority of kidney stones risk factors, reducing the supersaturation of urine with minerals such as calcium oxalate, calcium phosphate, and uric acid. For this purpose, current dietary guidelines formulated in this study, recommend increasing fluid intake at all times, especially during hot and dry weather, maintaining a balanced calcium intake, reducing dietary intake of sodium and animal proteins that can be replaced by plant based foods that are high in protein and low in oxalate such as beans, dried peas, and lentils in addition to increasing intake of fruits and fibers. Whereas high content of fruits and vegetables associated with a balanced intake of low-fat dairy products carries the lowest risk for incident kidney stones (**Ferraro 2020**).

Mothers of children with kidney stones play a meaningful role in managing their children's disease. In addition to their ordinary role, these mothers substitute as carecoordinators, nurses, physician for their children. Having children with stone disease may lead to more significant responsibilities for mothers. So, guidelines should be for mothers to supply them with the needed knowledge and practices for helping them to implement dietary guidelines deals the foods included and avoided specifically based on the types of stones that may ameliorate this problem and prevent recurrence as well as indirectly achieve better outcomes for mothers and their children (**Khorsandi 2020**).

Nurses, among the health care professionals, are more recommended to promote health and deliver preventive programs within the primary care context. In addition; nurses play a crucial role in health education through raising dietary knowledge and practices about avoidance of kidney stones occurrence and preventing its recurrence. Therefore, it is critical to assist mothers of children with kidney stones and persuade older children to self-medicate via follow dietary guidelines (Mohamed et al., 2019). Moreover, nurses must play a leading role in the administration of these instructional dietary guidelines through systematic educational interventions that help in preserving and enhancing children with kidney stones' health. Consequently, play a beneficial impact in reducing children's hospitalization and minimizing the emergence and progression of problems. (Mahmoud et al., 2019) In this concern, the researchers desired to evaluate the effect of instructional guidelines on dietary knowledge and practices among mothers of children with kidney stones.

Significance of the study:

Pediatric kidney stone has increased globally in the last few decades. It included among the major causes of child mortality that may be due to obstructive abnormalities or underlying metabolic predispositions (Yousefichaijan et al., 2018). Children who develop a kidney stone have a significant chance of developing stones in the future which is estimated to be between 30% and 65 %. Also, kidney stones raise the risk of chronic kidney disease and end-stage renal disease (Frassetto & Kohlstadt, 2019). It is estimated that stone formers have twice as high a risk of chronic renal disease than non-stone formers. Pediatric kidney stone is increasing in incidence and healthcare costs as well as putting an increasing clinical and budgetary strain on the world's healthcare systems (Hughes et al., 2020). As a result, this problem needs necessitated strategies to optimize the treatment of children with kidney stones and to reduce recurrence risk through preventive medical and dietary management. Therefore, dietary interventions through following instructional guidelines considered primary prevention of pediatric kidney stone, are assumed a low cost public health program with far-reaching societal effects. Thus, dietary interventions may reduce the

risk of urinary stone formation and its recurrence (Aleign & Petros, 2018).

Aim of the study:

The study aimed to determine the effect of instructional guidelines on dietary knowledge and practices among mothers of children with kidney stones through:

- Assessing the dietary knowledge and practical level among mothers of children with kidney stones
- Determine the mothers of children with kidney stones adherence level to diet and the most common barriers affecting dietary adherence toward healthy current food choices.
- Designing and implementing instructional guidelines based on the mother's needs.
- Evaluating the effect of instructional guidelines on dietary knowledge and practices among mothers of children with kidney stones.

Research Hypothesis:

H1: Mothers of children with kidney stones who received instructional guidelines are expected to improve their dietary knowledge and practices in the study group more than that in the control group.

H2: Post the implementation of the instructional guidelines, the mean score of dietary adherence of mothers in the study group is expected to be higher than that in the control group.

Materials 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 used in the current study.

Setting:

The research was applied at the Pediatric Urology Department and Urology Outpatient Clinic at Sohag University Hospital in Egypt affiliated with the Ministry of Higher Education and Scientific Research. This setting was selected because it provides services for a

high number of children 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 50 mothers with their children having kidney stones who were randomly divided into two groups, 25 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 (25 patients) and the control group (25 patients). At a 95% confidence level (Thompson, 2012).

Mothers' inclusion criteria included:

- Mothers their age more than 18 years.
- Agree to participate in the study

Children's inclusion criteria included:

- Any child between the age of one and fifteen years
- Children from both sexes
- Children with documented kidney stone confirmed by plain X-ray and/or ultrasound

Exclusion criteria included:

- Children are suffering from other chronic illnesses
- Children with congenital abnormalities, metabolic/intestinal disorders, endocrinal diseases.
- Mothers do not agree to participate in the study

Data collection tools:

Tool (I): Mothers' interview questionnaire: Was developed by the researchers after analyzing related literature and expert comments for content validity. To avoid misunderstandings, it was translated into Arabic. It was adapted from Abd El-Wahid et al., (2016) & Mahmoud, et al., (2019). It was composed of five parts:

Part (1): Mothers' data: It contained data which consisted of 3 items related to age, educational level, and place of residence.

Part (2): Children's data: It contained data which consisted of 3 items related to age, gender, and educational level.

Part (3): Children's medical history; It involved

six questions about the medical history of the patients such as previous hospitalization, duration, family history, number of stones, and stone size.

Part (4): Mothers' knowledge assessment questionnaire regarding kidney stones: To assess mothers' knowledge. It was adopted by (Aghamohammadi et al., 2018, Almutairi et al., 2019 & Mahmoud et al., 2019). There were 14 total items. These products were divided into two categories, which are as follows: **The first section** assesses mothers' knowledge about kidney stones: It was used for all mothers in the (study and control groups) and was completed by the researchers. It consisted of ten questions. Multiple Choice Questions (MCQ) about the function of kidney, meaning of a kidney stone, causes, risk factors for stone formation, different forms of kidney stones, signs/ symptoms, diagnosis, preventative strategies, factors that increase stone formation, and treatment procedures.

The second section: Assesses mothers' 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: Each question has one correct answer; if the mother's answer is correct, the mothers receive one grade and 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 14. Based on 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 (5): Mothers' 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: a) Mothers' practices related to the approved food consumption (eight points) 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.

b) Mothers' practices regarding restricted food consumption (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.

c) Fluid drinking practices of children (ten points) such as drinking plenty of fluids in fever, diarrhea, intense physical activity, avoid drinking water from unsafe resources for health reasons, avoid drinking cola, avoid consuming stimulants such as tea and coffee, avoid drinking fresh water from harmful resources for health reasons, 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 in hot weather and exercises for extended periods of time, drink plenty of fluids before and after meals, particularly before bedtime and after wake up. It's a three-point Likert scale: always (three), usually (two), and never (one degree).

Scoring system:

Total mothers' practices were 28 items consumption (eight points): scores varied from 8 to 24. Mothers' practices regarding restricted food consumption (ten points): ratings ranged from 10 to 30. Fluid drinking practices of children (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: satisfactory level of practice 70%, and unsatisfactory level of practice 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. Higher scores indicated greater adherence, except for items, which indicated harmful choices (foods high in salts or oxalates). Because greater scores indicated lower adherence for these items, the scores for these items were inverted.

Scoring system:

For computing a total PDAQ score: According to a statistical study, the adherence level (>70%) Although based on a weekly timescale, the PDAQ was expected to reflect typical dietary patterns based on the notion that most people consumed comparable items from week to week.

Tool (III): The barriers to consuming a 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 toward current food choices. The goal of this segment was to obtain insight into the motivations for certain eating patterns as well as mothers' 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.

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.

Content validity: A jury of five expert professors, three from the field of pediatric nursing and two from the urology 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.

Test of reliability:

The internal consistency technique was used to assess the instruments' dependability. Cronbach's alpha reliability coefficient for mothers' knowledge was determined to be 0.833, the practice fluid consumption score was 0.945, the total practice food consumption score was 0.932, the barrier score was 0.918, and dietary adherence

was dependable at.852.

Pilot Study:

A pilot study was conducted on 10 % of the study subjects (5 mothers and their children with kidney stones) to test the applicability & feasibility of the tools of data collection, and to estimate the time required for filling out the required forms. As needed modifications were done and mothers and their children involved in the pilot study were excluded from the actual study.

Ethical considerations:

Approval was obtained from ethical committee of the faculty of nursing, at Sohag University to conduct this study. 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. Mothers 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 mothers that the data would be used for only the research purpose.

The control group received the same routine care.

Fieldwork:

The researcher acquired official authorization to perform the proposed study from the manager of the hospital, and the head of the pediatric urology department and urology outpatient clinic, at Sohag University Hospital after explaining its aim. Mothers in this study provided informed consent after being informed about the nature and purposes of the study. The researcher presented herself, as well as the nature and aims of the study during the first interview. Data were collected from July 2021 and ending in December 2021. The researchers questioned mothers three days a week, pre and post-sessions to assess mothers' knowledge and practices. The control group received routine hospital care, whereas the study group received routine hospital care in addition to the researchers' dietary instructional guidelines (training booklet).

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

Preparatory phase:

This phase involved the researcher creating study tools and creating instructional guidelines 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, images, for extra illustrations to help mothers for understanding.

Assessment phase:

Individual interviews were conducted with mothers and their children 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 mother after the first 25 mothers and their children were assigned to the control group and the last 25 mothers and their children were assigned to the study group. The researchers visited with mothers and their children three times a week (Sunday, Monday, and Wednesday).

General objective:

The general objectives of the instructional guidelines were to improve dietary knowledge and practices among mothers having children with kidney stones.

Specific objectives:

By the end of the instructional guidelines, mothers having children with kidney stones should be able to mention kidney function, define the meaning of kidney stones, enumerate the risk factors and causes of kidney stones, identify the clinical presentation of kidney stones, identify the required investigations and methods of treatment of kidney stones, list the most common recurrent type of stone and factors that increase stone formation, permitted foods and fluids, discuss the precautions to prevent a recurrence and management

Implementation phase:

After completing the study tools, the researchers prepared the instructional guidelines using a PowerPoint presentation as well as video tapes and posters. The researchers then divided the mothers and their children in the study group into small groups of five mothers and their children and conducted the instructional guidelines sessions in five groups. The

instructional guideline's material (booklet) was spread out across five consecutive sessions, with both theoretical and practical components. The first session was an orientation session to clarify the instructional guideline's aim and contents, general objectives, instructional methods, learner activities, and evaluation methods. The second session included the theoretical portion, that covered the necessary information about kidney functions, kidney stone meaning, risk factors, causes, diagnosis, investigations, management, and categories of forbidden foods as well as permitted foods and fluids. Other three sessions covered practical aspects of mothers' management such as how to cope with renal colic, dysuria, fever, nausea/vomiting, hematuria, exhaustion, urinary tract infections, and dietary adherence. Furthermore, the researchers distributed booklet of instructional guidelines for the diet to each mother in the study group. Each session lasted 30 to 45 minutes.

Evaluation phase:

The last phase was carried out on both groups post the instructional guidelines were implemented to determine the effect of instructional guidelines on dietary knowledge and practices among mothers of children with kidney stones by utilizing the same pre-test tools.

III- Administrative Design:

For the conduction of the study, written permission was taken from the Dean of the Faculty of Nursing, Sohag 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 mothers and their children 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 a p-value \geq 0.05 was considered not significant (NS).

Results:

Table 1 shows the mean age of the studied mothers in the study group and the control group were (33.1 \pm 7.6) (31.9 \pm 12) respectively. As regards the level of education, (52.0% & 56%) of them in the study and control groups respectively had a university education. Concerning residence, 80% of the studied mothers with their children in the study and 76% 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 personal data.

Table 2 demonstrates the mean age of the studied children in the study group and the control group were (9.1 \pm 4.8) (10.9 \pm 3.12) respectively. As regards the level of education, (60.0% & 68%) of them in the study and control groups respectively had primary education. Concerning gender, 60% of the studied children in the study and 64% of the control group were boys. There were no statistically significant differences between the study and control group children regarding all aspects of personal data.

Table 3 shows that (40% & 36%) of the studied children in the study and control groups respectively had a family history of kidney stone formation. The same table indicates that (48% & 44%) of children in the study and control groups respectively had history of previous hospitalization.

Figure 1 illustrates that all of the studied mothers were not received any education and or training regarding kidney stones.

Figure 2 portrays that 83% of the studied mothers reported that their main source of knowledge about kidney stones was doctors.

Table 4 illustrates the mothers' knowledge regarding kidney stones in both study and control groups pre and post-instructional guidelines. Also, the table revealed that there were improvements in the mother's knowledge regarding meaning, risk factors of kidney stone formation, types, signs/ symptoms, diagnosis, methods of prevention, the relationship between stone formation and diet, foods that increase the chance of stone formation, foods that reduce the chance of stone formation, amount of water that

must be consumed throughout the day post instructional guidelines implementation. There were highly statistically significant differences found between all items of mothers' knowledge regarding kidney stones pre and post- instructional guidelines among the study and control groups ($P < 0.001$).

Figure 3 shows that almost all of the studied mothers in the study and control groups (92%, & 91%) respectively had unsatisfactory knowledge level pre-instructional guidelines implementation with no statistically significant difference $p > 0.05$. While post-instructional guidelines implementation the majority (88%) of mothers in the study group had a satisfactory knowledge level. Also, reveals that there was a highly statistically significant difference and improvement between the studied mothers in the study and control groups post instructional guidelines implementation regarding total knowledge about fluid drink and food at ($p \leq 0.001$).

Figure 4 shows that (90%, & 91%) of the studied mothers in the study and control groups respectively had unsatisfactory practical level pre-instructional guidelines implementation with no statistically significant difference $p > 0.05$. While, post instructional guidelines implementation, less than three-quarters (70%) of mothers in the study group had satisfactory practical levels with a statistically significant difference between the two groups at ($p \leq 0.001$). Also, the same table illustrates that there was a highly statistically significant difference between the studied children in the study and control groups post instructional guidelines implementation regarding the total practice of fluid drink, and total practice regarding food at ($p \leq 0.001$).

Figure 5 shows that more than half of studied mothers with their children in the study and control groups (60% & 57%) respectively had high barriers to consuming a healthy diet pre- instructional guidelines implementation with no

statistically significant difference $p > 0.05$. While, after instructional guidelines implementation the high barriers decreased to (28%) in the study group less than in the control group with a statistically significant difference between the two groups at ($p \leq 0.001$).

Table 5 indicates that 68% of studied mothers with their children in the study group adhered to the recommended diet compared to 28% in the control group post-instructional guidelines implementation, while (72%) of them in the control group did not compared to 32% in the study group with a highly statistically significant difference at ($p \leq 0.001$).

Table 6 illustrates that there was a significant correlation between the total knowledge and practices of the studied mothers' pre and post-instructional guidelines implementation in the study group.

Table 1: Frequency and Percentage distribution of the studied mothers regarding their data in the study and control groups (N=50)

Demographic characteristics	Study (n=25)		Control (n=25)		X ²	p-value
	No	%	No	%		
Age (in years)					0.28	0.78
18-<30	14	56.0	13	52.0		
30-<40	7	28.0	7	28.0		
>40	4	16.0	5	20.0		
(Mean ± SD)	33.1± 7.6		31.9±12			
Educational level	5	20.0	7	28.0	1.57	0.62
Read and Write						
Secondary school	7	28.0	4	16.0		
University education	13	52.0	14	56.0		
Residence	5	20.0	6	24.0	1.9	0.17
Rural	20	80.0	19	76.0		
Urban						

χ^2 = Chi-square test f= Fisher exact test non-significant p>0.01

Table 2: Frequency and Percentage distribution of the studied children regarding their data in the study and control groups (N=50)

Demographic characteristics	Study (n=25)		Control (n=25)		X ²	p-value
	No	%	No	%		
Age (in years):					0.29	0.88
1-<6	8	32.0	7	28.0		
6-<12	10	40.0	11	44.0		
12-15	7	28.0	7	28.0		
(Mean ± SD)	11.7± 3.12		11.4±4.13			
Educational level:					1.59	0.72
Nursery school						
Primary school	0	0%	0	0%		
Preparatory school	15	60.0	17	68.0		
	10	40.0	8	32.0		
Gender:					1.3	0.15
Boys	15	60.0	16	64.0		
Girls	10	40.0	9	36.0		

χ^2 = Chi-square test f= Fisher exact test non-significant p>0.01

Table 3: Frequency and Percentage distribution of the studied m regarding their medical history in the study and control groups (N=50)

Medical history	Study (n=25)		Control (n=25)		X ²	p-value
	No	%	No	%		
Previous hospitalization					0.33	0.67
- Yes	12	48.0	11	44.0		
- No	13	52.0	14	56.0		
Duration of disease	42.8±34.3 Mean± SD		44.6±34.6 Mean± SD		1.32	0.70
Family history	10	40.0	9	36.0	1.2	0.16
- Yes	15	60.0	16	64.0		
- No						
Number of stones					1.17	0.19
- Single	20	80.0	19	76.0		
- Multiple	5	20.0	6	24.0		
Stone size	0.5 (0.11-1) Median(range)		0.6(0.11-1.7) Median(range)		1.3	0.18

χ 2 = Chi-square test

f= Fisher exact test non-significant p>0.01

Figure 1: Percentage distribution of the studied mothers regarding their previous education / training regarding kidney stones (N = 50)

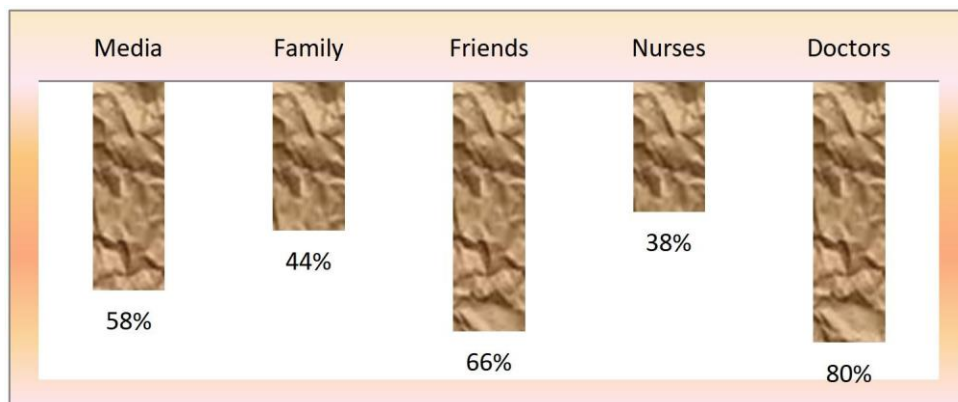
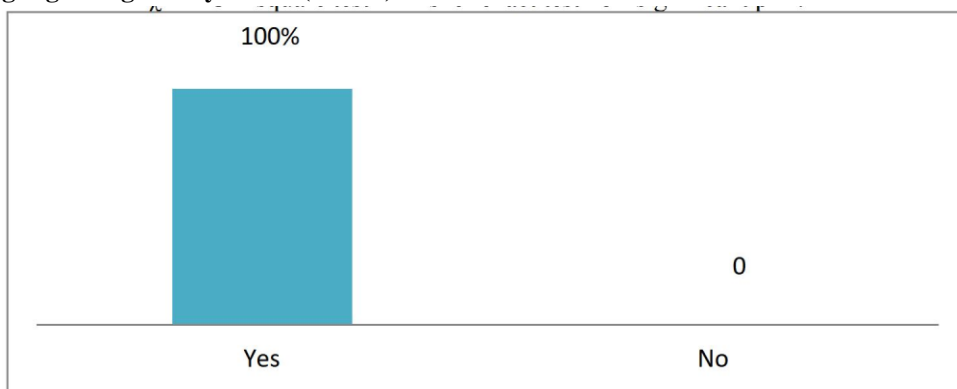
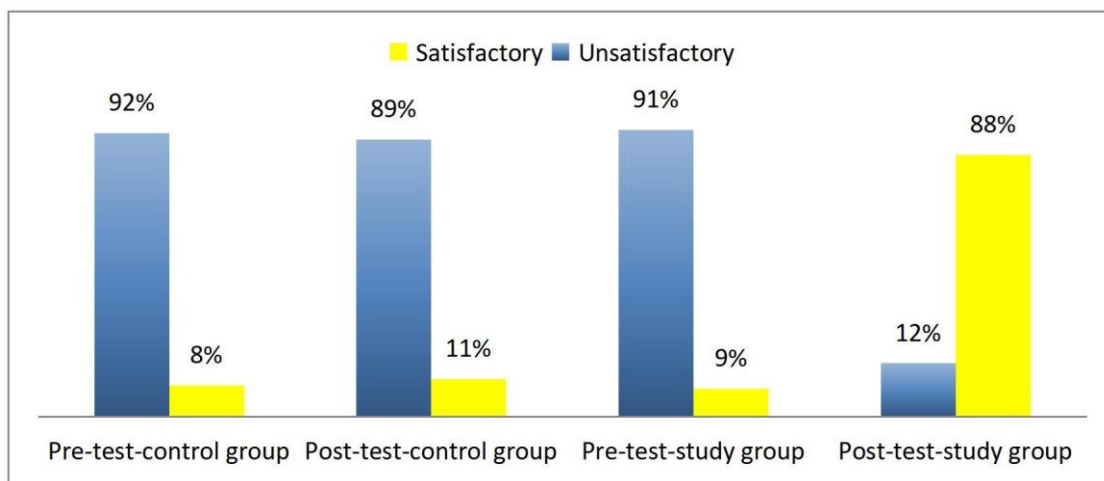


Figure 2: Percentage distribution of the studied mothers regarding their source of knowledge

Table (4) Comparison of the studied mothers' knowledge in the study and control groups regarding kidney stones (N=50)

Knowledge items	Control group				Study group				X ²	P-value
	Pre-instructional Guidelines		Post – instructional Guidelines		Pre – instructional Guidelines		Post-instructional Guidelines			
	No	%	No	%	No	%	No	%		
1. Meaning of kidney stone	13	52.0	15	60.0	14	56.0	25	100.0	138.33	<0.001**
2. Risk factors of stone formation	12	48.0	14	56.0	11	44.0	20	80.0	165.23	<0.001**
3. Types of kidney stones	14	56.0	13	52.0	8	32.0	18	72.0	126.26	<0.001**
4. Signs/ Symptoms	14	56.0	15	60.0	12	48.0	21	84.0	165.24	<0.001**
5. Diagnosis	8	32.0	11	44.0	13	52.0	22	88.0	143.27	<0.001**
6. Preventative strategies	13	52.0	14	56.0	12	48.0	24	96.0	138.37	<0.001**
7. Factors that increase the formation of stones	10	40.0	12	48.0	10	40.0	20	80.0	124.28	<0.001**
8. Methods of treatments	8	32.0	8	32.0	9	36.0	18	72.0	126.28	<0.001**
9. Relationship between stone formation and diet	12	48.0	14	56.0	11	44.0	20	80.0	165.23	<0.001**
10. Foods that reduce the chance of stone formation	14	56.0	15	60.0	12	48.0	21	84.0	143.27	<0.001**
11. Foods that increase the chance of stone formation	15	60.0	15	60.0	10	40.0	22	88.0	130.11	<0.001**
12. Amount of water that must be consumed throughout the day	13	52.0	13	52.0	14	56.0	24	96.0	124.22	<0.001**

**Highly significant at p-value < 0.001



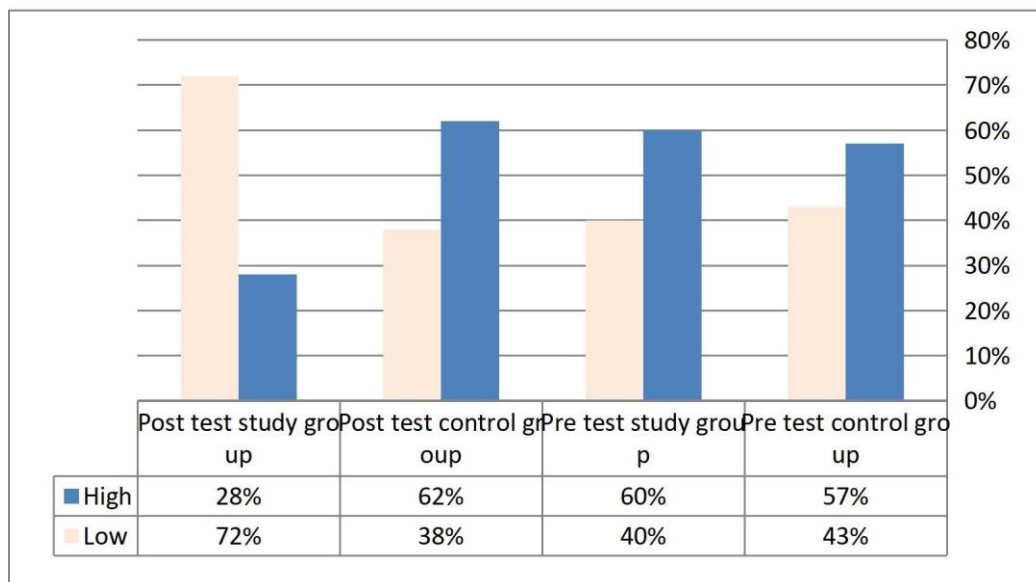
Note. * $p \geq 0.05$, ** $p \geq 0.001$, Not significant ($p < 0.05$)

Figure (3): Comparison between knowledge levels among the studied mothers in study and control groups regarding food & fluids (N= 50)



Note. *p ≥ 0.05, ** p ≥ 0.001, Not significant (p < 0.05)

Figure 4: Comparison between practical levels among the studied mothers in study and control groups regarding food& fluids (n= 50)



Note. *p ≥ 0.05, ** p ≥ 0.001, Not significant (p < 0.05)

Figure (5): Comparison between studied mothers with their children in the study and control groups regarding barriers to consuming a healthy diet

Table (5) Comparison between the studied mothers with their children in study and control groups regarding dietary adherence pre and post instructional guidelines implementation (n= 50)

Dietary Adherence	Study group (n=25)				Control group (n=25)				X ₂	p-value
	Pre- instructional Guidelines		Post – instructiona lGuidelines		Pre- instructional Guidelines		Post – instructional Guidelines			
	No	%	No	%	No	%	No	%		
Adhered	8	32.0	17	68.0	7	28.0	7	28.0	49.59	<0.001**
Not adhered	17	68.0	8	32.0	18	72.0	18	72.0		

Significant = $p < 0.001$ $\chi^2 =$ Chi-square test

Table (6) Correlation between total knowledge and practices of the studied mothers in the study group.

Correlation	Pearson correlation coefficient			
	Total practice score			
	Pre- instructional guidelines implementation		Post-instructional guidelines implementation	
	R	P	R	P
Total knowledge score	.447	.000**	.634	.000**

*Note ** Correlation is significant at the 0.0001 level*

Discussion:

Pediatric kidney stone has increased globally in the last few decades; Children with kidney stone constitute a vulnerable patient population, as they are more susceptible to stone recurrence throughout their lifetimes. Since diet has a significant impact on kidney stone development and prevention, widespread dietary interventions and health education may be helpful (Alblowi et al., 2022).

Mothers of children with kidney stones play a vital role in providing home care. Therefore, implementing the dietary instructional guidelines for mothers will help them acquire knowledge and practices regarding kidney stones. Furthermore, mothers' participation in the dietary instructional guidelines will enhance their awareness about risk factors influencing kidney stone progression among their children which are considered very important variables in regulating and improving children's health, quality of life and help to achieve a better outcome for children. Hence, the current study aimed to determine the effect of instructional guidelines on dietary knowledge and practice among mothers of children with kidney stones. (Prezioso et al., 2015)

The present study showed that the age of the studied children ranged from 1-15 years with a mean of (11.7.1± 3.12), (and 11.4±4.13) in the study and control groups respectively, this finding was in agreement with **El Lekhlifi (2016)** who found that the age of the studied children in their study was varied between 8 months and 15 years old, with a mean age of 7.86 ± 4. This finding conflicted with the result of **Tasian et al., (2016)** who noted that among age groups of the studied population, the greatest increase in nephrolithiasis was observed among children from 15 to 19 years old.

Concerning gender, 60% of the studied children in the study and 64% of the control group were boys. This is in the same line with **Yousefichaijan et al., (2018)** stone formation in males was more than in females. Also, **Mediarois et al., (2022)** were in agreement with the present study results and mentioned that 54.5% of the studied children were males, this may be attributed to pediatric stone formers having an age-dependent sex prevalence demonstrated that stone-forming children less than 10 years are more often boys while, in the adolescence, stage girls form more stones than boys (**Schwaderer et al., 2019**)

The present study revealed that 80% of the studied mothers with their children in the study and 76% of the control group were living in urban areas. This result can be due to urbanization that may affect the prevalence of kidney stone as a decrease in the green area in cities cause an elevation of the temperature compared to the rural area. Ambient temperature is associated with a higher incidence of nephrolithiasis, and the worldwide increase in nephrolithiasis may be related to global warming. This finding was in agreement with **Lyer and Goldfarb (2020)** who mentioned that urban populations are exposed to higher ambient temperatures than rural ones, which can cause an increase in kidney stone prevalence, on the other hand, this finding contradicted **Sas et al., (2010)** who concluded that there was no difference in the pediatric kidney stone incidence between the urban and rural areas in the USA.

The findings of the present study revealed that there were no statistically significant differences between the study and control group mothers regarding all aspects of personal data. From the researchers' point of view; it reflected the similarity of the characteristics among the sample

The present study revealed that more than one-third of the studied children in the study and control groups respectively had a family history of kidney stone formation. This finding was supported by **Safdar et al., (2021)** who found that about 34.9% of renal stone patients had a positive family history in their study titled "The prevalence of renal stones among residents in Saudi Arabia". **Nieto et al., (2018)** also, in congruence with the result of the current study as reported that family history was positive for urolithiasis in 68.3 % of the studied children. From the researchers' point of view; it could be due to genetic factors that play a role in stone formation as first-degree relatives of stone formers have a 2–16 times higher risk of developing kidney stones when compared to the general population as mentioned by **Cuellar et al., (2020)**.

The current study found that all of the studied mothers were not received any educational training regarding kidney stones. From the researchers' point of view, it reflected the cause of the knowledge deficit due to insufficient health education /training and highlighted the critical need to gain knowledge through these instructional guidelines. Regards sources of knowledge about kidney stones, the majority of the mothers reported that doctors were the main source of knowledge. This demonstrated that mothers seek information and medical assistance from the appropriate persons as a result of precise diagnosis and the judgment of specialists. According to the researchers, this demonstrated the need for mothers to develop their information and skills through dietary instructional guidelines.

Results of the current study highlighted that there were highly statistically significant differences found between all items of mothers' knowledge regarding kidney stones pre and post-instructional guidelines between the study and control groups. From the researchers' point of view, this reflected the positive effect of instructional guidelines implementation in improving knowledge among the studied mothers. This was consistent with the findings of **Mahmoud et al. (2019)**, who discovered an improvement in the study group's level of knowledge on kidney stones after the intervention compared to before the intervention. Also, **Ibrahim et al., (2022)** supported the current results as found that the majority of the studied patients in the study group had satisfactory knowledge after educational guidelines, while the majority of the studied patients in the control group and study group had unsatisfactory knowledge pre educational guidelines in a study titled 'Effect of educational guidelines prior nephrolithotripsy on patients' performance and satisfaction.

Concerning studied mothers' knowledge about fluid drinks and food, the study results revealed that almost all of the studied mothers in the study and control groups respectively had unsatisfactory knowledge level

pre-instructional guidelines implementation with no statistically significant difference but post instructional guidelines implementation, there was a highly statistically significant difference and improvement between the studied mothers in the study and control groups regarding total knowledge about fluid drinks and food. From the researchers' point of view, this reflected the success of the instructional guidelines and their positive effects. Similarly, **Alghamdi et al., (2018)** concluded that there was a lack of sufficient knowledge about the role of diet in the medical management of renal stones among their studied population and recommended providing health information concerning renal stone disease to overcome this defect in knowledge. These findings are consistent with the findings of a study conducted by **Ali et al., (2019)**, who revealed that there was a great improvement in patients' knowledge regarding dietary habits about stone disease post-implementation of educational guidelines.

Concerning studied mothers' practices, the study results revealed that there was a highly statistically significant difference between the studied mothers in the study and control groups post instructional guidelines implementation regarding the total practices of fluid drink, and total practices regarding food. From the researchers' point of view, this reflects the importance and effectiveness of instructional guidelines implementation that is commonly associated with improving practices as a better understanding of the research topic is reflected in the improvement in practices. Also, this means when the studied mothers had sufficient knowledge they can practice well. Moreover, the lack of practice is attributable to a knowledge gap as well as a lack of health education. 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, **Lin et al., (2020)** conducted meta-analyses about dietary and lifestyle factors for the primary prevention of nephrolithiasis, their result was congruent with the present study as they reported that increased fluid uptake, decreased the risk of nephrolithiasis, a high intake of soda promoted stone formation. In the same line, **Siener R. (2021)** found that, regardless of urine stone

composition or individual risk factors for stone formation, proper fluid intake was the most significant nutritional intervention to avoid kidney stone recurrence. This may be attributed to proper water intake preventing supersaturation of substances in the urine and stone formation. This is supported by the findings of **Almutairi et al., (2019)**, who found that three-quarters of respondents were having poor practice toward urinary tract stones and also, 92% of them were having poor knowledge about urinary tract stones in a study entitled "knowledge, attitude, and practices among Saudi population of urinary tract stones and their radiological diagnostic methods, Saudi Arabia 2018" therefore, this highlights the importance of education program for urinary stone population by using instructional guidelines to improve their knowledge and practices. As well as, this is matched with the findings of **Fakhoury et al. (2019)**, who reported that the design of an effective program focused on the prevention of stone formation, encouraging the participants to be proactive in modifiable behavior modifications of stone-promoting risk factors, and adapting counseling to the participants' level of obstacles.

The current study found that more than half of studied mothers with their children in the study and control groups respectively had high barriers to consuming a healthy diet pre-instructional guidelines implementation with no statistically significant difference. While, after instructional guidelines implementation the high barriers diminished in the study group than in the control group with a statistically significant difference between the two groups. These confirmed the effective modifications in their practice and the success of the main goals of the implementation of the instructional guidelines. This is comparable to **Bishop et al., (2019)** who identified the primary barriers to eating a healthy diet and discovered that the high barriers were reduced following program implementation. Besides that, **Saboula et al., (2019)** found in their study that post-intervention, the mean total score of perceived barriers of behavior modification to reduce kidney stone recurrence among the study group was significantly decreased.

The current study found that more than two-thirds of studied mothers with their children in the study group adhered to the recommended diet post-instructional guidelines

implementation. From the researchers' point of view, this reflected the positive impact of the instructional guidelines in improving dietary adherence among the participants in the study group. This finding indicated that it is important to design strategies for mothers to understand their children's dietary regimens and improve their adherence. As dietary salt restriction and increase intake of vegetables and fruits should be recommended in all children with kidney stones as mentioned by (Kovacevic 2020). 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.

Concerning the correlation between the total knowledge and practices of the studied mothers, the current study revealed that there was a significant correlation between the total knowledge and practices of the studied mothers. These findings indicated that skills can be easily improved, especially if linked with their relevant scientific base of knowledge. The current study's findings were similar 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 instructional guidelines were effective in enhancing knowledge and practices. This reflected the necessity of enhancing mothers' knowledge and practices to help them study, acquire, and use good information successfully. This association is explained as when mothers have sufficient knowledge to practice properly. Furthermore, the current study's findings were comparable to those of Maya et al., (2021), who discovered a link between knowledge level and practice. The current study's findings confirmed the study's goal and hypothesis, as well as the knowledge and practices of the mothers had improved.

Conclusions:

Based on the study findings, instructional guidelines have a positive effect on enhancing the dietary knowledge and practices among mothers of children with kidney stones.

Recommendations:

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

- Mothers of children with kidney stones should continue to receive instructional guidelines to improve their dietary knowledge and practices.
- Arabic and a simplified booklet with easy language and various simple photos should be accessible in all pediatric urology departments and Outpatient urology clinics for providing instructional 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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