Effect of Designed Ureteral Stent Instructions on Patient Recovery

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ABSTRACT

Contents: Ureteral stent placement is performed in up to eighty percent of patients following ureteroscopy. It associated with significant morbidity, resulting in a reduction in general health function in another eighty percent of patients.

Aim: This study aimed to evaluate the effect of designed ureteral stent instructions on patient recovery.

Methods: Quasi-experimental (pre/posttest) design was utilized in this study .The study was carried out at the urology department to be followed up through the urology outpatient clinic at Benha University Hospital from the beginning of February 2019 to February 2020 on a purposive sample of 134 patients. Four tools were used to collect the study data .These tools included a structured interview questionnaire to assess patients' knowledge regarding ureteral stents, a ureteral stent symptoms questionnaire, a ureteral stent discomfort test, and a patient's satisfaction assessment form.

***Results*:** Showed a mean study sample age of 43.42±6.47, 83.6% were males. The study also showed a statistically significant improvement of study group's knowledge in the post-operative and follow-up phases ($p<0.017$, <0.003), as well as a decrease in total mean score in ureteral stent symptoms and ureteral stent discomfort test ($p<0.001$), immediately and after designed instructions.

***Conclusion*:** Implementing designed instructions for patients with ureteral stent was effective in improving knowledge, a decrease of ureteral stent symptoms, and a decrease in patient discomfort. The study recommended manuals, information booklets, and self-instruction modules developed in areas of ureteral stent management.

Keywords: Ureteral stent instructions, patient recovery

1. Introduction

One of the most commonly used instruments by urologists is ureteral stents. It is performed in up to 80% of patients following ureteroscopy. They are placed with cystoscopy guidance in an operating room setting. It used to relieve ureteral obstruction, promote ureteral healing following surgery. Most patients are linked to some degree of morbidity, ranging from generalized urinary pain to urinary tract infection or obstruction. Most of the morbidity is correlated with the biocompatibility of the stent materials used *(Nakadk & Patel, 2020).*

More than seventy percent of patients with ureteral stents experience stent-related discomfort *(Michel- Ramírez et al., 2019).* Furthermore, functional impairment in many aspects of everyday life, with an overall 80% quality of life impairment and a 35% risk for sexual dysfunction, and a negative effect on social life and vitality were also common. The high morbidity of ureteral stenting also seems to have a significant negative economic impact *(Dominik et al., 2015).*

Since stent tolerance is a known issue, it stands to reason that some of the morbidity and excess healthcare utilization could be mitigated with a shorter stent duration *(Scales et al., 2016).* The ureteral stent should not last longer than three months. If more than this time is left, it would be difficult to extract the stent due to the formation of a stone directly on it *(British Association of Urological Surgeons, 2017).*

In uncomplicated cases, stents may be removed within two to three days of ureteroscopy, or they may be removed after one to two weeks in cases of ureteral perforation or obstructive persistence. The removal occurs in two different forms, either in outpatient clinics with topical anesthesia with a flexible ureter scope and grappling where the thread is gently extracted from the urethra of the patient to allow the removal of the stent or for patients who are unable to handle topical anesthesia. It may be removed under general anesthesia in the operating room. If a thread is not present, a cystoscopy is inserted into the urethra of the patient, then progressed into the bladder, where the stent can be easily removed *(Nguyen et al., 2015; Doerscha et al., 2018).*

The key complications associated with ureteral stents placement can range from mild discomfort to serious complications such as urgency, hematuria, spasms of the bladder, dysuria, back pain before or during urination, and ambulation and bladder pain *(Frohlich et al., 2017).* It may also contribute to the urinary tract's inflammation, movement of stents inside the urinary tract, stent encrustation, and retained stents. Rare complications include urinary tract stent migration, such as migration into inferior vena cava and reflux anuria following removal of or obstruction (*Turney, 2016; Bruwaene et al., 2018).*

Patients should be advised that ureteral stents are temporary instruments that need to be changed periodically and removed when no longer needed. They should also be advised about possible complications of ureteral stents and how to treat them *(Freifeld et al., 2017)*. Nurses caring for

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these patients require specialist knowledge to reduce problems by prevention or anticipation and early intervention to maximize short- and long-term outcomes. Patients (and relatives) who are engaged with the process are better equipped to care for themselves, and this also adds to the effectiveness of the ureteral stent *(Badawy et al., 2019).*

2. Significance of the Study

In 80% of patients, ureteral stents are associated with substantial morbidity, resulting in a decline in overall health function *(Dellis et al., 2010).* It is difficult in Egypt to get precise stent statistics due to the lack of an accurate national reporting system. Benha university hospital documented the admitted number of urology patients in 2018, amounting to 200 patients, at the urology department in Benha University Hospital *(Statistical Department of Benha University Hospital, 2018).* High-quality patient education on ureteral stent-related symptoms is highly advisable, as it can reduce these symptoms. However, the influence of information on the incidence and extent of potential problems seems to be limited.

3. Aim of the study

This study aimed to evaluate the effect of designed ureteral stent instructions on patient recovery through:

- Assessing patients ' knowledge regarding the ureteral stent.
- Assessing the ureteral stent symptoms after installation of the stent.
- Designing and implementing ureteral stent-related instructions for patients.
- Evaluating the effect of instruction on patient knowledge, discomfort, and satisfaction.

3.1. Operational definition

Patient recovery is referred to as ureteral stent symptoms, patient discomfort after ureteral stent installation, and satisfaction with the designed instructions.

3.1. Research hypotheses

- H1: The patients ' knowledge regarding the ureteral stent will be improved after implementing the designed instructions compared to their preintervention level.
- H2: The ureteral stent symptoms will be significantly lowered after designed instructions implementation compared to their preintervention level.
- H3: The degree of discomfort among patients will be significantly decreased after implementing the designed instructions compared to their preintervention level.
- H4: There will be a negative correlation between the total knowledge and both ureteral stent symptoms and the degree of discomfort among studied patients after implementing the designing instructions.

4.Subjects & Methods

4.1. Research design

Quasi-experimental (pre/posttest) design was utilized to conduct the current study. Quasi-experimental research involves manipulating an independent variable without the random assignment of participants to conditions or orders of conditions and can be constructed with single or multiple groups and may involve pretest and posttest or post-test-only measurement *(Mateo & Foreman, 2014).* The quasi-experimental design includes a wide range of nonrandomized or partially randomized pre-post intervention studies *(Handley et al., 2018).*

4.2. Research setting

This study was conducted in the urology department for the patients to be followed through the urology outpatient clinic at Benha University Hospital. The urology department was composed of five rooms (two rooms for males and two rooms for females). Each room contained five beds. Beds are full most of the time. There is also one room for dressing.

4.3. Subjects

A purposive sample of 134 patients undergoing ureteric stents from the settings mentioned above was recruited. The sample size was calculated based on the previous year's census report of admission in the urology department from *Benha University Hospital Census (2018)* utilizing the following formula *(Yamane, 1967).*

$$n = \frac{N}{1 + N\,(e)2}$$

Where:
n= sample size
N= total population (200)
e= margin error (0.05)
Inclusion criteria

The patients had been selected according to the following criteria: Age 20 years or older, both genders (males and females), are willing to participate in the study, with the first time for a stent, the stent remains more than three months, free from severe cognitive, physical and communication impairment as well as comorbidities such as obesity, diabetic and metabolic syndrome. Besides, they did not receive any instructions related to the ureteral stent (if installation or removal).

4.4. Tools of the study

Data collected through the utilization of the following tools:

4.4.1. Structured Interview Questionnaire

The researchers constructed it after reviewing relevant literature. It was written by the researcher in the simple Arabic language. It used to assess patients' knowledge regarding stent and included three parts:
Part one (pre) is concerned with assessing patients' socio-demographic data such as age, gender, marital status, residence, educational level, occupation, and receiving previous educational instruction (Installation or removing).
Part two (pre) assessed the stent-related data. The researchers developed this tool to collect data related to

diagnosis, location, stone sizes, and stent size.

Part three (pre, immediately post, after three months) encompassed the patient's knowledge assessment. It was adapted from *Dominik et al. (2015)* translated into Arabic and back translation into English to avoid misunderstanding. It included 21 MCQs about ureteral obstruction and ureteral stent distributed as:

The first section included the anatomy of the urinary system (1 questions), the definition of ureteral obstruction (1 question), causes (1 questions), signs and symptoms (1question), diagnosis and treatment (2 questions), complications (1 questions), the technology of breaking stones with shockwaves (1 questions), definition and reasons for uses of ureter stent and symptom (3 questions), contraindications and complications (2 questions), side effect and removal (3 questions).

Section two included patient information about the necessary instruction after ureter stent removal as rest, healthy diet, follow-up, taking medication, and exercises to get rid of ureter stones (5 questions). This tool is distributed three times pre, immediately post, and after three months of designed instructions implementation.

Scoring system

Knowledge obtained from patients was scored and calculated. Each question ranged from 1-2 grades. At the same time, the correct answer scored two grades and scored one for an incorrect answer. The total score level for the questionnaire sheet was 42 grades (equal to 100%).

- The patients' knowledge ≥60% considered satisfactory knowledge.
- The patients' knowledge <60% considered unsatisfactory knowledge.

4.4.2 The Ureteral Stent Symptoms Questionnaire (USSQ)

It was used three times pre, immediately post, and after three months. It was adapted from *Tanidir et al. (2016)* and modified by the researcher. It is used to evaluate stent-related symptoms. It is divided into the following five parts: urinary symptom (10 questions), pain (7 questions), general health (6 questions), work performance (4 questions), and sexual matters (3 questions) with a total of (30 questions).

Scoring system

The Ureteral Stent Symptoms Questionnaire (USSQ) was a five-point Likert scale. Each question was graded from 1-5 grades. Never (1), occasional (2), sometimes (3), usually (4), and always (5). The total score was 150 scores. They are presented as mean and SD, with the higher the score, the more frequent the symptoms.

4.4.3 Ureteral Stent Discomfort Test (USDT)

It was used three times pre, post, and after three months. It was adopted from *Ramírez et al. (2019*. The USDT is an objective and standardized test designed to evaluate the ureteral stent-discomfort. The questionnaire items include 13 Items MCQ.

Scoring system

Ureteral Stent Discomfort Test (USDT) is a five-point scale. Each question ranged from 0-5 grades where the answer scored (0) never, (1) seldom, (2) very seldom, (3) sometimes, (4) more than half the time, and (5) almost always.

4.4.4. Patient's Satisfaction Assessment Form

It is a three-point Likert scale. The researchers developed it to determine the degree of patient's level of satisfaction with a booklet containing 21 questions divided into satisfaction with knowledge (10 questions), e.g., does the contents were clear, informative, helpful? Satisfaction with exercise (11 questions), e.g., Does the exercises was clear, helpful?

Scoring system

The scores were distributed as zero for unsatisfied, one for may be satisfied, and two for satisfied. The total score level for the questionnaire sheet was 21 grades (equal to 100%).

- >70% considered satisfied.
- 50% -<70% considered may be satisfied.
- <50% considered unsatisfied

4.5. Procedures

Permission granted from the Dean of Faculty of Nursing, Benha University, hospital directors, and head of the urology department at Benha University Hospital. The researcher obtained approval for data collection. The study's objectives and nature were explained, so it became possible to carry out the study with minimum resistance.

Tools' validity was tested through a jury of five experts from the medical-surgical nursing department, faculty of nursing, Benha University. The modification was made according to the panel's judgment on the clarity of sentences, appropriateness, and content completeness. The percentage of consensus among experts regarding the structured interviewing questionnaire was 97%, and the Ureteral Stent Symptoms Questionnaire (USSQ) was 98%. The reliability of the designed tools was tested by Cronbach's alpha test (0.981) for a structured interview questionnaire, (0.715) for UUSSQ, and (0.914) for Ureteral Stent Discomfort Test (USDT).

A pilot study was carried out on 10% of the studied subjects (13 patients). They were included in the primary study sample. The pilot study was carried out to ensure the study tools' clarity, applicability, the time needed for each tool to be filled in, and the study process's feasibility.

During all stages of the study, all ethical issues were taken into consideration. This study's ethical research consideration included the approval of the Ethical Research Committee of Faculty of Nursing, Benha University, before the designed ureteral stent instructions implementation. The objectives and aim of the study were explained to all participants. They were told that they might, at any moment, withdraw from the research. Additionally, oral consent was taken from the patients who participated in the study. The researcher protected the subjects' privacy and confidentiality.

The preparatory phase included reviewing the available literature and different studies related to the research problem and theoretical knowledge using textbooks, evidence-based articles, internet periodicals, and journals.

The researcher designed ureteral stent patients' instructions based on patients' need assessment, literature review, researchers' experience, and experts' opinions. The researchers designed an Arabic instruction booklet with illustrations.

The designed instructions were included information about ureteral obstruction and ureteral stent. It is divided into three main parts. Part one included the anatomy of the urinary system, definition of ureteral obstruction, causes, signs, symptoms, diagnosis, treatment, and complication, the technology of breaking stones with shockwaves, definition, and reasons for uses of ureter stent, symptoms, contraindications, complications, replacement, side effects, and removal.

Part two included patient information about the necessary instructions after ureter stent removal, such as rest, healthy diet, follow up and taking medication, and exercises to get rid of ureter stones.

Fieldwork: The data collection process extended over 12 months from February 2019 to the end of February 2020. The researchers visited the urology department three days weekly (morning and afternoon) to collect the data using previous tools. The average time took for the questionnaires to be completed about 20-30 minutes.

Implementation phase: The designed instructions of ureteral stent were implemented for patients who underwent the ureteral stent. After admission, it started in the patient room with an orientation about the ureteral stent's instructions. Individualized or small group sessions were done. The instructions of the ureteral stent were delivered in 4 sessions. Each session's duration ranged from 45-60 minutes. The content of the program was similar for all patients except for its simplicity. The booklet was handed to the studied patients at the end of the sessions.

The teaching methods included lectures and group discussions. Visual aids included a colored printed booklet (handout), Microsoft PowerPoint presentation, illustrated pictures, and videos.

Evaluation phase: The researcher evaluated the effect of the designed instructions immediately after implementation on patient knowledge; Ureteral Stent Symptoms Questionnaire (USSQ), Ureteral Stent Discomfort Test (USDT) was used by the researcher using the study tool I, part (3), tool II and tool III pre, immediately post and after three months o designed instructions implementation. Also, they were evaluated for their satisfaction immediately after the implementation of the designed instructions.

4.6. Limitation of the study

The small sample size was a restriction. It hinders the generalizability of the results.

4.7. Data analysis

The collected data were organized, coded, computerized, tabulated, and analyzed using the statistical package for social science (SPSS), version (20). Data analysis was accomplished using the number, percentage distribution, chi-square test, mean, standard deviation, and correlation coefficient; a Paired t-test was used to test the significance of some variables. Statistical significance was considered as follows:

P-value > 0.05 Not significant
P-value < 0. 05 Significant
P-value < 0.001 Highly significant

5. Results

Table 1 shows the socio-demographic characteristics of patients with a ureteral stent. It was observed that 73.9% of the study sample was ≥40 years old with a mean of 43.42±6.47, and the majority (83.6%) were males, and 74.6% were married. Moreover, 61.2% resided in an urban area, and 56.7% had intermediate education. Besides, about half of both groups had manual work, 61%, and the majority of them, 95.5%, do not receive any instruction regarding ureteral stent.

Table 2 displays the frequency and percentage distribution of the studied patients' illness-related data. It shows that 71.6% have ureteral stone, 43.3% of the study sample have lesions on both sides of the ureter, and 43.75% of the stone affected patients had the stone of 1 mm size. Moreover, 64.9% of them insert stent size duple J.

Table 3 reveals a comparison of patient's knowledge pre-instruction, immediately post, and after three months of design instructions implementation. The table shows that 91% of patients had an unsatisfactory level of knowledge pre-instruction. However, 79.1% of patients had a satisfactory level of knowledge immediately post designed instructions implementation. 61.9% had a satisfactory level of knowledge after three months of implementing the designed instructions with statistically significant differences between knowledge pre instructions, immediately, and three months of instructions implementation (P < 0.017, 0.003).

Table 4 shows a comparison of ureteral stent symptoms pre, post, and after three months of implementing the designed instruction. Total mean score of ureteral stent symptoms pre was 97.43±8.21, improved significantly to 49.37±9.82 immediately post, and 36.49±14.68 after three months of implementing the designed instructions (P <0.001).

Table 5 shows the mean score of the ureteral stent discomfort test immediately post and after three months of implementing the designed instructions. This table reveals a significant decrease in the total mean score of ureteral stent discomfort immediately post (40.37±6.26) and after three months of implementing the designed instructions (3.35±3.51) compared to (57.13±3.94) pre-implementation (P <0.001).

Table 6 demonstrates the correlation between total knowledge of ureteral stent, total ureteral stent symptoms,

and ureteral stent discomfort among patients after three months of implementing designed instructions. This table reveals a highly statistically significant negative correlation between patients' total knowledge and their total USSQ

(r=-0.625 with P-value < 0.001). This table also shows a non-statistically significant correlation between the total knowledge and ureteral stent discomfort after three months post-instruction implementation (r=-0.212 with P-value <0.14) inverse relationship.

Figure 1 illustrates that 69% of the study sample was satisfied with the designed instructions.

Table (1): Frequency and percentage distribution of the studied patient's socio-demographic characteristics (n=134).

Demographic characteristics	No.	%
Age/ years		
<40	35	26.1
≥40	99	73.9
Mean ± SD	43.42± 6.47	
Gender		
Male	112	83.6
Female	22	16.4
Marital status		
Not married	34	25.4
Married	100	74.6
Residence		
Rural	25	38.8
Urban	82	61.2
Level of education		
Uneducated	12	9
Read & Writes	22	16.4
Intermediate education	76	56.7
University education	24	17.9
Job		
Manual work	83	61
Employee	36	26.9
Other work	15	11.2
Receiving previous instructions about the stent (Installation or removing)		
Yes	6	4.5
No	128	95.5

Table (2): Frequency and percentage distribution of the studied patient medical data (n =134).

Medical data	(No.)	(%)
Diagnosis		
Ureter tumor	26	19.4
Ureter Stone	96	71.6
Congenital anomalies in kidney or ureter	12	9
Site of lesion		
The right-side ureter	13	9.7
The left side ureter	29	21.6
Both side	58	43.3
Kidney	34	25.4
Size of the stone		
1mm	42	43.75
2mm	24	25
8mm	9	9.37
10mm	21	21.88
Mean ± SD	2. 84± 0.92	
Size of the stent		
JJ	87	64.9
G duple	37	27.6
Other	10	7.5

Table 3: Comparison of total patients' knowledge pre, immediately post, and after three months of implementing the designed instructions (n=134).

Items of USSQ	Pre-designed instructions	Immediately post instructions.	After three months of instructions	T-test (1)	p-value	T-test (2)	p-value
	Mean± SD	Mean±SD	Mean±SD				
Urinary Symptoms	33.31±4.86	18.00±6.93	13.746±12.71	23.92	<0.001	16.400	<0.001
Pain	19.059±3.25	11.34±4.69	7.90±2.031	15.913	<0.001	33.817	<0.001
General Health	19.75±3.15	9.84±3.62	6.940±2.42	25.28	<0.001	36.227	<0.001
Work Performance	13.69±2.85	5.77±2.104	3.49±1.231	25.636	<0.001	33.019	<0.001
Sexual status	11.63±2.013	4.43±2.104	3.49±1.24	29.369	<0.001	43.225	<0.001
Total	97.43±8.21	49.37±9.8	36.49±14.68	48.106	<0.001	41.34	<0.001

** (1) Difference between the level of knowledge pre & immediately post designed instructions implementation, (2) Difference between the level of knowledge pre-designed instructions & after three months of implementing the designed instructions.*

Table (4): Comparison of ureteral stent symptoms pre, immediately post, and after three months of implementing the designed instructions.

Total knowledge	pre-designed instructions		immediately post instructions		After three month		$X^2 1$	p-value	$X^2 2$	p-value
	No	%	No	%	No	%				
Un satisfactory	122	91	28	20.9	51	38.1	5.67	<0.017	133.0	<0.003
Satisfactory	12	9	106	79.1	83	61.9				

** (1) Difference between the level of USSQ pre & immediately post designed instructions implementation, (2) Difference between the level of USSQ pre & after three months of implementing the implementation of the designed instructions.*

Table (5): Comparison of urinary discomforts pre, immediately post, and after three months of implementing the designed instructions.

Urinary discomforts	Pre-designed instructions	Immediately post instructions.	After three months of instructions	T-test (1)	p-value	T-test (2)	p-value
	Mean±SD	Mean±SD	Mean± SD				
Urinate less frequently than every two hours.	7.74±50.88	3.37±0. 67	0.63±0.65	36.30	<0.001	88.49	<0.001
Had the sensation of not emptying the bladder.	4.69±0.45	3.14±0.70	0.51±0.65	32.52	<0.001	84.67	<0.001
Found it difficult to postpone urination.	4.74±0.51	3.41±0.96	0.29±0.58	36.35	<0.001	91.25	<0.001
Have you presented with urine leakage?	4.69±0.54	3.22±0.59	0.26±0. 45	47.07	<0.001	84.67	<0.001
Have you had a burning sensation during urination?	4.79±048	3.36±0.68	0.21±0. 46	43.76	<0.001	96.19	<0.001
Have you observed blood in your urine?	4..58±0.66	3.27±0.59	0.19±0.45	45.64	<0.001	67.79	<0.001
Had lower back pain (lumbalgia), describe it.	2.92±0.27	1.80±0.57	0.17±0.40	26.42	<0.001	82.17	<0.001
Had lower abdominal pain (suprapubic region), describe it.	2.68±0.33	1.87±0.53	0.20±0.42	28.21	<0.001	65.82	<0.001
The ureteral stent made you unable to walk, do exercise, or perform daily activities	4.61±0.62	3.35±0.69	0.16±0.41	46.01	<0.001	71.49	<0.001
Since ureteral stent placement, have you experienced pain or discomfort during sexual intercourse.	4.60±0.62	3.13±0.71	0.20±0.43	42.29	<0.001	74.84	<0.001
Since ureteral stent placement, have you had to take an analgesic or pain medication to lessen the discomfort from the ureteral stent.	4.59±0.61	3.20±0.36	0.16±0.39	47.17	<0.001	72.38	<0.001
Since ureteral stent placement, have you had to see a physician or go to the emergency room due to the discomfort from the ureteral stent.	4.66±0.55	3.33±0.71	0.18±0.39	44.67	<0.001	82.13	<0.001
Since ureteral stent placement, has the ureteral stent negatively affected your daily life.	4.62±0.56	3.90±5.20	0.19±0.44	8.45	<0.001	79.52	<0.001
Total	57.13±3.94	40.37±6.26	3.35±3.51	62.94	<0.001	115.07	<0.001

**(1) Difference between the urinary discomfort pre & immediately post designed instructions implementation, (2) Difference between the urinary discomfort pre-designed instructions & after three months of implementing the designed instructions.*

Table (6): Correlation between total knowledge, ureteral stent symptoms, and discomfort after three months of implementing the designed instructions (n=134).

Variables	Total Knowledge	
	r-test	P-value
Total ureteral stent symptoms questioner	-0.625	<0.001
Total ureteral stent discomfort test	-0.212	<0.14

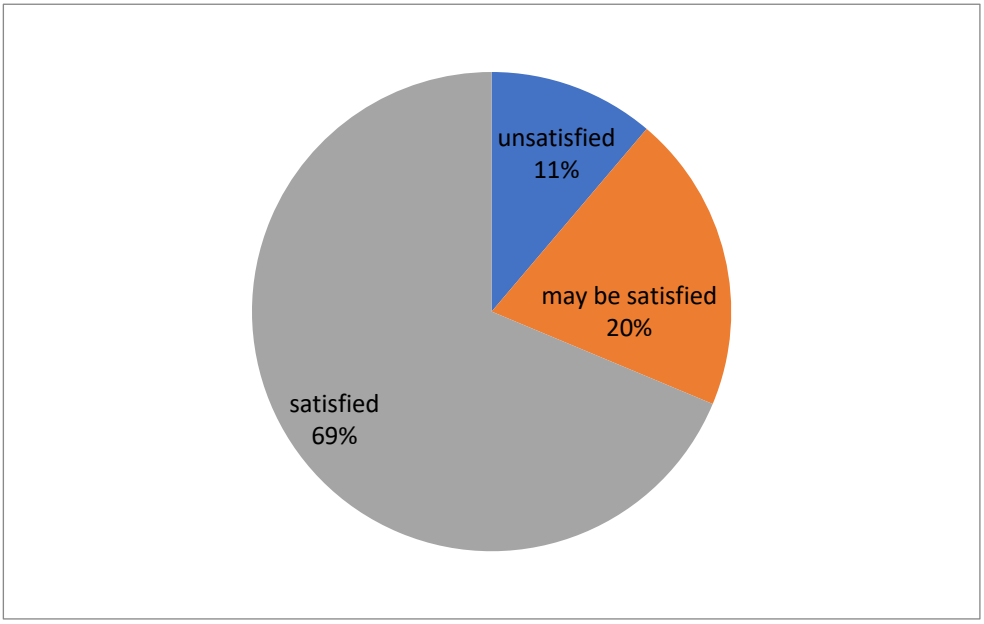

Figure (1): Percentage distribution of the study sample satisfaction immediately post the implementation of the designed instructions.

6. Discussion

Ureteral stent placement can be used as a minimally invasive procedure to relieve obstructive uropathy in patients with poor general conditions *(Loh-Doyle et al., 2015).* So, the study aimed to evaluate the effect of designed ureteral stent instructions on patient recovery.

Regarding socio-demographic characteristics, the present study reveals that nearly three-fourths of the study sample ages were ≥40 years old with a mean of 43.42±6.47, the majority were males, and around three-fourths were married. Moreover, approximately two-thirds were residing in an urban area, and around half of them had intermediate education. Besides, about half of both groups had manual work, and the majority of them, do not receive any previous instruction regarding ureteral stents. These findings might be interpreted as the sample age was the average age for urinary stones between 20 and 50. Male gender and manual working might also be factoring in the predisposition to stone formation.

These results agreed with *Arafa and Rabah (2010),* who conducted a study about "quality of life and its determinants in patients after urinary stone fragmentation and reported patients' mean age of 41.45 ± 10.80 years. Nearly two thirds (67%) were males. The majority (92%) were educated to at least the secondary school level. On the same line, *Altunala et al. (2017)* studied "Ureteral stent infections: A prospective study." This study reported that 89 ureteral stents patients were of an average age of 54±15 years (range 16-85 years), including 76% males and 23.5% female patients. Also, following the study of *Molina et al. (2017)* about "A new patient safety smartphone application for prevention of "forgotten" ureteral stents," which reported a total of 115 patients recruited with their mean age of 52.4 years; 54% were males.

Similar findings were reported in an epidemiological study of *Trinchieri (2008),* who reported a prevalence range of kidney stones in males of 8% to 19% and from 3% to 5% in females. Other population-based studies investigated prevalence and incidence rates of urolithiasis in different countries. In developing countries, the male-to-female ratio range from 1.15:1 in Iran *(Safarinejad, 2007)* and 1.6:1 in Thailand *(Tanthanuch, 2005),* to 2.5:1 in Iraq (Qaader et al., 2006), and 5:1 in Saudi Arabia *(Khan et al., 2004).* A surprisingly high 15% prevalence of urolithiasis was observed in the rural population of Thebes in Greece *(Stamatelou et al., 2006),* which is contradicting the current study findings

Regarding diagnosis, more than two-third have ureteral stone, less than half of them have a lesion on both sides of the ureter with 1 mm of the stone size. Moreover, approximately two-thirds of them inserted stent size duple J. This finding agreed with *Altunal et al. (2017),* who reported 72% of their patients with ureteral stents was due stone either prophylactic before Extracorporeal Shock

Wave Lithotripsy or hydronephrosis due to nephrolithiasis. *Fawzi and Ali (2018)* conducted the study on the same line, addressing "Association of JJ stent insertion and sexual function," the study showed that 60 male patients underwent JJ stent insertion.

This finding disagreed with that of *Taguchi et al. (2017)* in a study about "Impact of loop-tail ureteral stents on ureteral stent-related symptoms immediately after ureteroscopic lithotripsy: Comparison with pigtail ureteral stents," which reported that a total of eighty-five adult patients with unilateral indwelling ureteral stents do not have JJ stent insertion.

Concerning knowledge about ureteral stent, the present study points out that most patients had an unsatisfactory level of knowledge pre-implementation of the designed instructions. However, most patients had a satisfactory level of knowledge immediately after implementing the designed instructions. More than half of patients had a satisfactory level of knowledge after three months of implementing the designed instructions, with a statistically significant difference between the three study phases. This result asserts that meeting the patient's instructional needs could improve the patient motivation for gaining knowledge regarding their clinical situation as it answers their concerns and queries. These findings are supporting the first research hypothesis.

This result agrees with *Dominik et al. (2015)* study about the influence of patient education on morbidity caused by ureteral stents," the study concluded that high-quality patient education regarding ureteral stent is highly advisable, as it has the potential to improve the patient level of knowledge, motivation, and reduce the symptoms.

Pointing to USSQ, the present study reveals that there was a decrease in the mean score of ureteral stent symptoms (Urinary symptoms, pain, general health, work performance, and sexual status) pre, immediately post, and after three months of the implementation of the designed instructions, which is supporting the second research hypothesis. This result reveals that education is the key to successfully managing a patient with a stent; minimizing its impact and providing an adequate education can alter behavior and empower the patient to make positive improvements in their health status. These findings are supporting the second research hypothesis.

This result agreed with that of *Leibovici et al. (2005)* study about "Ureteral Stents: Morbidity and impact on the quality of life" added stented patients have functional impairment in many aspects of everyday life, including general health, pain, urinary tract symptoms, and hematuria are frequent and sexual function. Also, the USSQ is the most recommended instrument to objectify a patient's subjective experience due to its composition of 5 domains. The current study is congruent with *Park et al. (2015).* The study examined the "Validation of the Dutch linguistic version of the Ureteral Stent Symptom Questionnaire." It showed that the information provided to patients decreases the ureteral stent symptoms and helps reveal patients' perspectives of treatment, and allows for a comparison of several interventions in the continuous attempt to improve ureteral stent tolerance search for the ideal stent design.

On the same line, *Ben turney's (2016)* study about "Ureteric stent, information for patients" and concluded that patients who have received good-quality patient education might be less susceptible and less sensitive to symptoms than patients who have been inadequately informed or not at all.

Regarding ureteral stent discomfort, the current study clarified a decrease in the total mean score of ureteral stent discomfort pre, immediately post, and after three months of implementing the designed instructions with statistical significance difference. That means when the symptoms resulting from the stent's installation decrease, the level of discomfort also decreases, indicating that the designed instructions have positively affected the stent patient recovery. This finding is supporting the third research hypothesis.

Ramírez et al. (2019) reported that 70% of patients with ureteral stents suffer from discomfort. Moreover, *Miyaoka and Monga's (2009)* study "Ureteral stent discomfort: Etiology and management" reported that fifty-eight percent of patients had reduced work capacity due to the stent's discomfort.

The results of the current study agreed with *Abdelaa et al. (2016)* in their study of combined therapy to manage ureteric stent-related symptoms. The study showed that anxiety and discomfort might be reduced by thorough patient education. They were also developed and validated a patient information booklet on ureteral stents. Therefore, a well-informed patient could enjoy a better life and incur fewer costs. Moreover, *Dakkak et al. (2012)* declared in their study about "Management of encrusted ureteral stents" that the best treatment is preventing ureteral stent complication by providing thorough patient education and developing a computerized tracking system.

The correlation between total knowledge and (ureteral stent symptoms and ureteral stent discomfort) among patients reveals an inverse correlation between total knowledge and both ureteral stent symptoms and ureteral stent discomfort after three months of the implementation of the designed instructions. These results indicate that as the patient's level of information with a ureteral stent improved, the ureteral stent symptoms and ureteral stent discomfort decrease. It is supporting the fifth research hypothesis. This result matched a study conducted by *Dominik et al. (2015)* and mentioned a significant inverse correlation (-0.40, P=0.02) between high-quality patient education and a lower incidence of typical complaints with indwelling ureteral stents. Overall, negative correlations could be found between patient education and symptoms, showing that better information leads to lower morbidity.

Also, *Leibovici et al. (2005)* stated that the correlation between patient education and ureteral stent symptoms measured by the USSQ was significant in their study. They also found that the extent of influence of patient education is great, as shown by its value of -0.4. This finding was confirmed by several patients rating of their patient education, which they received as excellent. This finding

reflects an improvement in the patients' knowledge levels that leads to an improvement in the level of ureteral stent symptoms and discomfort, and this was the primary goal of this research, and it has been proven.

Regarding patient satisfaction with the designed instructions, the majority of patients had satisfied with the designed instructions. These results agreed with *Joshi et al. (2001),* who reported that patients preferred written descriptions with illustrative drawings as a method of receiving stent information. Previous studies show that seventy-five percent of patients needed written information and that the vast majority of eight percent of patients read this information. The same applies to the medical investigation and care or hospital admission procedures.

Patients with ureteric stents do not obtain adequate stent data to fulfill their needs. The new booklet is a crucial patient communication tool that should help patients better deal with ureteric stent-related problems.

7. Conclusion

Based on the findings of the current study, it can be concluded that: Implementing designed instructions for patients with ureteral stent was effective in improving knowledge, a decrease of ureteral stent symptoms, and decrease of discomfort.

8. Recommendations

Based on the results of the current study, the following recommendations are suggested:

- Encouraging a written, simple booklet for ureteral stent patients includes all therapeutic instructions, and threatening complications could increase patients' awareness, understanding and decrease USS and discomfort .
- A study can be conducted by including. Manuals and self-instruction modules should be developed in areas of ureteral stent management.
- Nurses should take the initiative to improve their knowledge and practices by using online education, virtual learning, booklets, posters, brochures, charts. Posters and simple illustrations about ureteral stent management should be available in every surgical department.

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