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Neglected Double-J Ureteral Stents in Upper Egypt Patients

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ABSTRACT

Background: A ureteral double-J stent (D-JS) is a hollow tube used to redirect urine from the kidneys to the bladder,
Aim: This research aimed to compile data on patients in upper Egypt to understand better the rate of neglect of double-J ureteral stents (DJS), the reasons for this neglect, the associated consequences, and the current methods for dealing with these issues.
Patients and Methods: This hospital-based prospective clinical investigation was conducted in The Urology Department, Al-Azhar University Hospitals, Assiut, Egypt. It comprised all patients who presented with neglected DJS (indwelling time > 6 months) between January and July of 2022. DJ stents were implanted after URS in 37.3% of patients. The DJ stent insert was used before SWL in 20.3% of patients and after percutaneous nephrolithotomy (PCNL) in 12.8% of cases.
Results: 22 patients (55%) received medical treatment for UTIs, 16 instances (40%) received conservative treatment for gross hematuria, & the other cases required several treatment modalities due to mixed pathology. And we watched that different approaches were required for stent removal. The majority of cases (24%) were removed with simple cystoscopy, 9 cases (22%) via URS, 2 cases via PNL, 3 cases (7.5%) via cystolithotripsy, and the remaining cases (2%) via combination endoscopic and/or open surgical techniques.
Conclusion: DJS indwelling time-related problems are more likely in patients who are noncompliant or who have disregarded their stent. In spite of the widespread use of endourological procedures, avoiding problems should always be the first concern. Potential consequences from ignored DJS can be avoided if regular operating procedures for placement and removal are followed.
Key Words: Double-J ureteral stents, Ureteroscopy, Ureteral stent placement.

INTRODUCTION

When first introduced to clinical usage, double J ureteral stents quickly became standard in the field of urology [(1)].

As a preventative measure, they have been used in extensive procedures to repair the urinary tract, and they have been used following iatrogenic ureter injuries [(2)]. Patients often report side effects after getting stents, and there are certainly potential problems and treatment concerns associated with stents. Hematuria, stent occlusion, migration, discomfort, lower urinary tract symptoms (LUTS), fragmentation, encrustation, stone formation, recurrent urinary tract infection (UTI), urinary tract blockage and renal failure are only some of the consequences that can result from neglected ureteral stents. Even the establishment of fistulas in the iliac arteries is well understood. There has also been word of fatalities [(3)].

The goal of this research was to analyze the long-term effects of double-J stents in patients from Upper Egypt, paying special attention to any adverse events that may have occurred and the factors that may have contributed to them.

PATIENTS AND METHODS

The Urology department at Al-Azhar University Hospitals, Assiut, Egypt, was the site for this prospective clinical investigation. From the beginning of 2022 to the middle of 2022, all patients who had ignored DJS (indwelling time > 6 months) were included.

Study Procedures and Data Collection:

All of the participant's medical records were combed through to look for demographic and historical data including age, gender, marital status, residence, occupation, degree of education, socioeconomic situation, chronic medical condition, and regular medication. Medical history, lab profile, operative details, side of DJS, double-J indwelling time (as measured from when something is inserted until it is taken out), causes of DJS insertion, causes of negligence (if the patient fails to understand the instructions, misses or is unable to attend the scheduled retrieval), reported complication of neglected DJS (Recurrent UTI, recurrent gross hematuria, encrustation, stone formation, stent migration, stent collapse, fever & irritative symptoms, methods of stent removal and treatment modalities of complications all were asked about.

We analyzed the frequency & severity of problems after implantation of double-J ureteral stents in patients who had not received adequate follow-up care. Potential risk variables included stent length, urine acidity, and prior stone formation (UTI, gross hematuria, encrustation, stent fragmentation, stone bladder formation, and complicated endoscopic technique needed for stent removal).

Ethical Approval:

Patients were provided with the necessary trial information, and the research was accepted by the

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Ethics Board of Al-Azhar University. All research participants provided written informed consent. All procedures applied in this research were carried out in accordance with the principles described in the International Medical Association's Declaration of Helsinki, which was issued to assure the ethical conduct of medical research involving human participants.

Statistical analysis

Using SPSS, version 27, we tabulated, grouped, and performed statistical analyses on the data we collected (IBM, Armonk, NY, USA). The Kolmogorov-Smirnov test and the Shapiro-Wilk test were utilized to investigate the data's normality. Parametric quantitative data were summarized as mean ± SD and examined using an unpaired student t-test. The chi-square test was used to examine qualitative data provided as frequencies (%). In this study, statistical significance was defined as a two-tailed P value ≤ 0.05. The outcomes of the information investigation were displayed in the text, tables, or figures as applicable.

RESULTS

During the study period, 40 individuals were reported to the outpatient department with a neglected DJ ureteral stent. DJ ureteral stenting lasted an average of 9.58 ± 3.29 months (median: 12; Range: 6 to 18 months). There were 24 (60%) men & 16 (40%) women, for a men-to-women ratio of 1.5:1. The majority of cases (50%) had a DJ stent in the left ureter, 12 (30%) had a stent in the right ureter, and 8 (20%) had stents on both sides.

The patients' demographic and historical features are summarised in table (1).

Table (1): Demographics and historical characteristics of 40 patients with fixed DJureteral stent

Variables	
Mean (age, years)	41.5 ± 23.5
Age group, years	18-65
Educational level	
Literates	18 (45%)
Illiterates	22 (55%)
Co-morbidities	
Hypertension	6 (15%)
Diabetes Mellitus	2 (5%)
Cardiovascular disease	1 (2.5%)
Others (liver disease)	1 (2.5%)

Data presented as mean ± SD or number (%).

* Some patients had more than one comorbidity.

In 37.3 % of cases, DJ stent was inserted post-URS. The DJ stent insert pre- SWL in 20.3 % and post-PCNL (12.8 % of cases). Causes of DJstent insertion in the entire population are shown in (table 2).

Table (2): Causes of DJ stent insertion in the entire patients

Causes of stent insertion	**NO. (%)**	**Causes of stent insertion**	**NO. (%)**
URS	**(n=13)**	**Obstructive uropathy**	**(n=3)**
- False passage	2 (12.5)	- Bilateral stones	2 (50)
- Stricture ureter	4 (25)	- Solitary kidney	1 (25)
- Bilateral stones	3 (18.7)		
- Mucosal injury	2 (12.5)	**Open surgery**	10(25%)
- Solitary kidney	1 (6.2)		
- Other causes*	1 (6.2)		
SWL	**(n=7)**		
- Large stone burden	3 (37.5)		
- Solitary kidney	1 (12.5)		
- Bilateral stones	2 (25)		
- Impacted ureteral stone	1 (12.5)		
PCNL	**(n=5)**		
- Residual stones for SWL	2 (40)		
- Persistent leakage	1 (20)		
- Solitary kidney	1 (20)		
- Bilateral stones	1 (20)		

SWL: Extracorporeal shock wave lithotripsy, PCN: Percutaneous nephrolithotomy, URS: Ureteroscopy.

*Other causes as meatotomy, passive dilatation, residual stones and impacted stone. The incidence of DJ stent complications in 40 cases with neglected DJstent are summarized in figure (1).

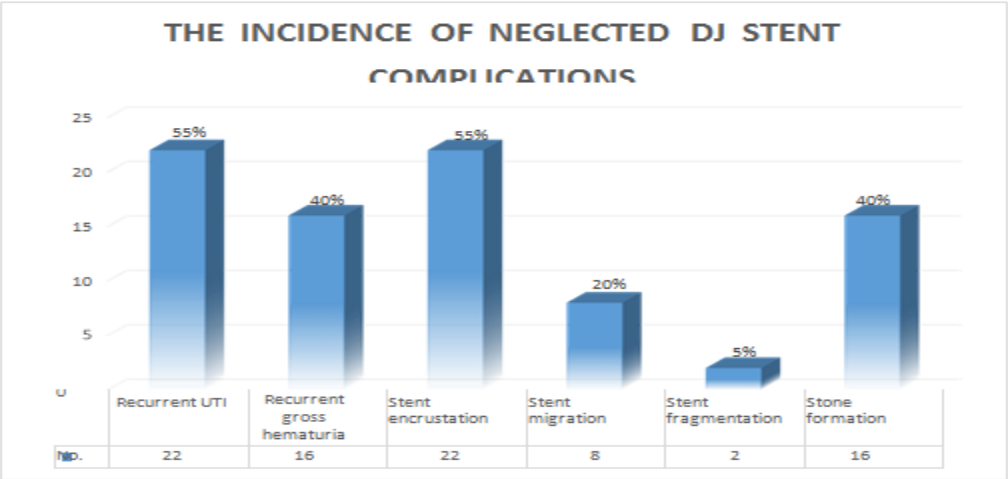

Figure (1): The incidence of neglected DJ stents complications

Twenty-two cases (55%) had encrustation along the DJ stent. In 6 cases (27.3%) the DJ stents were removed by simple cystoscopy, 4 cases (18.2%) need ureteroscopy, 3 cases (13.6%) needed cystolithotripsy and 2 cases (9%) need combined URS and cystolithotripsy.

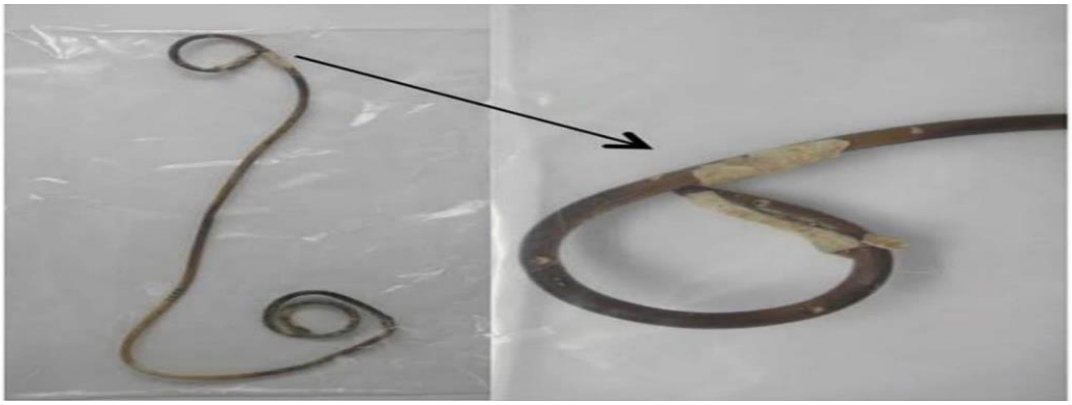

Figure (2): Encrusted neglected DJ stent following cystoscopic removal

The methods of DJ stent removal in 22 cases with encrusted neglected DJ stent are summarized in figure (3).

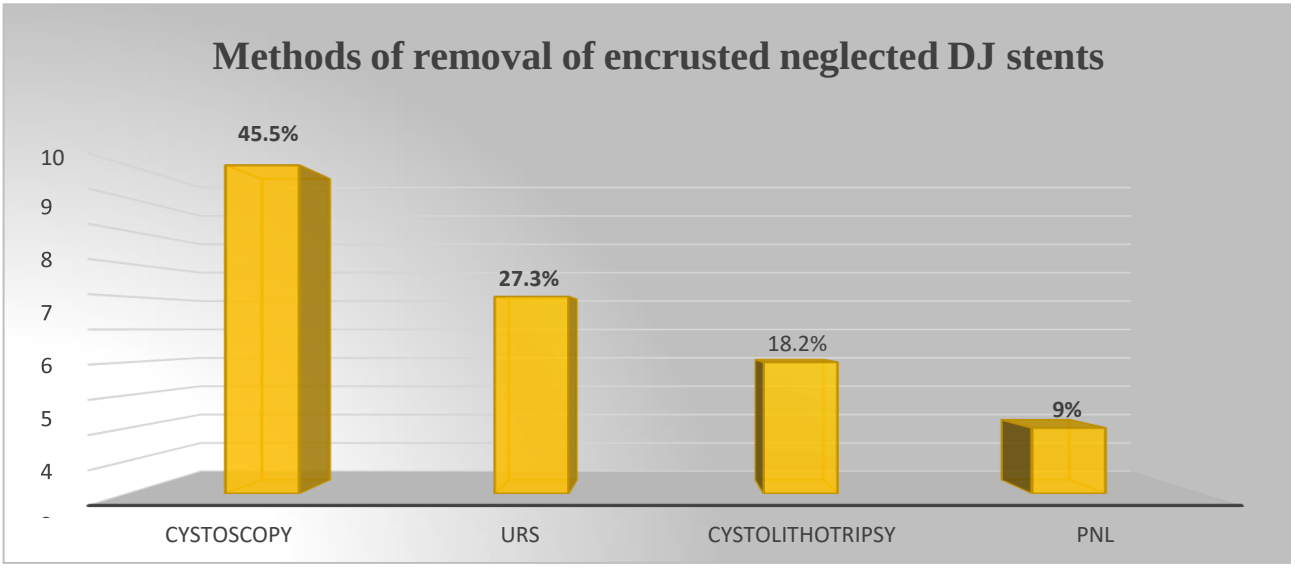

Figure (3): Methods of DJ stent removal with encrusted neglected DJ stents.

The methods of DJ stent removal in 4 cases with fragmentedneglected DJ stent are described in table (3).

Table (3): Methods of DJ removal in 4 cases with fragmented neglected DJ stents

Method of DJ stent removal	No.	%
URS (Ureteroscopy)	2	50
PCNL	1	25
URS and cystolithotripsy	1	25

Two cases (5%) have stone formation at upper coil of DJ stent. 13 cases (81.2%) developed stone formation at lower coil. One case has ureteric stone formation which needed open surgery for stent removal.

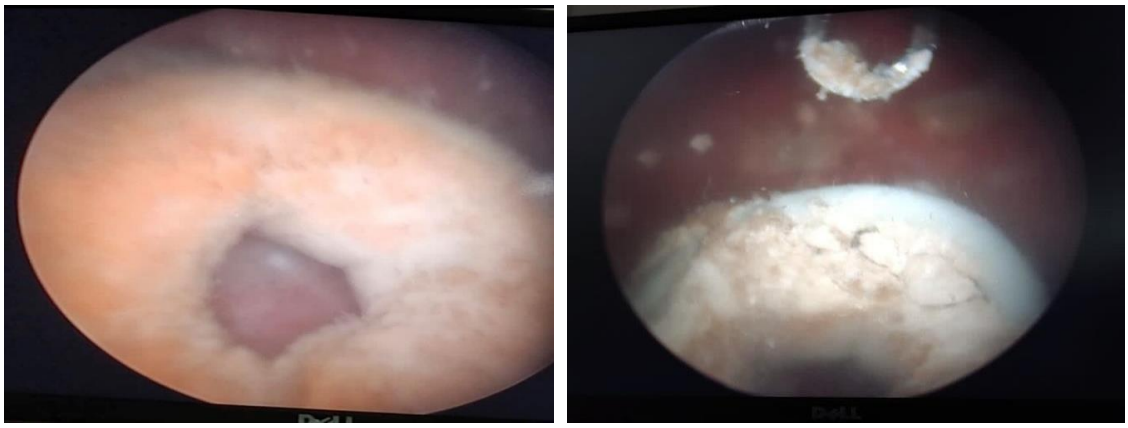

Figure (4): Endoscopic view of stone formation over lower coil of neglected DJ stent.

Sixteen cases (40%) had a background of urinary stone. There was no significant association among the history of urinary growth of stones & frequency of complications & methods of stent removal (Table 4).

Table (4): The association amongst history of urinary stone formation andfrequency of complications.

	History of urinary stone formation			P-value
	No	Yes	Total	
Recurrent UTI	9	4	13	0.598
Recurrent gross hematuria	4	1	5	0.397
Stent fragmentation	1	1	2	0.141
Stent encrustation	2	2	7	0.940
Stone bladder formation	1	1	2	0.782

Duration of indwelling DJS was significantly associated with recurrent UTI, recurrent gross hematuria, stent fragmentation ($p < 0.001$), encrustation ($p < 0.001$) and stone formation (p equal 0.045) as shown in figure (4).

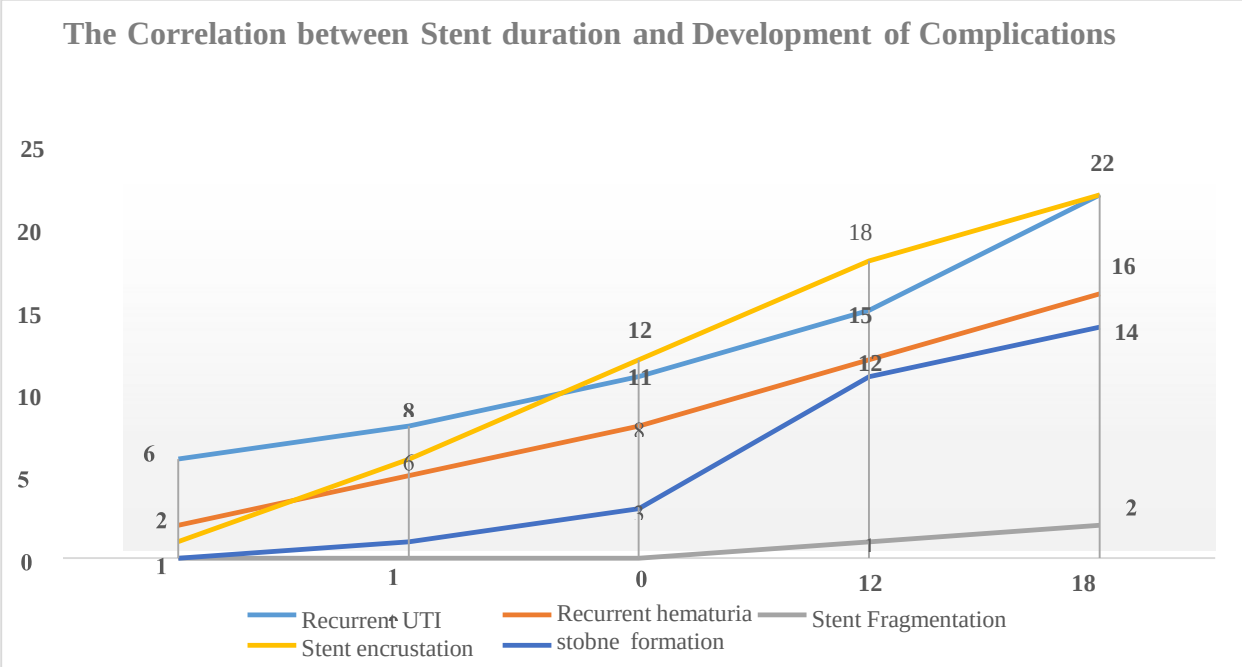

Figure (5): Correlations between stent duration and development of complications and method of stent removal in 40 cases with neglected DJ stent

DISCUSSION

The purpose of this reading was to document the occurrence & likely causes of neglected DJS as well as its difficulties, & therapeutic options among Upper Egypt patients.

In the current investigation, frequent manifestation of DJS installation in all cases (n=16) was (40%), while stenting previous Extracorporeal shock wave (SWL) (n=8) was the most common reason among patients with ignored DJS (20%). According to **Ali *et al.*** [4], the most common indication of DJS installation was urolithiasis leading to obstructive uropathy. They described preventative stenting followed by blockage alleviation, whereas **Ikram *et al.*** [5] characterized obstructive uropathy as the most common indication for DJS.

The appearance of an ignored stent varies. **Damiano *et al.*** [3] discovered flank discomfort in 25.3% of the patients, irritative bladder signs in 18.8%, hematuria in 18.1%, & fever in 12.3%. While **Abdelaziz *et al.*** [6] reported that post-inflammatory bladder symptoms and hematuria are more common than pelvic pain. Two patients also experienced recurrent fever, suggesting an ascending infection caused by a blocked stent, stent migration occurred in 20% of the cases, according to **Abdelaziz *et al.*** [6].

Stent migration happened in 9 cases with pre- and intraoperative stent fragmentation and was substantially linked with a lack of urine acidity. However, some investigations have suggested that migration and spontaneous fragmentation are unusual complications [7]. While the basic reason for encrustation is unknown, the occurrence of encrustation rises with the time of an indwelling stent. The rate of encrustation amplified from 9.2% before 6 weeks to 76.3% after 12 weeks [8].

This study found that 7 (17.5%) of 40 patients had encrustations around their ureteral stents on imaging. The seriously encrusted stent presents a difficulty that necessitates a multimodal endourological treatment. The treatment was tolerated depending on the location and amount of the stone burden. To guide treatment decisions, we used the maximal diameter of the encrustation on non-contrast spiral CT. In most situations, cystoscopic stent exclusion is effective in the presence of minor encrustations. In the face of opposition or hardship, the process should be discarded. In this study, 10 (45.5%) cases of stent encrustation were successfully treated with easy cystoscopic stent removal. Multimodal treatment was required due to the size and proximity of the encrustations. **Ecke *et al.*** [9] concurred that the stent's proximal end stone would be treated by percutaneous nephrolithotomy (PCNL) before the distal end stone was extracted. The same technique is recommended for complete stone and stent removal [9].

These data corroborate our results that the greater & more proximal the stone burden, the more difficult it is to treat. Six cases (27.3%) require ureteroscopy, four cases (18.2%) require cystolithotripsy, and two cases (9%) require PNL. Encrustation contributes significantly to the difficulties and morbidity associated with ureteral stents [10]. **Murthy *et al.*** [11] discussed their experience managing 14 cases with encrusted neglected ureteric stents who had been indwelling for an average of 4.9 years. A ureteric stone disease stent was inserted in 11 of the 14 patients. All patients underwent two to six endo-urological procedures.

To avoid encrustation, the correct period for changing or removing an indwelling ureteral stent is debatable. The optimal interval is usually 2-4 months. However, in patients with risk factors, it should be sooner. In the absence of UTI, **Robert *et al.*** [12] discovered that calcium oxalate is the most abundant component of stent encrustation, with calcium ammonium phosphate and calcium phosphate being present in trace amounts. There is no ideal ureteral stent biomaterial or design. However, one advancement is the introduction of drug-eluting stents (triclosan), which may stop infection, encrustation, & even stent-related signs.

There was a significant relationship amongst a history of urine acidity & stent encrustations in this study (p.025), but no link between stent encrustation & other threat variables (stent duration and history of recurrent stone formation). Long indwelling time, urinary infection, history of stone disease, chronic renal failure, and congenital anomalies were all identified to be risk factors for stent encrustation by **Ahallal *et al.*** [14] in their investigation.

Much like any other foreign object that is constantly submerged in urine, stents develop a bacterial biofilm that calcifies, resulting in encrustation and frank stone formation. This results in stent entrapment [15]. Although fractured stents are less typically reported, they are the most common complication seen in **Ray *et al.*** [16] study. They discovered broken DJ stents in 57.89% of the patients. Breakage happens in cases who have had a DJ stent for an extended period of time, ranging from 15 to 156 months [16].

In the current study, we documented 6 cases (15%) of stent migration up, requiring rigid ureteroscopy to remove, and 2 cases (5%) of stent migration down, requiring cystoscopy to remove. **Damiano *et al.*** [3] documented 9.5% stent migration. **Ullah *et al.*** [17] observed a significant incidence of stent migration (26.32% (5 cases) with a mean duration of 9 months in a study of 19 cases.

Stone development in a stent or fragment is another typical problem. Stone development is most common in people who are predisposed to stone formation & have a long indwelling period. Dehydration, stent blockage, urinary tract infection, and chronic renal failure can all lead to stone development [16]. In the current investigation, we discovered two cases of stone formation at the upper coil of the DJS. One of which required PNL, and the other required open surgery. Stone development at the lower coil occurred in 13 patients, with 12 undergoing cystolithotripsy and one undergoing

cystolithotomy. One instance had ureteric stone development that required open surgery to remove. **Rabani** [18] stated that 94.74% of patients were handled endoscopically, with a 57.89% success rate by single treatment and the remaining instances (42.11% requiring repeated procedures). In one case, after a failed URS, there was fragmentation with the knotting of the stent in the ureter, necessitating an open operation.

In this study, we discovered that 22 patients (55%) received medical treatment for UTIs, 16 instances (40%) received conservative treatment for gross hematuria, & the other cases required several treatment modalities due to mixed pathology. And we watched that different approaches were required for stent removal. The majority of cases (24%) were removed with simple cystoscopy, 9 cases (22%) via URS, 2 cases via PNL, 3 cases (7.5%) via cystolithotripsy, and the remaining cases (2%) via combination endoscopic and/or open surgical techniques.

Poor announcements among the surgeon & the diseased people, as well as poor compliance, are major variables related to DJS retention. Patients should be appropriately informed and made aware of the significance of stent presence. Economic issues are also a key source of concern in emerging countries such as ours [19]. Nevertheless, **Jhanwar *et al.*** [20] observed that the most common reason for residual DJS was poor patient counseling on the side of the surgeon (38.16%).

We discovered that the causes of DJS removal delays are misunderstood instructions, neglect, being unable to arrive on the designated retrieval day, or a missing discharge summary card. The period for stent replacement or removal has ended, the most recommended way is to send a reminder SMS (short messaging service, or text message) to the patient's and physician's cell phone numbers. This strategy sought to eliminate the potential of physician neglect [21]. Because of the morbidity of retained DJS, a mechanism for DJ documentation and removal should be developed. The advancement of digital technology has helped underdeveloped nations to build a workable plan and follow up for DJS elimination, hence avoiding serious issues.

CONCLUSION

Severe DJS problems are associated with indwelling time and are most typically encountered in ignored stents or cases with poor compliance. Endourological operations are frequently used, although the objective is to keep patients safe from problems. Following standard operating procedures for DJS implantation and removal may help to avoid difficulties caused by ignored DJS.

DECLARATIONS

- **Consent for publication:** I attest that all authors agreed to submit the work.
- **Availability of data and material:** Available
- **Competing interests:** None
- **Funding:** No fund
- **Conflicts of interest:** no conflicts of interest.

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