

**COMPARATIVE ANALYSIS OF BACTERIOLOGICAL  
PROFILE OF URINE AND STENT CULTURE AMONG  
PATIENTS WITH URETERIC JJ STENT**

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***Abstract***

**BACKGROUND**

A common indication in urological pathologies and especially in instances of ureteric calculi/obstruction, is the placement of ureteric catheter such as the double J stent (JJ stent). 76% of patient with JJ stent may encounter adverse outcome owing to bacterial colonization of their stents. Though antibiotic administration may help counter the situation, the implicated microorganisms are hard to determine. One may suggest that a urine culture may offer insight into the matter, however, little is known how bacteriology of the urine and stent culture resemble and thus a comparative analysis is much needed.

**OBJECTIVE**

To compare the bacteriologic profile of urine and stent culture among patients with ureteric JJ stent.

**METHODOLOGY**

This cross-sectional analysis, was conducted upon a sample of 219 patients (of either gender, aged 10 to 70 years) presenting for ureteric JJ stent removal from June 2021 to February 2022 at Ziauddin University Hospital, Karachi. After taking written informed consent, data was recorded onto a pre-structured questionnaire containing inquiries pertaining to basic biodata, sociodemographic details, bacteriological profiles of the urine and ureteric JJ stent culture. The data obtained was analyzed using SPSS v. 21.0.

**RESULTS**

Among the sample 51.6% of the patients were males, while the remaining 48.4% were females. The mean age of the sample stood at 38 (SD ± 9.1). The total incidence of bacterial colonization was seen in 61.64% and 19.6% of stent and urine cultures respectively, with Enterococci being the commonest (54.8%) organism in stent culture and Pseudomonas Aeruginosa being the commonest (32.6%) in urine culture.

## **Conclusion**

After careful consideration, it can be concluded that the incidence of bacterial colonization among both cultures, in addition to the detailed bacteriological profiles of urine and ureteric JJ stent culture differ considerably and urine culture may not serve as an ideal indicator of stent colonization and antibiotic prophylaxis should continue to be practiced among symptomatic patients despite a sterile urine culture.

## **KEYWORDS**

Bacterial Colonization, Ureteric JJ Stent, Prophylaxis, Sterile Urine & Bacteriological Profile.

## **INTRODUCTION**

The renal system is vulnerable to many pathologies. Statistics yielded by global burden of disease show that ailments pertaining to the renal system are responsible for an approximate 0.8 million deaths, giving them the 12th rank among all causes of mortality (1.4% percent of cumulative mortality). Pakistan ranks eight in renal disease causing 20,000 deaths every year. Among the common pathological renal conditions prevalent are chronic kidney disease, glomerulonephritis, polycystic kidney disease urinary tract infections and renal calculi. <sup>[1, 2]</sup>

In the developed world, stones of the renal system have a high incidence, with one in every thousand people acquiring stones of the renal system annually. The incidence is expected to rise in the developing world. <sup>[3]</sup> Pakistan is situated in the middle of Afro-Asian stone belt. Stone disease is an increasing problem in the Sindh province. Approximately 10 to 20 percent of all kidney stones require surgical removal. <sup>[4, 5]</sup> However, even despite removal, patients may experience significant pain while passing urine or face blockage of the urinary tract owing to edema (following surgery) and may thus need an alternate route to void urine. Artificial ureteric stents serve that purpose temporarily till the patient has healed and can safely revert to normal process. <sup>[6]</sup>

Double J stent (JJ stent) are commonly used for drainage of the urine from kidney to bladder to bypass ureteric obstruction. Use of JJ stent have become an integral part of endo-urological procedures <sup>[7]</sup> but morbidity (ranging from minor suprapubic pain and heightened urinary frequency and urgency to major hematuria and even displacement and blockage of stent due to bacterial encrustation) associated with stent placement is encountered by up to three quarters of all patients with JJ stents. Bacterial encrustation is known to heighten nearly two weeks

following the placement of JJ stent and is followed by bacteriuria (bacterial presence in the urine).<sup>[8]</sup>

Some believe that stent colonization though undetectable at the early stage, can be identified if bacteria are shown in the urine, however, the sensitivity of this strategy is debatable with some literature suggesting that the urine may remain sterile even when a significant bacterial colonization exists in the stent,<sup>[9]</sup> while other published evidence showing a strong association between positive urine culture and JJ stent culture. Most common organism isolated from both urine culture and stent culture are Escherichia coli (E coli), enterococcus, staphylococcus species, pseudomonas and candida specie. Thus a wide array of organisms may be implicated in colonization of stents and the urine.<sup>[10]</sup>

## **METHODOLOGY**

This cross-sectional analysis, was conducted upon a sample of 219 patients (of either gender, aged 10 to 70 years) presenting for ureteric JJ stent removal from June 2021 to February 2022 at Ziauddin University Hospital, Karachi. After taking written informed consent, data was recorded onto a pre-structured questionnaire containing inquiries pertaining to basic biodata, sociodemographic details, bacteriological profiles of the urine and ureteric JJ stent culture. Stent was removed under sterile conditions with the help of cystoscope and foreign body forceps. 2 to 3 cm of upper part of removed stents was taken for culture and sensitivity. Bacteria from urine and stent sample were cultured by the conventional method. All microbial isolates were tested for their susceptibility to a panel of antibiotics. The data obtained was analysed using SPSS v. 21.0.

## **RESULTS**

Among the sample 51.6% of the patients were males, while the remaining 48.4% were females and the male to female ratio was thus roughly equal. The age of the sample ranged from 18 years to 62 years. The mean age of the sample stood at 38 (SD  $\pm$  9.1).

Fig 1: Gender

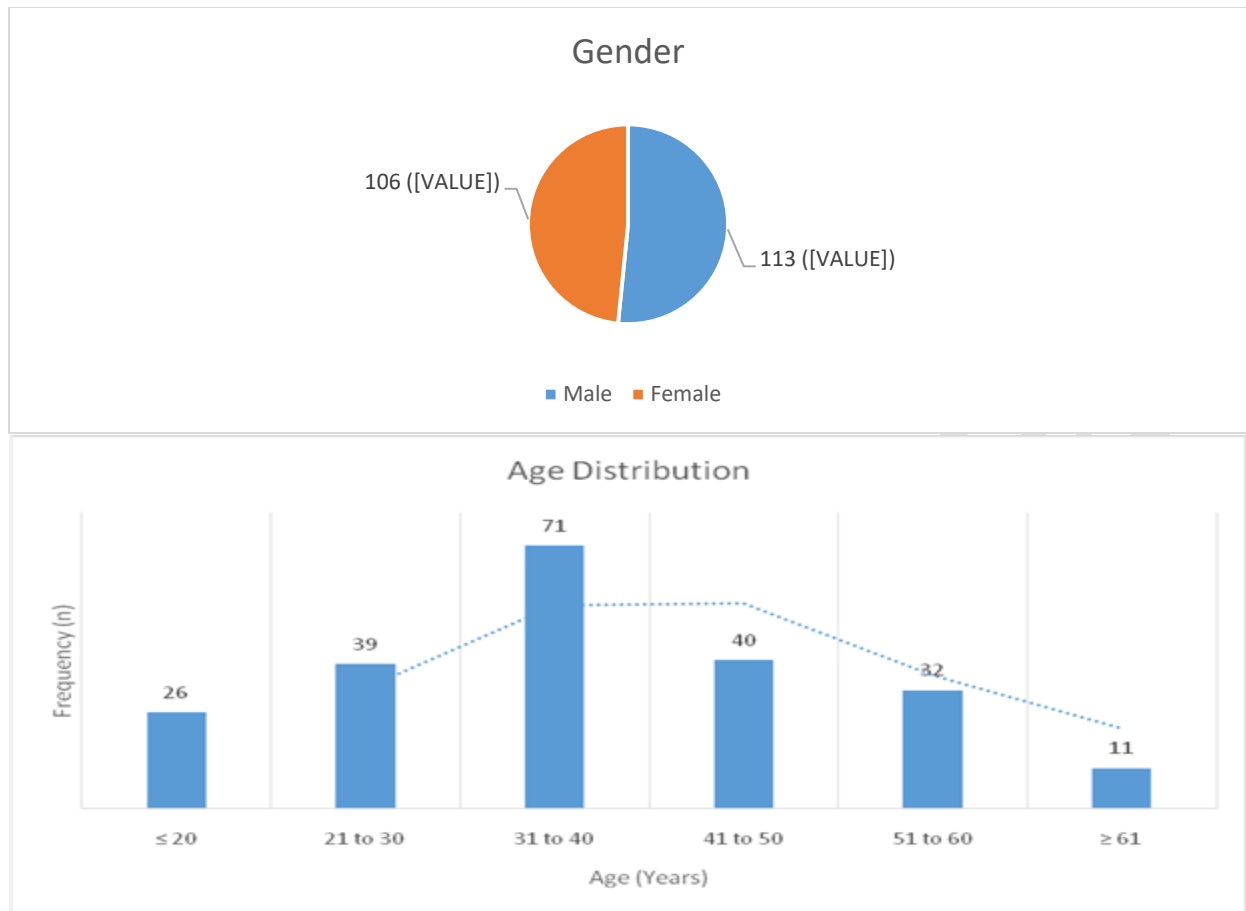


Fig 2: Age Distribution

The total incidence of bacterial colonization was seen in 61.64% and 19.6% of stent and urine cultures respectively.

Table 1: Bacterial Colonization

Bacterial Colonization (Stent)		Frequency (n)	Percentage (%)	P value
Positive	Male	79	58.5%	0.0412*
	Female	56	41.5%	
Negative	Male	34	40.5%	
	Female	50	59.5%	

Table 2: Bacteriuria

Bacteriuria		Frequency (n)	Percentage (%)	P value
Present	Male	31	72.1%	0.0391*
	Female	12	27.9%	

<b>Absent</b>	<b>Male</b>	82	46.6%
	<b>Female</b>	94	53.4%

Enterococci were the commonest (54.8%) organism in stent culture and Pseudomonas Aeruginosa being the commonest (32.6%) culprit in urine culture.

Table 3: Organism in Stent Culture

<b>Organism in Stent Culture</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Enterococci</b>	74	54.8%
<b>E. Coli</b>	28	20.7%
<b>Gram Positive Rods</b>	11	8.2%
<b>Neisseria Subflava</b>	07	5.2%
<b>AcinebtobacterBaumannii</b>	05	3.7%
<b>Candida Albicans</b>	03	2.2%
<b>Pseudomonas Aeruginosa</b>	03	2.2%
<b>Streptococcus Viridans</b>	02	1.5%
<b>Staphylococcus Epidermis</b>	02	1.5%

Table 4: Organism in Urine Culture

<b>Organism in Urine Culture</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Enterococci</b>	09	20.9%
<b>E. Coli</b>	11	25.6%
<b>Pseudomonas Aeruginosa</b>	14	32.6%
<b>Acinetobacter Baumannii</b>	04	9.3%
<b>Candida Albicans</b>	03	7.0%
<b>Staphylococcus Epidermis</b>	02	4.6%

## **DISCUSSION**

Published evidence states bacterial colonization rates to vary from 33% <sup>[11]</sup> and 44% <sup>[12]</sup> to as high as 54.3% in temporary stents and as high as 100% in permanent stents. <sup>[13]</sup> This matches the high rates of bacterial stent colonization in our research. One may argue that the stents may have been placed for longer duration in this study subjects but the mean duration of JJ stent placement was a meagre 64 (SD ± 27) days, which when compared to the international norms; stands at 6 weeks i.e. 35 days. <sup>[14, 15]</sup>

The commonest microorganisms responsible for colonization of JJ stents were identified to be Enterococci (54.8%), followed by E. Coli, Gram Positive Rods, Neisseria Subflava, Acinebtobacter Baumannii, Candida Albicans, Pseudomonas Aeruginosa, Streptococcus Viridans and Staphylococcus Epidermis in order of decreasing frequency. When compared to literature, the results were synonymous with Riedl CR <sup>[16]</sup>, who reported E. Coli to be among the commonest colonizing organisms.

The detailed look reveals that although enterococci are the commonest colonizing organisms in our and in international research, the incidence is much higher (25%) than reported norm in our research. Thus prophylaxis strategies must include agents specifically targeting this organism to achieve fewer instances of colonization and lesser blockage rates. However, this contradicts the local findings by another study which report gram negative organisms to be the commonest infecting organisms colonizing ureteric stents. <sup>[17]</sup>

An interesting observation was the low incidence (19.6%) of bacteriuria in the research. This may be interpreted in a variety of ways. Firstly, it is in harmony with findings reported in the literature, which suggest a low incidence of bacteriuria despite high level of bacterial colonization in the ureteric stent. <sup>[18]</sup> There have been a few exceptions though, especially after stent manipulation as is reported by Rao et al. <sup>[19]</sup> Thus the ability of urine culture to predict stent colonization is minimal and a sterile urine should not be taken as a sign of the ureteric stent being free from infective agents. The overall sensitivity & specificity of urine culture is thus poor in this regard.

Additionally, the organisms isolated from the stent culture and the urine culture (pre DJ removal sample) too do not always match. Despite enterococci being most prevalent organism in stent culture, the prevalence of enterococci was considerably reduced and thus it came third to E. Coli and Pseudomonas Aeruginosa. Many of the other organisms isolated in stent culture did not make it to the urine. This too is a sign that not only urine culture has limited efficacy in predicting whether the stent is colonized or not, it also has poor performance in predicting the colonizing organisms accurately. Thus the choice of antibiotics should not be made on the basis of urine culture only. There is ample research exploring the outcomes of patients being administered antibiotics based on urine culture sensitivity findings, however the results are not encouraging. <sup>[20, 21]</sup>

## **CONCLUSION**

After careful consideration, it can be concluded that the incidence of bacterial colonization among both cultures, in addition to the detailed bacteriological profiles of urine and ureteric JJ stent culture differ considerably and urine culture may not serve as an ideal indicator of stent colonization and antibiotic prophylaxis should continue to be practiced among symptomatic patients despite a sterile urine culture.

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