



A Research Comparing Preoperative urine culture and Post-Percutaneous Nephrolithotomy stone culture, and Their Association to Systemic Inflammatory Response Syndrome.

A thesis submitted to department of surgery, college of health sciences, Addis Ababa University

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Title of Research: Correlation of Preoperative Urine Culture and Post PCNL Stone Culture and Their Association with Post PCNLSIRS

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Acronyms and Abbreviations

BMI.....	Body Mass Index
BPM	Beat Per Minute
CFU.....	Colony Forming Unit
CKD.....	Chronic Kidney Disease
Confidence intervals	CI
DM.....	Diabetes Mellitus
HIV.....	Human Immune Deficiency Virus
IV.....	Intravenous
MSU.....	Mid-stream urine
NPV.....	Negative Predictive Value
Odd ratio.....	OR
PBUC	Preoperative Bladder Urine Culture
PCNL	Percutaneous Nephrolithotomy
PCO2.....	Partial Pressure of Carbon Dioxide
PPV.....	Positive Predictive Value
PR.....	Pulse rate
RPUC	Renal Pelvis Urine Culture
RR.....	Respiratory Rate
SC.....	Stone Culture
SCr.....	Serum Creatinine
Serum creatinine	SCr
SIRS.....	Systemic Inflammatory Response Syndrome
URS.....	Ureteroscope
UTI.....	Urinary Tract Infection
WBC.....	White Blood Cell

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Abstract

Introduction: Under ideal conditions PCNL has a stone clearance rate of over 90%. However, after PCNL, 10% to 35% of patients experience a systemic inflammatory reaction, and a small proportion progresses to sepsis.

Objectives: To investigate the correlation between PBUC and intra operative SC and to assess factors associated with post PCNL SIRS.

Methodology: - A prospective cross-sectional study conducted at Tibur Anbessa Specialized Hospital, Addis Ababa University, Addis Ababa, Ethiopia, on patients undergoing PCNL from December 1, 2023, to May 30, 2024. A PBUC sample was obtained prior to surgery, the broken stone was sent for examination during the procedure, and the patient was monitored for SIRS symptoms afterward. Data were gathered through the use of a formal questionnaire. For analysis, SPSS version 26 was utilized.

Results: -The mean duration of surgery was 91.48 minutes, with a range of 30–150 minutes. In 13.6% of patients, PBUC was positive, whereas in 27.3% of patients, SC was positive. There was no positive relationship between PBUC and post-PCNL SIRS. In addition, age, gender, comorbidity, preoperative level of hydronephrosis, serum creatinine, laterality of the operated side, and duration of surgery were not associated with post-PCNL SIRS. There was just a positive relationship between post-PCNL SIRS and having stones in two or more calyx, positive SC, number of tracts, number of stones, and history of recurrent UTIs, but the only independent risk factors for SIRS was numbers of tracts.

Conclusion: -In our study, the only independent risk factor for post-PCNL SIRS was the number of tracts. SC is not a predictor of post-PCNL SIRS, so we don't recommend routine SC.

1. Introduction

1.1. Background

Globally, the prevalence of kidney stones (nephrolithiasis) is climbing, leading to significant health burdens. In the last two decades, percutaneous nephrolithotomy (PCNL) has become the accepted procedure for treating complicated and big kidney stones.(1)PCNL is a minimally invasive procedure for removing kidney stones, with an over 90% stone clearance rate under ideal circumstances. (2)Nonetheless, 10% to 35% of patients develop a systemic inflammatory response following PCNL, with a small percentage going on to sepsis. Sepsis can cause severe complications and has a mortality rate of 25–50%.(3)The post-operative systemic inflammatory response syndrome (SIRS) clinical symptoms are characterized by the occurrence of two out of four criteria: a temperature of less than or equal to 38 °C, a pulse rate (PR) of more than 90 beats per minute (BPM), a respiratory rate of more than 20 breaths per minute, or hyperventilation with a PCO₂ level of less than 32 mmHg and white blood cells (WBC) of less than 4.000 or more than 12.000/mm³. (4)Urosepsis, a potentially life-threatening systemic reaction to infections in the urinary tract, can arise from blockages caused by kidney stones, tumors, or strictures. Additionally, it may occur during urinary tract manipulation.(5)Even for metabolic stones, most kidney stones requiring PCNL harbor infectious organisms. (6)It is not unusual for patients who had a sterile pre-operative urine culture to experience post-operative sepsis following stone fragmentation or manipulation, presumably as a result of the release of bacteria into the bloodstream. If this condition is not treated quickly and aggressively, it may even worsen and lead to multiple organ failure and maybe death. Therefore, even with sufficient pre-operative antibiotic therapy and a negative urine culture,

urosepsis in the post-operative interval may prove to be dangerous. Thus, the bacteria cultured from stone may serve as a preoperative indication for the management or avoidance of post-operative urosepsis. Several factors increase the risk of sepsis after procedures, including the length of the procedure, the amount of bacteria in the urine, the severity of hydronephrosis, and the presence of an infection within the stone itself.(7)While pre-surgery urine cultures are routinely performed, numerous studies show they aren't reliable predictors of sepsis after PCNL or ureteroscopy (URS).(8)While stone culture (SC) has a well-established role in predicting perioperative septic episodes, its function in guiding postoperative antibiotic prescription and patient management needs further validation. (9)Recent research indicates a stronger association between stone cultures and the risk of infection after PCNL compared to preoperative bladder urine cultures (PBUC) and renal pelvis urine cultures (RPUC). These studies, which are constrained by small patient numbers, also observed a weak connection between PBUC and SC. (10)According to the European Association of Urology Guidelines on Urolithiasis, the intraoperative renal SC may aid in the selection of post-operative antibiotics. (11)

1.2. Statement of the problem

TikurAnbessa utilizes PCNL, but objective measurements of PBUC and SC sensitivity and their correlation with postoperative SIRS remain unavailable. Evidence suggests intraoperative renal SC may aid in selecting post-operative antibiotics. This highlights the potential value of implementing objective culture-sensitivity assessments to enhance postoperative care.

1.3. Significance of the study

This study aims to address the current lack of Ethiopian data on the relationship between PUBC and post-PCNL SC, and the association between PBUC, SC and other factors in the development of post-operative SIRS, It will be the first of its kind in Ethiopia to investigate this crucial topic.

The study will analyze two primary objectives:

1. Identify the association between PBUC and post-PCNL SC, and their association with the development of post-operative SIRS. This will provide valuable insights into the potential role of PBUC and post PCNL SC results in predicting and managing post-operative complications.
2. Identify additional factors associated with post-operative SIRS. By exploring beyond culture results, the study will gain a more comprehensive understanding of the risk factors for this serious complication.

Furthermore, the study recognizes the importance of intraoperative SC for guiding post-operative antibiotic selection. The findings will contribute to evidence-based practices for optimizing antibiotic use in PCNL patients, potentially reducing unnecessary antibiotic exposure and promoting more targeted treatment.

2. Literature Review

Indrawan et al.'s (12) Indonesian study examined the relationship among 33 PCNL patients' pre-op urine cultures, SC, and post-surgical SIRS. The prospective study was carried out in 2012, from February to May. Individuals with bilateral kidney stones, disease that may cause sepsis (such as diabetes or DM), a history of SIRS, or use of antibiotics two weeks prior to surgery were excluded. However, patients with unilateral kidney stones whose indications for PCNL were included in the study. Midstream urine (MSU) culture was taken before to surgery, and fragmented stones were collected for stone culture during PCNL. Postoperatively, patients

were closely monitored for signs of SIRS. According to the study, the majority of the patients were male (63.6%) and the age range was from 37 to 68 year. The pelvis was the most often involved area, followed by the pelvis with inferior calyx. Only 3.03 percent of patients having PCNL had no hydronephrosis, approximately 60.6% of patients had grade 1-2 hydronephrosis, while the remaining patients had grade 3–4 hydronephrosis. The average surgical time was 80.96 ± 10.61 minutes. Out of 33 patients, MSU cultures were positive in 15 patients (45.45%) and stone cultures were positive in 18 patients (54.54%). Only one patient (out of eight (24.24)) with a positive SC and a positive MSU culture had the same pathogen in both cultures. *E. coli* was the most common found bacteria from MSU culture, followed by *K. pneumonia*. The most frequently isolated bacteria from SC were *S. coagulase* and *E. coli*. Additionally, *Acinetobacter* spp. was isolated in both SC and MSU cultures. For the incidence of SIRS, the MSU culture's sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were, in order, 40%, 52.17%, 26.7%, and 66.7%. Conversely, for SC, the corresponding values for sensitivity, specificity, PPV, and NPV were 100%, 65.2%, 55.6%, and 100%. Of the 33 patients, 10 showed signs of SIRS after surgery. According to the study, 10 out of 18 patients (55.5%) who had positive SC developed SIRS. Comparatively, only 4 patients (26.7%) out of 15 who had positive MSU cultures experienced SIRS. Preoperative hydronephrosis ($p = 0.003$), the length of the surgery ($p = 0.001$), and stone culture positivity ($p = 0.001$) were the study's primary risk variables for post-PCNL SIRS. They came to the conclusion that SC is essential in guiding patients with post-PCNL SIRS to choose the appropriate antibiotic, and that positive SC is a more reliable sign of SIRS after PCNL.

A prospective study comparing pre-operative MSU urine culture with intra-operative SC in patients having endoscopic operations for urinary tract stones was carried out in India at Utkal University, Bhubaneswar, by A. Gupta et al. (7). A total of 122 individuals, ages 18 to 70, were enrolled in the study. Patients with congenital urologic anatomical defects, prolonged catheterization or stent use, significant immunological impairment, other causes of sepsis, urogenital cancer, and steroid use were excluded. Three to five days prior to surgery, MSU cultures were obtained. Patients with positive MSU cultures received antibiotics for three to five days before to surgery, depending on their level of sensitivity SC was obtained during surgery. According to the study, only 24.59% of patients had a positive pre-operative MSU culture, but 50.82% of patients tested positive for post-PCNL SC. Only eight people (6.56%) out of the 18 (14.75%) who tested positive for both SC and MSU cultures shared the same organism. The most common isolated bacteria in MSU culture was *E. coli* (33.3%), which was followed by *Pseudomonas* (26.67%) and *Enterococcus* (13.33%). In contrast, the most common isolated bacteria in SC were *Pseudomonas*, *Enterobacter*, and *E. coli*, respectively. The study found that, when compared to the SC, the MSU culture had sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of 29.03%, 80%, 60%, 52.17%, and 54.09%, respectively. The study comes to the conclusion that pre-operative urine cultures do not provide a highly reliable indicator of whether an infectious organism is present in a kidney stone. Therefore, they advise routine SC when doing endourologic stone surgery.

At the Chiang Mai University Hospital in Thailand (13), researchers Lojanapiwat and Kitirattrakarn carried out a prospective study to determine the variables influencing the development of post-PCNL SIRS. All patients had their urine tested for cultural sensitivity prior to surgery. Antibiotics selected based on culture

and sensitivity tests were given to those who had positive results at least 48 hours prior to the procedure. On the other hand, individuals whose cultures came out negative were given a single dosage of ceftriaxone at the start of the procedure. Both the kidney stone fragments and the urine obtained from the renal pelvis were sent for culture and sensitivity testing after the surgery. Any patients who had visible pus during the initial puncture were excluded from the study. SIRS was monitored during the postoperative period. Out of 200 patients undergoing the PCNL, 56 (28%) developed a SIRS (Group I), while the remaining 144 did not (Group II). Then the researchers compared various factors between these two groups, including age, sex, body mass index (BMI), stone size, operation time, success rate, postoperative nephrostomy tube placement, preoperative urine culture, pelvic urine culture, and stone culture. The results show that among patients who developed the SIRS (Group I), a significantly higher percentage had positive cultures compared to those who didn't (Group II). In group I, preoperative urine, pelvic urine, and SC were positive in 66.1%, 46.4%, and 48.2% of cases, respectively. Interestingly, Group II patients had significantly lower rates of positive cultures; only 10.4%, 3.5%, and 3.5% tested positive for preoperative urine, pelvic urine, and stone cultures, respectively. *Escherichia coli* was the most often detected bacterium in the investigation, followed by *Enterococcus*, *Pseudomonas*, and *Klebsiella*. *Acinetobacter* species were grown in a preoperative urine culture from one patient. It was determined how sensitive the isolated bacterial strains were to various antibiotics. The susceptibility of 31 distinct strains of *E. coli* to ceftriaxone was tested on just 11 patients. Just five of those eleven exhibited ceftriaxone resistance. In contrast, all the other bacteria tested, including *Pseudomonas*, *Klebsiella*, and *Proteus*, were resistant to ceftriaxone. Five (2.5%) developed septic shock after surgery, and all belonged to Group I. Notably, four out of these five patients had positive results for bacteria in all three urine tests

conducted (preoperative, pelvic, and stone cultures). Only one patient with septic shock had a positive result solely in the stone culture. Interestingly, three of these patients required a change in their antibiotic treatment based on the specific bacteria identified in their stone cultures. Fortunately, all five patients recovered fully after receiving supportive care and intravenous antibiotics. In the study, there were no significant differences between the two groups in terms of average age ($p = 0.22$), BMI ($p = 0.92$), stone size ($p = 0.12$), surgery duration ($p = 0.94$), success rate ($p = 0.27$), or the number of patients who underwent tubeless PCNL ($p = 0.22$). They conclude that positive results in both preoperative urine cultures and intraoperative cultures (from the renal pelvis and stone) were strong indicators of postoperative SIRS ($p < 0.001$). They suggested that intraoperative cultures, in addition to preoperative ones, can be valuable tools for clinicians to make informed decisions about treating potential infections and complications after surgery.

A prospective study by Y. Osman et al. (14) at Mansoura University in Egypt examined the therapeutic usefulness of SC in directing antibiotic choices for patients suffering from post-PCNL sepsis between June 2012 and April 2013. Patients with urinary diversion, those receiving preoperative antibiotic therapy, pediatric patients, tubeless PCNL, and cases involving intraoperative laser fragmentation were not included in the total number of 79 patients with stones who qualified. The patient took antibiotics based on the culture sensitivity 48 hours before the procedure if the preoperative MSU sample for culture was positive. If the patient had a nephrostomy tube for urine diversion prior to PCNL, cultures from the nephrostomy were collected. Colony-forming units (CFU) greater than 100×10^3 were considered significant growth. Intraoperative stones were sent for culture and sensitivity. A sample from the nephrostomy was sent for culture and sensitivity on the first operative day. Post-operatively, patients were followed for

signs of SIRS. Patients with a positive preoperative culture continued the same antibiotic regimen for 3 days. In those with negative cultures, oral ciprofloxacin was prescribed routinely for 5 days. According to the results, *E. coli* was the most often found bacteria in the preoperative urine cultures of 26 patients (32.9%). SC was positive in 23 cases (29.1%), while the most often identified pathogen was *E. coli*. Significant bacterial growth on SC was substantially correlated with both the presence of a preoperative urine culture and a urinary catheter (double pigtail stent or nephrostomy tube). Both patients with catheters (10/23, $p = 0.001$) and those who had positive urine cultures prior to surgery (15/23, $p = 0.006$) had significantly increased chances of positive SC results. Only six patients (7.6%) had positive urine cultures from their postoperative nephrostomy tubes. Twelve patients, or 15.2%, had SIRS on the first postoperative day. Preoperative leukocytosis was the only factor in the study that could predict SIRS. Neither preoperative culture, stone culture, nor postoperative culture were predictors of SIRS. Only one patient's treatment strategy was changed as a result of the four SIRS patients who had positive SC results. With p values of 0.7 and 0.5, respectively, neither SC nor preoperative urine culture were found to be predictive of SIRS in this investigation. The authors speculate that SC may not always be required during PCNL workup. Though cultures can be positive in some situations, they rarely affect antibiotic selection, indicating little utility for the majority of patients.

In another prospective study from Columbia University College of Physicians and Surgeons, researchers led by R. Korets⁽¹⁵⁾ compared pre-operative urine, intra-operative RPUC, and SC in patients undergoing PCNL. The study, conducted between February 2009 and 2011, included 204 PCNL procedures in 198 patients. Pre-operatively, all patients underwent PBUC two weeks before surgery. Patients

with positive cultures received a seven-day course of targeted antibiotics based on the identified bacteria's sensitivity profile. The renal pelvic urine was collected either by retrograde catheter or during percutaneous puncture, and the intraoperative stone was sent for culture. The patient then followed up postoperatively for signs of SIRS. The results show PBUC was positive in 47 cases (23.5%), RPUC was positive in 21 cases (10.3%), and SC was positive in 33 cases (16.2%). Of the 21 patients with positive RPUC, 7 (33%) patient had negative PBUC. Out of 33 patients with positive SC, 16 (48.5%) were negative for PBUC, and 25 (75.8%) were negative for RPUC. In the study, there was a 64% to 75% concordance between SC, RPUC, and PBUC, with the greatest concordance observed between SC and RPUC. PBUC was just 30% sensitive in the study to identify positive SC. E. coli was the predominant organism isolated in all cultures. Patients with postoperative SIRS had a significantly higher prevalence of positive RPUC and SC. 20 patients develop post-operative SIRS. A univariate analysis identified several factors associated with an increased risk of SIRS (with a significant p value). These factors included having a stone burden of 10 cm² or greater, having multiple punctures, having struvite stones, and having a positive pelvic urine culture and SC. After controlling factors like stone composition, pelvic urine culture results, and SC results, a multivariate analysis revealed that two factors remained significantly associated with an increased risk of postoperative SIRS: having multiple renal punctures during the procedure (p = 0.04) and having stones with a burden of 10 cm² or greater (p = 0.01). Finally, their conclusion was that infected urine during PCNL may occur even in cases of properly treated preoperative urinary infections. SC and RPUC may be the only ways to know the etiology and guide antibiotic treatment. They recommend obtaining RPUC and SC in order to identify the offending organism in patients at risk of sepsis, especially in patients with a large stone burden requiring multiple access tracts.

P.Mariappan et.al (11) prospectively evaluated the effectiveness of stone and pelvic urine cultures in predicting urosepsis after PCNL, compared to bladder urine cultures. The study was done. A Scottish Lithotripter Centre study (Edinburgh, UK). 54 patients who underwent PCNL between June 2003 and March 2004 were included. Those with pre-existing stents, catheters, diabetes, renal issues, fever, prior kidney procedures, bladder stones, antibiotic use, or contralateral kidney stones were excluded. Preoperatively, a MSU or a clean, straight catheter urine sample was collected and tested for bacteria growth and antibiotic susceptibility one day prior. In the study, there were two patients who had ileal conduits, from whom bladder urine was collected by passing a sterile catheter into the stoma of the conduit." Intraoperatively, urine was first removed from the kidney's collecting system and also tested for bacteria and antibiotic susceptibility. Additionally, stone fragments were collected and analyzed for bacterial growth and antibiotic susceptibility. Postoperatively, patients were closely monitored for any signs of SIRS. If SIRS developed, blood cultures were performed. In this study, the duration of surgery ranges from 30 to 180 days. Researchers found that stones were the most common site for positive cultures, significantly more so than bladder urine. SC primarily contained E. coli, while infected bladder urine often had mixed bacterial growth. Only one patient had all three specimens (bladder, pelvic, and stone) positive simultaneously. In 42.6% of patients, the upper tract was infected (pelvic urine and/or stone), while only 5.6% had positive bladder cultures. SC was positive in 35.2%. The study indicates that bladder urine has limited accuracy in detecting upper tract infection (UTI), with a PPV of 0.5, an NPV of 0.56, and a risk ratio (RR) of 1.15 (95% CI 0.48–2.73). When both the pelvic culture and SC were positive, there was an 85.7% chance that the bacteria found in both samples were identical. Infected bladder urine rarely matched the bacteria found in the upper

tract. Researchers studied the use of bladder and pelvic urine to identify infections in stones, since stones were often found to be infected. Pelvic urine was more accurate than bladder urine in predicting stone infections, with a two-times greater chance of detecting an infection in the stone. Among the 20 patients (37%) who experienced SIRS, 18 had a positive culture from at least one specimen. While 3 patients (5.6%) developed septic shock, fortunately, no deaths were reported. Notably, none of these patients had positive blood cultures. Among the three patients experiencing septic shock, two had ileal conduit. Notably, in these conduit cases, the bladder urine samples did not exhibit significant bacterial growth (meaning less than 10⁵ CFU per milliliter), even if there were multiple bacterial types present. Interestingly, analysis of various specimen cultures and SIRS showed that patients with infected stones or pelvic urine had a fourfold higher risk of developing urosepsis. The study also showed that postoperative SC had a strong association with postoperative SIRS, with a p value of less than 0.001. Conversely, age, PUBC (P = 0.659), operative time, hydronephrosis, and previous UTI history did not have a statistically significant association, with p values of 0.9, 0.504, 0.529, and 0.221, respectively. The study concludes that collecting urine directly from stones and the renal pelvis provides better clues about potential sepsis compared to standard bladder urine. Based on these findings, they recommend including these additional samples in routine testing

In a retrospective analysis carried out at the Indiana University School of Medicine, Jessica E. et al. (10) examined data from 776 individuals who had PCNL between April 1999 and January 2014. Only individuals who have both PUBC and SC available were included in this subset. Examining the correlation between urine culture and SC outcomes in a large cohort of PCNL patients was the study's main goal. The results in patients with infectious stones and those with

metabolic stones were also compared by the researchers. As per the guidelines set by the institution, every patient who was supposed to have PCNL had PBUC. For at least two weeks before to PCNL, patients with a positive urine culture, a history of urosepsis, or recurrent UTIs were prescribed antibiotics specific to their culture. For one week before to PCNL, patients with a negative urine culture were prescribed prophylactic oral antibiotics on a regular basis. Stone fragments that were removed during surgery were also sent for sensitivity and culture testing. The results of the analysis of the 776 patients showed that: 38.7% (300 patients) had a positive SC, and 45.4% (352 patients) had a positive preoperative urine culture.. Staphylococcus was the most prevalent organism, found in 22.2% of PUBC and 25.3% of SC. Other common PBUC pathogens included Proteus (15.3%), Escherichia coli (13.1%), and Enterococcus (8.8%). Other common SC pathogens included Enterococcus (13.7%), Proteus (13%), and Candida (12.7%). 45% (349 patients) had negative cultures in both urine and stone samples. Interestingly, 16.4% (127 patients) with positive PBUC had negative SC. 9.7% (75 patients) had positive SC despite sterile PBUC. 29% (225 patients) had positive cultures in both PUC and SC, but only 54.2% (122 patients) had the same organisms in both cultures. 45.8% (103 patients) had different organisms, meaning 13.3% overall had discordant results. When any bacteria found in the stone wasn't present in the urine, cultures were considered "discordant. Based on these data, PBUC was able to predict the correct organism(s) within kidney stones with 62% sensitivity, 60% specificity, and a PPV of only 35%. Among the 776 patients, 13 (1.7%) developed sepsis after surgery. Interestingly, 9 of these patients (approximately 70%) had discordant results between their PBUC and SC. Out of the 13 post-operative sepsis cases, blood cultures were taken for 11 patients and revealed bacterial growth in 4. Only two had matching bacteria in both their blood and SC. Surprisingly, none of the blood cultures matched the bacteria found in PBUC. Only one patient with

sepsis had struvite stones, which are often associated with *Proteus* infections, in this specific case, both stone and urine cultures identified *Proteus* as the etiology. However, all other septic patients had metabolic stones. Their conclusion were PBUC have significant limitations in predicting the bacteria causing kidney stones. In nearly a quarter of cases (25%), the urine culture did not match the bacteria found in the stone itself. Based on the observed limitations of PBUC in accurately identifying bacteria causing kidney stones, this study strongly supports the routine inclusion of intra-operative SC during PCNL.

A retrospective study in China investigated risk factors for developing SIRS after PCNL surgery. Led by Z. He et al.(16), the study included 1030 patients who underwent PCNL between January 2014 and July 2016. Patients with specific conditions like tumors, blood diseases, urinary tuberculosis, hyperthyroidism, and juvenile patients were excluded. The researchers collected preoperative data including age, sex, BMI, surgery duration, serum creatinine (SCr) levels, MSU cultures, WBC count in urine sediment microscopy, presence of staghorn calculi, and DM status. Importantly, all patients with a positive urine culture before surgery received at least one week of appropriate antibiotic treatment. The study showed an average age of 52.05 years. The average SCr level was 107.74 micromoles per liter (mol/L). The gender breakdown was 571 (55.44%) males and 459 (44.56%) females. The average operation time was $153.05 \pm (45.60)$ minutes. Positive MSU culture was identified in 179 patients (17.38%), with Gram-negative bacteria found in 143 cases (13.88%) and Gram-positive bacteria identified in 33 cases (3.20%). Microscopic analysis of urine sediment revealed elevated WBC counts in 298 patients (28.93%). A total of 108 out of 1030 patients (10.49%) developed SIRS in this study. The univariate analysis revealed several factors associated with an increased risk of SIRS after PCNL surgery (p-value < 0.05):

patient sex (male), presence of staghorn calculi, WBC count in urine sediment microscopy, and presence of gram-negative bacteria in MSU culture. In contrast, no significant association was found between SIRS and age, BMI, SCr, operation time, or DM (p-value > 0.05). Multivariate logistic regression analysis identified three independent risk factors for developing SIRS after PCNL surgery: staghorn calculi (p = 0.01), the presence of gram-negative bacteria in preoperative urine culture (p<0.001), and a highly positive white blood cell count (+++++) in urine sediment microscopy (p<0.001). The study concluded that the presence of Gram-negative bacteria in preoperative urine culture and an elevated WBC count in urine sediment microscopy were associated with an increased risk of SIRS following PCNL surgery. These factors should be given particular attention by clinicians. Finally, the study emphasizes the importance of performing preoperative routine urine culture and microscopic examinations to detect UTIs early on. Timely identification and treatment of UTIs are considered significant factors in preventing postoperative SIRS.

Liang Chen et al.'s (17) retrospective study conducted in China looked into risk variables for SIRS development following PCNL surgery and attempted to quantitatively predict the likelihood of SIRS following PCNL. Clinical data from 209 consecutive PCNL patients treated at Peking University People's Hospital between January 2005 and February 2007 were evaluated in this retrospective analysis. If a patient fulfilled any of the following requirements, they were excluded: had ureter pelvic junction stricture, polycystic kidney, horseshoe kidney, tumors, hematologic disorders, diabetes mellitus, oral immunosuppressive medications, anatomical abnormalities of the kidneys, heart or kidney failure, preoperative fever requiring antibiotic treatment, underwent a minimally invasive PCNL (with an 18-Fr sheath), a second PCNL, a tubeless PCNL, a PCNL

combined with another treatment in the same operation, or a combination of all of these. Prior to the PCNL surgery, each patient was given 250 mg of ciprofloxacin orally twice a day for one week. Patients who did not have a penicillin allergy were given two grams of ceftriaxone intravenously at the beginning of the PCNL procedure. To decrease general infection, intravenous ceftriaxone or ciprofloxacin was administered for at least three days following PCNL. They categorize and identify the results of an MSU culture and a drug sensitivity screen as low-grade and high-grade bacteriuria in order to distinguish between them. The development of a single organism in an MSU culture and drug sensitivity test with a colony count of less than 10^5 CFU/mL is known as low-grade bacteriuria. The growth of two or more organisms or any organism with a colony count higher than or equal to 10^5 CFU/mL in an MSU culture and drug sensitivity screen is referred to as high-grade bacteriuria. A dilated pelvis or calices with a maximal diameter larger than 10 mm is what they classify as pyelocaliectasis. The duration of the operation was measured from the start of the puncture to the completion of inserting the indwelling nephrostomy tube. Single-trait operations were defined as those that created a single tract, while multiple-trait operations were defined as those that created two or more tracts. According to the results, the patient's age ranged from 17 to 79 years old, with an average age of 49.05 years. Thirty-two (63.2%) of the patients were male. During the surgery, 13 individuals (6.2%) needed blood transfusions. SIRS was developed in forty-nine patients (23.4%). In 84 patients, MSU samples (40.77%) showed signs of bacterial development. Gram-negative bacteria were the most frequent offender among these positive cultures, representing more than half (53.6%) of the cases. Gram-negative bacteria made up the majority of the colonization in patients with high levels of bacteria (61.5%). Conversely, gram-positive bacteria colonized patients with lower bacterial counts more frequently (68.4%). The univariate analysis showed statistically

significant correlations between SIRS and six distinct factors: the number of tracts ($P < 0.001$), the presence of staghorn calculi ($P = 0.001$), pyelocaliectasis ($P = 0.007$), stone size ($P < 0.001$), operative time ($P < 0.001$), and blood transfusion receipt ($P < 0.001$). In this univariate study, there was no statistically significant correlation found between preoperative urine culture and pyonephrosis and SIRS (p-value = 0.152 and 0.299, respectively). According to the multivariate logistic analysis, the number of tracts ($P < 0.001$), receiving a blood transfusion ($P < 0.001$), stone size ($P < 0.001$), and pyelocaliectasis ($P = 0.005$) were the main risk variables for the development of SIRS following PCNL. The number of tracts, having received a blood transfusion, the size of the stone, and the existence of pyelocaliectasis are determined to be the primary risk factors for the development of SIRS following PCNL.

Fahad S. Alhamad et al.'s (18) retrospective cohort study at King Abdulaziz Medical City in Saudi Arabia aimed to determine the variables associated with the development of urosepsis following PCNL. Patients with missing data and those who had the procedure performed outside of the institution were subject to exclusion criteria. This study had 155 patients in total. There were 47 females (30.3%) and 108 males (69.7%) in the study. Following PCNL, three patients (1.9%) experienced urosepsis. Notably, the patients in all three cases were men. Gender and the risk of urosepsis do not significantly correlate, as indicated by the p-value of 0.554. During the surgery, the mean age of all the subjects was 46.4 years, with a standard deviation of 18.1 years. Compared to patients who did not develop urosepsis (46.6 years old), those who did had an average age that was slightly lower (37.3 years old). Despite this variation, the development of urosepsis did not significantly correlate with age at surgery (p-value = 0.384). A total of 57 participants (36.8%) had hypertension; among those who developed urosepsis,

only one patient (33.3%) also had hypertension. After PCNL surgery, there was no statistically significant correlation (p-value = 1.000) between hypertension and the development of urosepsis. There was no significant correlation between urosepsis and chronic kidney disease (CKD) in 14 patients (9.0%); the p-value for this correlation was 1.000. There was no significant difference between DM and urosepsis (p-value = 1.000). Other co-morbidities do not significantly correlate with urosepsis (p-value = 0.569). Unilateral renal stones were the most frequent cause of PCNL surgery (73.5% of patients). Interestingly, unilateral renal stones were present in all three of the patients who developed urosepsis. Staghorn calculi in 24 patients (15.5%), bilateral renal stones in 10 patients (6.5%), and ureteric stones in 7 patients (4.5%) were among the additional reasons for PCNL. P-value = 0.746 indicates that there was no statistically significant correlation between the type of kidney stone and the onset of urosepsis.

3. Objectives

General objectives

1. To look at the relationship between PBUC and post-PCNL SC.
2. To assess how PBUC, SC, and other variables relate to the development of post-operative SIRS.

Specific Objectives

1. To determine which frequent bacterial species cause urinary tract infections in people with urolithiasis.
2. To establish antibiotic sensitivities and resistance to the commonly used

antibiotic (Ceftriaxone, Nitrofrantoin and Ciprofloxacin) for UTI treatment in our region, focusing on both PBUC and SC.

4. Methods

4.1 Study area and Period

4.1.1 Study area

TikurAnbessa Specialized Hospital, Addis Ababa University, Addis Ababa, Ethiopia.

4.1.2 Study period

This study was be conducted from December 01, 2023 GC to May 30, 2024 GC.

4.2 Study design

The study is institution based prospective Cohort study

4.3. Source population and Study Population

Source population:

All Patients who were be admitted for surgical intervention for urolithiasis from December 01, 2023 GC to May 30, 2024 GC.

Study population:

All Patients who undergo PCNL from December 01, 2023 GC to May 30, 2024 GC

4.4. Eligibility Criteria

Inclusion criteria:

- All patients who undergo PCNL for stone during the study period.

Exclusion criteria:

- Patients with others causes of sepsis
- Severely immune compromised patients (E.g. DM)
- History of antibiotic with in the first 2 week prior to surgery
- Patients with a stent, nephrostomy tube or indwelling catheter
- Any previous procedures or manipulations done recently

4.5. Study Variables

Dependent Variables:

- PBUC result
- SC result
- Antibiotic sensitivity for PBUC and SC of bacterial etiologies.
- Post PCNL Signs of SIRS(PR, Respiratory rate ,Temperature and WBC)

Independent Variables:

- Sex
- Age
- History of UTI
- Pre-operative SCr
- Preoperative urine culture

- Level of preoperative hydronephrosis
- Stone size and burden
- Stone location
- Duration of surgery
- Number of tract

4.6. Data collection

This study will follow a structured questioner to investigate the correlation between PBUC and SC, and the association of PBUC, SC and other factors in post PCNL SIRS.

Pre-operatively:

- PBUC sample was collected for culture and sensitivity testing.
- The operating resident documented the results in well-structured questionnaire.
- Patients with negative cultures were received a single-dose antibiotic (ceftriaxone 1g IV) 30 minutes before surgery, which continued post operatively for 2 to 3 days
- Those with positive cultures took receive a 3-5 day course of antibiotics based on bacterial sensitivity results.

Intra-operatively:

- In our institution as protocol all patient were received 1 dose of prophylactic antibiotic (ceftriaxone 1 gm. IV) just 30 minutes before surgery ,if not allergic to penicillin
- Following GA, patients were turned into the prone position.
- Since fluoroscopy was not accessible, all PCNL procedures were carried out in the prone position under ultrasound guidance.

- Tract dilation was performed by facial dilator serially until 16 Fr to 28 Fr depending on patient, stone burdens, clinical profile and surgeon preference.
- For mini PCNL we used 16 Fr sheath and for standard PCNL we used 24 to 28 Fr amplatz sheath
- A rigid nephroscope was used in combination to pneumatic lithotripsy to fragment the stone.
- we usually use flexible nephroscope to check remaining fragments
- After being repeatedly cleaned with sterile saline, the stone is crushed and sent for SC and sensitivity.
- Following each procedure, a 14-Fr to 18-Fr nephrostomy tube and a 6-Fr DJ stent were inserted.

Post-operatively:

- Within 48 hours following surgery, patients were closely watched for symptoms of SIRS (PR, respiratory rate, fever, and WBC).
- The principal investigator recorded post-operative SC results and any evidence of SIRS in the questionnaire.
- Patients who developed SIRS were placed under close supervision and given antibiotics empirically until they stabilized or postoperative cultures were obtained.

4.7 Data Management

After being compiled into an excel spreadsheet, the study's data was uploaded to SPSS for analysis. Data that contains outliers, missing values, and other inconsistencies will be eliminated.

4.8 Data analysis

The data were analyzed using SPSS version 26. Frequencies, percentages, means, and ranges were used to characterize the study population's clinical and demographic features in descriptive findings. The connection between PBUc and post-PCNL stone culture was assessed using correlation analysis. In particular, the direction and strength of any linear relationship between these variables was measured using Pearson's correlation coefficient. Binary logistic regression analysis was used to identify variables related to the development of postoperative SIRS. In order to account for any confounding factors, variables from the bivariate analysis with a p-value of less than 0.05 were taken into consideration for inclusion in the multivariable logistic regression. In the multivariable analysis, the strength of the correlations were represented by odds ratios (OR) and accompanying 95% confidence intervals (CI).

4.9 Data Quality Assurance

A standardized and modified questionnaire that was derived from earlier studies was used to guarantee the quality of the data. The survey was composed in English, translated into Amharic, one of the most widely spoken local languages, and then back into English to ensure uniformity. The principal investigator and supervisors closely monitored and tracked every aspect of the study's overall operations. Patients' data was collected and cross-checked from the official I-CARE, the patient's cross-sectional image on hand, and the MEDWEB of Tikur-Anbessa Specialized Hospital data base in order to increase memory, information correctness, and result consistency.

4.10 Ethical clearance

Following ethical clearance from the department of surgery's institutional review board, the study was conducted. Each subject gave their permission to take part in the study.

4.11 Dissemination of results

The study's findings will be submitted to TASH's Department of Urology as part of the dissertation requirement for the postgraduate certificate program. The research committee will also present the findings to all department staff and residents during a seminar. It will also be submitted for potential publication to medical journals.

4.12 Operational definition

SIRS: The occurrence of at least two SIRS events during their inpatient stay was diagnostic of SIRS. The criteria were defined as a temperature <36 or more than 38 °C, heart rate more than 90 BPM, respiratory rate more than 20/min and WBCs < 4.000 or more than $12.000/mm^3$.

Sepsis: SIRS and infection either documented or strongly suspected

Severe sepsis: sepsis plus sepsis-induced organ dysfunction or tissue hypoperfusion, typically systolic blood pressure (SBP) less than 90 mm Hg or mean arterial pressure (MAP) less than 70 mm Hg

Septic shock: an extreme form of sepsis with sepsis-induced hypotension persisting despite adequate fluid resuscitation; findings may include elevated lactic acid or oliguria

Operative time: was measured from the beginning of inserting the ureteric catheter to the conclusion of inserting the indwelling nephrostomy tube.

5. Results

5.1 Sociodemographic data

There were 44 patient in the study which fulfil the inclusion criteria..Out of these patients, the study showed 75 %(33) of the patient were male and 25 %(11) were female .The mean age of the patient were 41.91 with range of 13 years to 81 years.

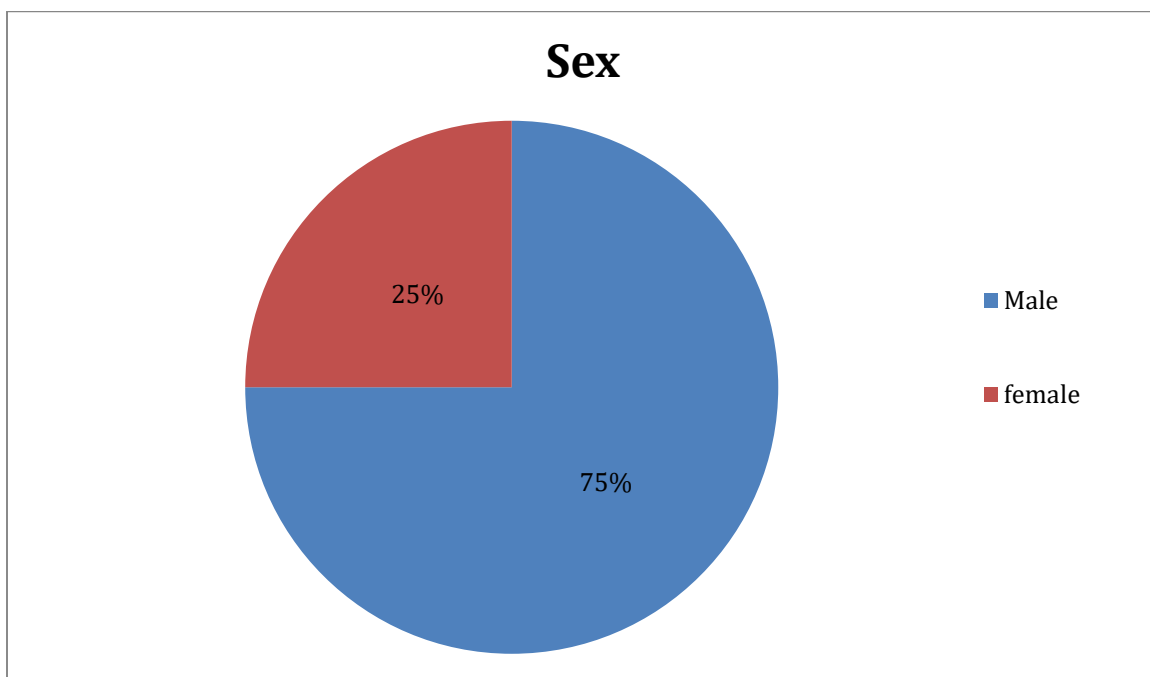


Figure 1: Sex Distribution

5.2. Clinical presentation

The left side was involved in 18 patients (40.9%), the right side in 19 (43.2%), and bilateral involvement occurred in 7 (15.9%). When patients were asked about their history of recurrent UTI, only nine (20.5%) had a history of recurrent UTI, while the rest did not. Regarding the comorbidity, 10 patients (20.5%) were hypertensive, 2 had gouty arthritis, 1 had epilepsy, and 2 patients had CKD (one of the patients was anatomically solitary kidney and hypertensive, and the other was functionally

solitary and had open stone surgery 5 years ago). The mean SCr was 0.9 mg/dl, with a range of 0.4–2.4 mg/dl. Regarding the hydronephrosis on ultrasound, 34 patients (77.3%) had hydronephrosis, and in 10 patients (22.7%) there was no hydronephrosis. Based on the CT scan, a single stone was identified in 18 patients (40.9%), and multiple stones were identified in 26 patients (59.1%). Regarding the location of the stone, the lower pole is the commonest area to be involved, followed by the pelvis.

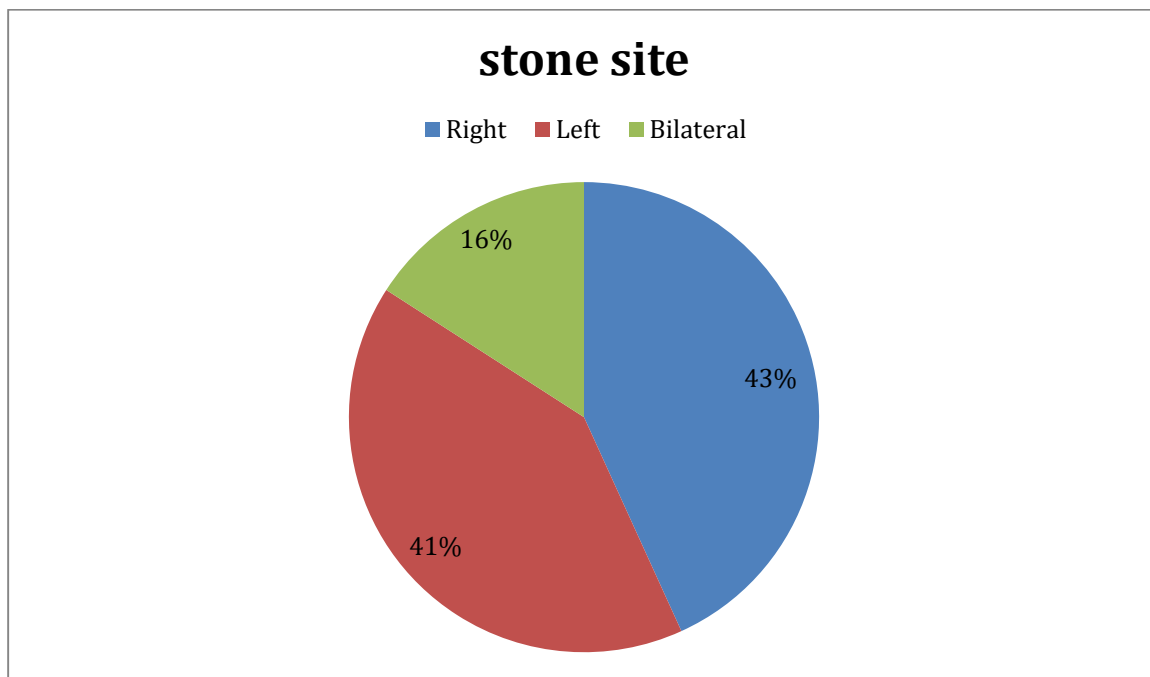


Figure 2 Site involved by stone

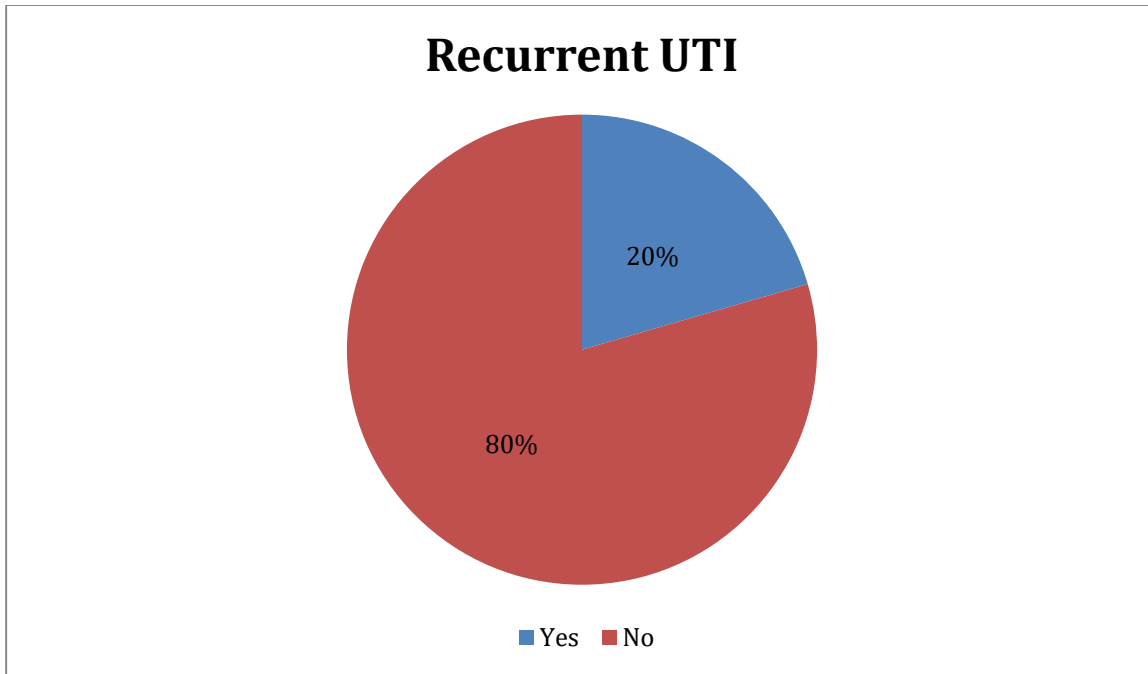


Figure 3 Recurrent UTI history

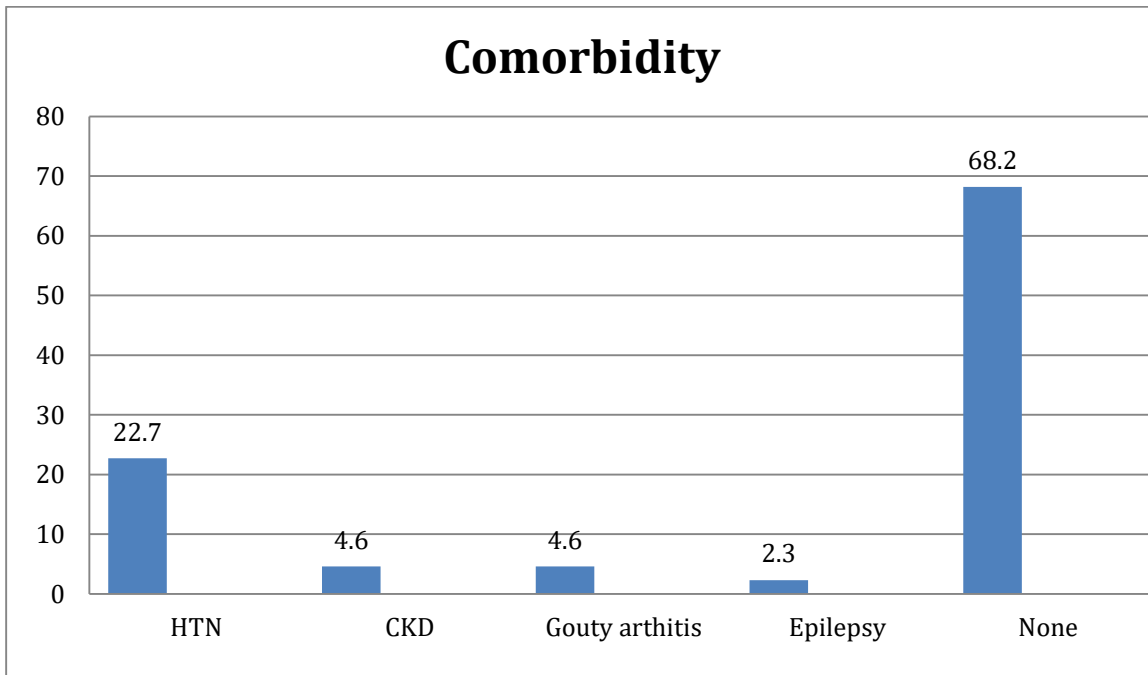


Figure 4: Comorbidity

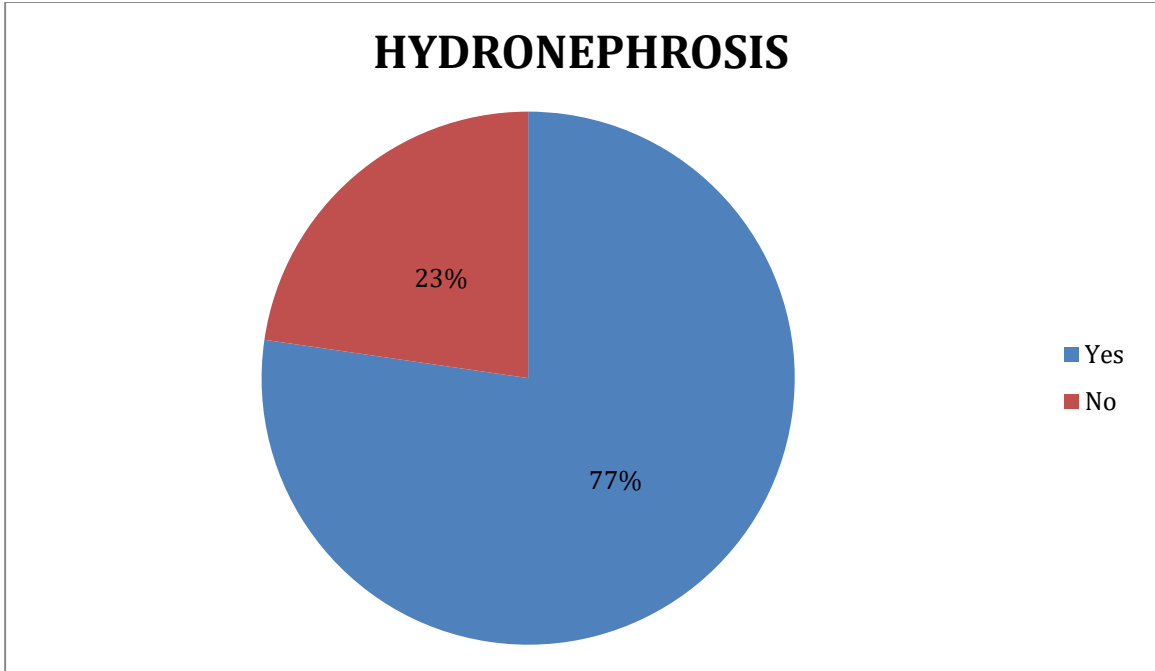


Figure 5: Level of preoperative hydronephrosis on U/S

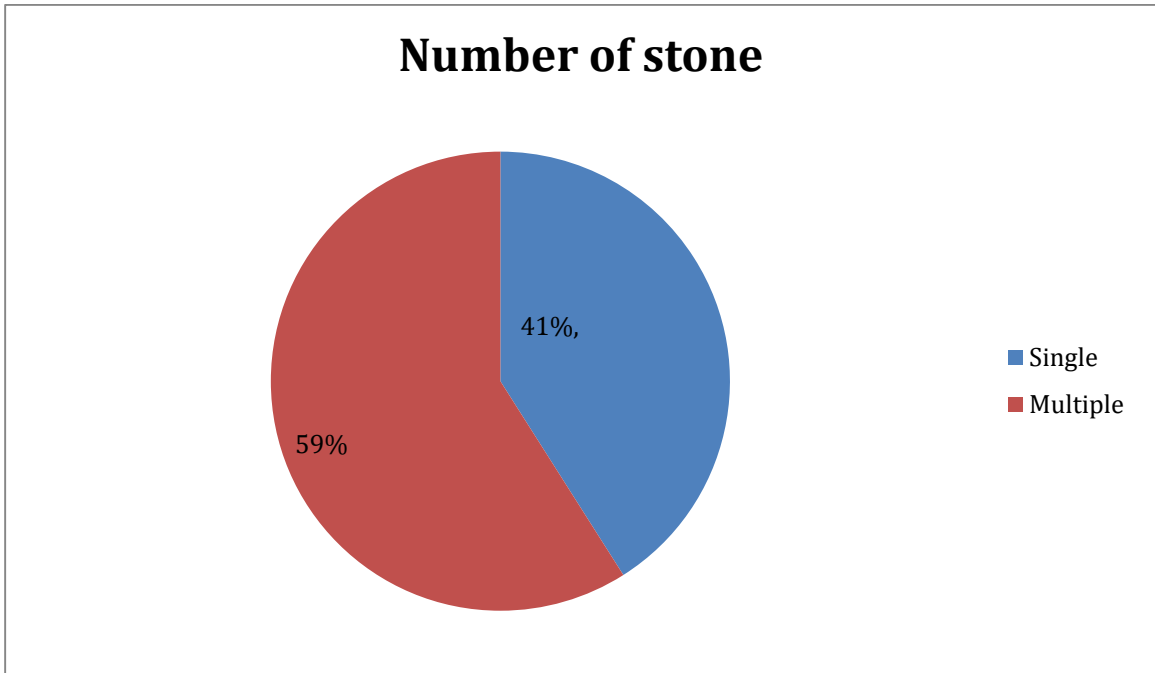


Figure 6: Number of stone on CT scan

5.3 Intraoperative findings

The left side was operated in 23 patients (52.3%), while the right side was operated in 21 patients (47.7%). For stone access, single tracts were used in 35 patients (79.5%) and multiple tracts were used in 9 patients (20.5%). Most of our PCNL was done using standard PCNL; 90.9% (40 patients) of PCNL was done by standard PCNL; the remaining 4 patients (9.1%) underwent mini PCNL. The mean duration of surgery was 91.48 minutes, with a range of 30–150 minutes

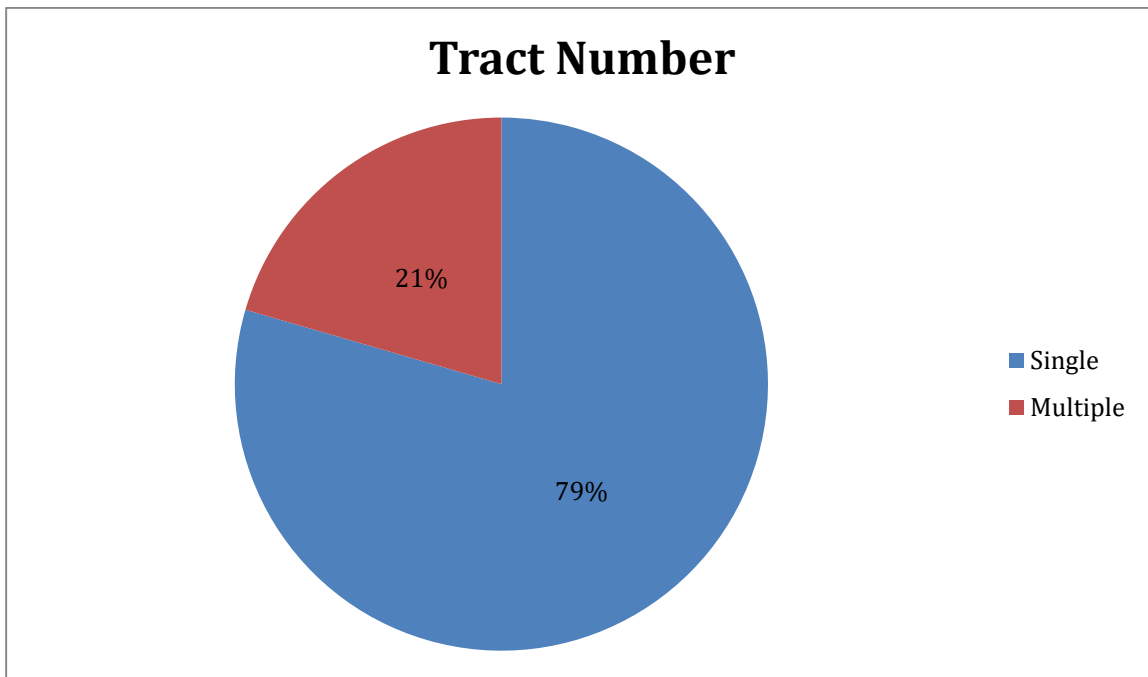


Figure 7: Number of tract

Variable	Value	
Side operated	Right	21(47.7%)
	left	23(52.3%)
Number of tract	Single	35(79.5)
	Multiple	9(20.5)
Size of the tract	Standard PCNL	40(90.9%)
	Mini PCNL	4(9.1 %)
Duration of surgery	Range	30 -150 minutes
	Mean	91.48 minutes

Table 1: Intraoperative Findings

5.4. PBUC and SC Result

PBUC was positive in 6 patients (13.6%), while SC was positive in 12 patients (27.3%), which is 2 times more than PBUC. Interestingly, only one patient had both PBUC and SC at the same time. Since infections in stones were highly prevalent, we used the bladder to predict the infection in renal stones. Based on our data, PBUC was able to predict the correct organism within the kidney stone with 8.3% sensitivity, 84.4% specificity, only 16.7% PPV, and an NPV of 71.1%. *E. coli* was the most common isolated organism in PBUC, accounting for 50% (3 patients) of the bacteria, followed by *Klebsela Pneumonia*, *Proteus*, and *Enterococcus* with an equal percentage. In SC, still *E. coli* is the predominant organism identified, positive in 3 patients (25%), followed by *Klebsela Pneumonia*, *Proteus*, and *Enterobactor Cloacae* with equal frequency, positive in 2 patients each (16.7%). In addition, the SC harbors other bacteria like *Citrobactor*, *Enterococcus*, and *Acinetobactor Baumannii*. In our sample, mixed organisms are not found in both SC and PBUC. In PBUC and SC-positive patients, the antibiotic sensitivity and resistance were assessed, and we paid attention to the sensitivity and resistance of the commonly used antibiotics for the management of UTI in our setup (ceftriaxone, Nitrofrantoin, and ciprofloxacin). Out of 6 positive PBUC patient samples, ceftriaxone was sensitive in 2 (33.3%) patients, ciprofloxacin was sensitive in 4 patients (66.6%), and fortunately, Nitrofrantoin was sensitive in all 6 patients (100%). Out of 12 SC-positive patients, only 2 patients (16.7%) were sensitive to ceftriaxone, Nitrofrantoin was sensitive in 4 patients (33.3%), and ciprofloxacin was sensitive in 5 patients (41.7%).

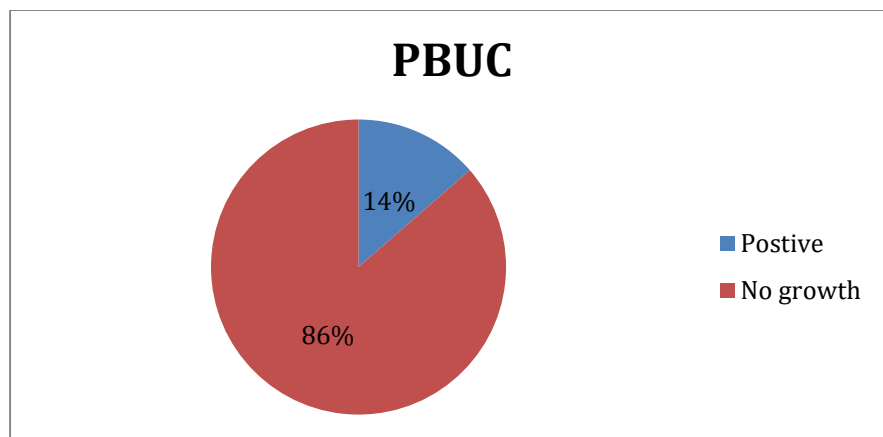


Figure 8: PBUC result

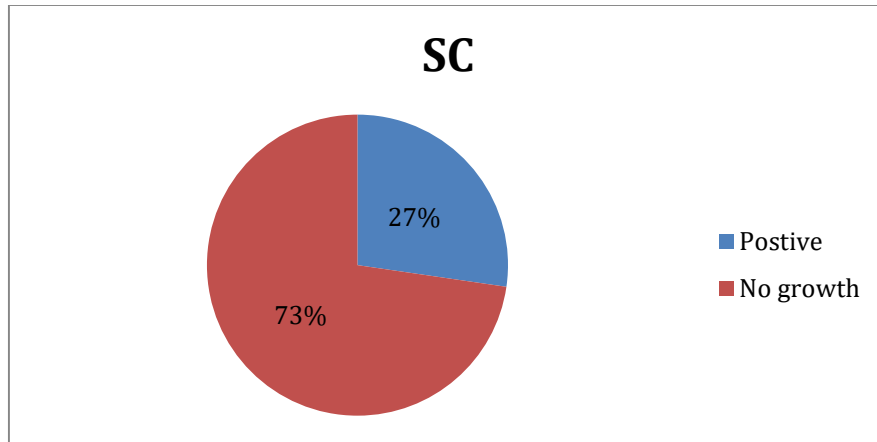


Figure 9: SC result

PBUC *Post PCNL SC cross tabulation				
		Post PCNL SC		Total
		Positive	Negative	
PBUC	Positive	1	5	6
	Negative	11	27	38
Total		12	32	42

Table 2: PBUC *Post PCNL SC cross tabulation

Bacteria	PBUC		SC	
	Frequency	percentage	Frequency	Percentage
E.coli	3	50 %	3	25 %
K. Pneumonia	1	16.7 %	2	16.7%
Proteus	1	16.7 %	2	16.7%
E. Cloacae			2	16.7 %
Citrobactor			1	8.3 %
Enterococcus	1	16.7 %	1	8.3 %
A. Baumannii			1	8.3 %
Total	6	100 %	12	100 %

Table 3: PBUC and SC bacteriology

5.5. Postoperative course

Out of 44 patients undergoing PCNL, 12 (27.3%) developed post-PCNL SIRS, and the rest had no post-PCNL SIRS. Fortunately, no patient developed septic shock or severe sepsis. The association between SIRS and different variables was done using binary logistic regression analysis. Variables with a p-value of less than 0.05 in the bivariate analysis were considered for inclusion in the multivariable logistic regression to control for potential confounding factors. There is no association between SIRS and age, gender, comorbidity, level of preoperative SCr, preoperative hydronephrosis, and, PBUC, laterality of the operated side, or duration of surgery, all of which have a p value > 0.05. On bivariate analysis this study identified four factors positively associated with SIRS: recurrent UTI (p = 0.042), presence of multiple stones (p = 0.022), presence of multiple tracts (p = 0.001), and SC positivity (p = 0.008). But on multivariate analysis, the only independent risk factor for post-PCNL SIRS was having multiple tracts (p value < 0.047).

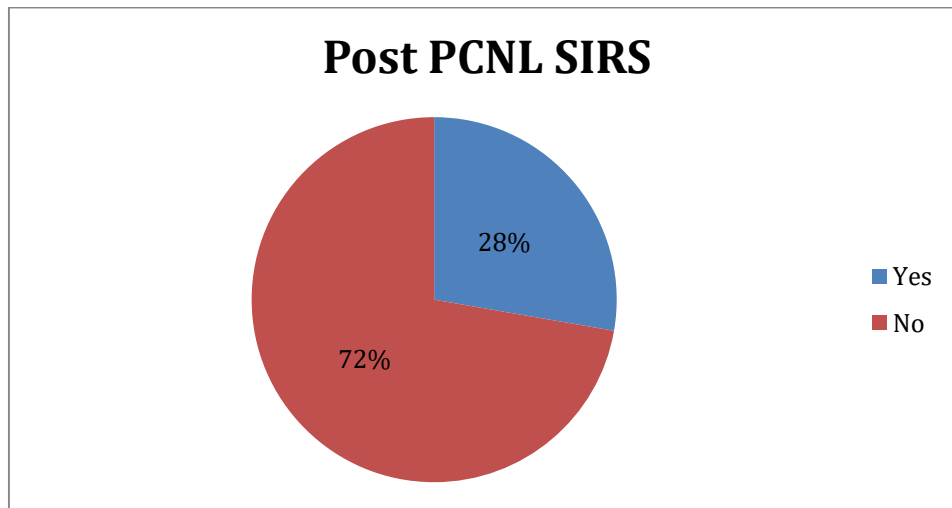


Figure 10: Post PCNL SIRS

Bivariate	OR(95 %CI)	P value
Sex	1.786(0.413-7.719)	0.438
Age	1.004(0.964-1.046)	0.834
Comorbidity (HTN ,CKD,Epilepsy)	0.636(0.142-2.842)	0.554
Recurrent UTI history	5(1.057-23.650)	0.042 *
Preoperative SCr (range)	1.96(0.329-11.67)	0.46
Preoperative hydronephrosis on ultrasound	0.84(0.178-3.967)	0.826
Number of stones on CT scan	0.08(0.009-0.697)	0.022 *
PBUC	1.4(0.221-8.856)	0.721
Laterality of the Operated side	0.714(0.187-2.7)	0.623
Number of tract used for stone access	21(3.353—131.518)	0.001 *
Duration of surgery		
≥ 90 minutes	2.267(0.567-9.069)	0.247
SC positivity	7.56(1.700-33.629)	0.008 *
Multivariate		
Recurrent UTI history	0.872(0.06—11.579)	0.917
Number of stones on CT scan	12.499(0.917-170.374)	0.058
Number of tract used for stone access	8.602(1.029-71.916)	0.047 *
SC positivity	5.893(0.646-53.752)	0.116

Table 4: Logistic regression analysis of variable associated with SIRS after PCNL

6. Discussion

This study analyzed 44 cases. While our sample size is relatively modest compared to some research in the field, it is larger than a recent study conducted in Indonesia (12). The study showed 75% of the patients were male and 25% were female. Studies in Indonesia (80.96 minutes), the UK (70.7 minutes), and China (153.05 minutes) reported average PCNL surgery durations. In our study, the average surgery time was 91.48 minutes, which is slightly longer than those reported in the UK (11) and Indonesia (12) but significantly shorter than China (16). In studies done in the US at Indiana University, in China by Z He et al., in the UK by P.

Mariappan et al., in Egypt by Y. Osman et al., in Colombia University by R. Korets, and in India by A. Gupta, PBUC was positive in 45.4%, 17.38, 5.6%, 32.9, 23.5%, and 24.59%, respectively. In our study, the PBUC positivity rate was 13.6%. This rate is comparable to those reported in China, lower than the rates observed in the US (Indiana University), Egypt, and India but higher than study in UK. SC was positive in 16.2%, 29.1, 35.2% and 50.82% of the studies done at Colombia University in the US, in Egypt, the UK, and India by A. Gupta, respectively. Our SC result (27.3%) is almost comparable to those from Egypt and the UK (14, 11), but show a lower positivity of SC compared to India (7) and a higher positive rate than the US (10). In most of the above studies, SC is more likely to be positive than PBUC, but in the studies done in Egypt, Colombia University, and Indiana University in the USA, PBUC is more positive than SC. In our study, PBUC was positive at 13.6%, while SC was positive at 27.3%), which is two times more than PBUC. So this is supported by the study was done in India and the UK (10, 14).

In an Indian investigation conducted by A. Gupta et al., the MSU culture exhibited sensitivity, specificity, PPV, and NPV of 29.03%, 80%, 60%, and 52.17%, respectively, in comparison to the SC. A US study by Jessica E. et al. examined PBUC's capacity to identify the organism present in kidney stones. Their results revealed a 62% sensitivity, 60% specificity, and only 35% positive predictive value (PPV). Our findings showed that the PBUC had an 8.3% sensitivity, 84.4% specificity, 16.7% PPV, and a 71.1% NPV in identifying the proper bacteria within the stones. So the PBUC is poor at predicting bacteria in kidney stones.

Research in Thailand, Colombia and Egypt showed *E. coli* was the most common isolated organism in both PBUC and SC. In our study, in both PBUC and SC, *E.*

coli was the most common isolated organism, accounting for 50% in PBUC and 25% in SC. In contrast to our result, a study in the US at Indiana University showed the commonest isolated organism in both SC and PBUC was Staphylococcus. A study in the UK showed mixed bacterial growth tends to occur in PBUC, but in our study, mixed growth was not seen. A study in Thailand also showed Acinetobacter spp. in PBUC, and a study in Indonesia showed Acinetobacter spp. was found in both SC and PBUC. Acinetobacter spp. is also isolated in one patient in SC in our study.

In our study, culture sensitivity and resistance were checked in both PBUC and SC. In 6 PBUC-positive patients, Ceftriaxone was sensitive in 2 (33.3%) patients, Ciprofloxacin was sensitive in 4 patients (66.6%), and Nitrofrantoin was sensitive in all 6 patients (100%). Out of 12 SC-positive patients, only 2 patients (16.7%) were sensitive to Ceftriaxone, Nitrofrantoin was sensitive in 4 patients (33.3%) and Ciprofloxacin was sensitive in 5 patients (41.7%). Due to the high prevalence of antibiotic resistance for common antibiotics used for UTI in our setup (especially Ceftriaxone), we should pay attention during the management of UTI. This high prevalence of Ceftriaxone resistance is supported by a study done in Thailand. In their study, they tried to test the sensitivity of the isolated bacterial strains to different antibiotics in preoperative urine culture. Sensitivity and resistance status for ceftriaxone were determined in 11 strains of E. coli; of those 11, only 5 were resistant to Ceftriaxone. In contrast, all the other bacteria tested, including Pseudomonas, Klebsiella, and Proteus, were resistant to Ceftriaxone.

The risk of post-PCNL SIRS varies depending on the research. Research conducted in the USA, China, Egypt, Thailand, UK, and other countries revealed that the respective risks of post-PCNL were 9.8%, 10.49%, 15.2%, 28%, and 37%.

The risk of post-PCNL SIRS was 27.3% in our investigation. This falls within the range observed in Thailand and is slightly lower than the UK but significantly higher than the rates reported in the US, China, and Egypt. (15, 16, 14).

In our study, there was no association between SIRS and age, gender, comorbidity, level of preoperative SCr, preoperative hydronephrosis, PBOC, laterality of the operated side, or duration of surgery, all of which have a p value > 0.05. In our univariate analysis, there was a positive association between SIRS and recurrent UTI (p = 0.042), having multiple stones (p = 0.022), having multiple tracts (p = 0.001), and SC positivity (p = 0.008). The only independent risk factors for post-PCNL SIRS were having multiple tracts (p < 0.047). This is supported by a study in Saudi Arabia that showed there was no statistically significant association between post-PCNL SIRS and gender (p = 0.554), age (p = 0.38), or other comorbidities like CKD (p = 1) and Hypertension (p = 1). A study in the UK also showed no statistically significant association between hydronephrosis (P = 0.529), operative time (p = 0.504), age (p = 0.903), PBOC (P = 0.659), and previous UTI (p = 0.221). In a study in China by Z. He et al., no significant association was found between SIRS and age, serum creatinine, or operation time (p-value > 0.05).

In contrast to our study, a study in Indonesia and the UK showed positive SC was a more reliable indicator of SIRS following PCNL (p = 0.001 and P < 0.001), respectively. Like our study, study in China by L. Chen and the study done at Colombia University by R. Korets, the number of tracts (P < 0.001) was an independent risk factor for post-PCNL SIRS.

Our findings demonstrated that the sole independent risk factor for post-PCNL SIRS is multiple tracts. Therefore, it is important to carefully evaluate multiple tract PCNL for better disintegration in order to prevent SIRS and the ensuing sepsis.

Similar to our study, a study in Egypt showed there was no association between post-PCNL SIRS and positive SC ($p = 0.7$). Because SC was not a predictor of SIRS in this study, they don't recommend routine SC. Based on our results, SC was not a predictor of post-PCNL SIRS, so we do not recommend routine intraoperative SC.

7. Limitations

This study was conducted at a single institution and involved a relatively small sample size when compared to similar research in this field

8. Conclusion

Post-PCNL SIRS is common after PCNL procedures. PBUC is a poor predictor of SC results with 8.3% sensitivity, 84.4% specificity, only 16.7% PPV, and a NPV of 71.1%. There is a positive relationship between post-PCNL SIRS and positive SC, number of tracts, number of stones, and history of recurrent UTI, but the only independent risk factors for SIRS were the numbers of tracts. While a PCNL using multiple access points might improve disintegration of kidney stones, it's important to weigh this benefit against the heightened risk of sepsis. Even though there is a positive association, intraoperative stone culture is not a predictor of post-PCNL SIRS in our study. So routine SC is not recommended

9. Recommendation

A larger, multi-institutional study is recommended by the principal investigator

10. References

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Annex: Questionnaire

Questionnaire on Correlation of Preoperative Urine Culture and Post PCNL Stone Culture and Their Association with Post-Operative SIRS

A. Demographic data

1. MRN _____
2. Sex: a. Male b. Female
3. Age (years) _____

B. Preoperative data

4. Chronic medical illness (more than one answer is possible)
a. No b. HTN c. DM d. Other (specify) _____
5. Which side is involved?
a. Right b. Left c. bilateral
6. Recurrent UTI history
a. Yes b. No
7. Antibiotic therapy in the past 2 weeks?
a. Yes b. No
8. Is the upper urinary tract is diverted (Preoperative decompression)?
a. Yes b. No
9. What is the preoperative serum creatinine level Specify _____
10. Preoperative level of hydronephrosis on ultrasound
a. Yes b. no
11. Preoperative CT scan finding, number of stone?
a. Single b. Multiple
12. Location of stone (more than one answer is possible answer if the stones are multiple)
a. Upper pole b. Lower pole c. Mid pole d. Pelvic e. Proximal Ureter
13. Mid-stream Urine culture
a. Positive b. No growth within 24-48 hr.
14. If the answer for question no 14 is 'Positive', what bacterial growth is seen (more than one answer possible)
a. E.coli b. Klebsella c. Proteus d. Enterococcuse. specify _____

15. For which antibiotic is the bacteria sensitive for (for q no 15)

a. Ceftriaxone b. Nitrofrantionc. Ciprofloxacillind. Specify _____

16. For which antibiotic is the bacteria Resistance to (for Q15)

a. Ceftriaxone b. Nitrofrantionc. Ciprofloxacillind. Specify _____

17. With what antibiotic patient is managed?

a. Ceftriaxone b. Nitrofrantionc. Ciprofloxacillind. Specify _____

18. For how many days the patient took the antibiotics (in days)

a. 3-5 b. 5-7 c. Specify _____

C. Intra operative findings and procedure

19. Which side is operated?

a. Right b. Left c. Bilateral

20. Number of tract used for stone access?

a. Single tract b. Multiple tract

21. Size of the tract

a. Standard PCNL b. Mini PCNL

22. Duration of the surgery in minutes? _____

D. Postoperative course

23. Postoperative Pulse rate? (During first 48 hrs.)

a. 60-90 bpm b. >90 bpm

24. Postoperative Temperature? (During first 48 hrs.)

A. 36-38 °C b. <36°C c. >38 °C

25. Postoperative RR? (During first 48 hrs.)

a. 14-20 breath/min. b. >20 breath/mint.

26. Postoperative WBC? (During the first 48 hrs.)

a. 4-12 thousand b. <4 thousand c. >12 thousand

27. Based on question number 24 to 27, does the patient has post-operative SIRS?

A. Yes b. No

28. Post PCNL stone culture

a. Positive b. No growth within 24-48 hrs.

29. If the post PCNL stone culture is positive, what bacterial growth it show? (More than one answer is possible)

a.E.colib.Klebselac.Proteusd.Entrocucuse.specify_____

30. For which antibiotics is the bacteria sensitive to (for q no 30)

a.Ceftriaxoneb.Nitrofrantionc.Ciprofloxacillind.Specify_____

31. For which antibiotic is the bacteria to Resistance to (for Q30)

a. Ceftriaxone b.Nitrofrantionc.Ciprofloxacillind.Specify_____

32. with what antibiotic patient managed? _____