e-CliniC 2023; Vol. 11, No. 1: 64-71
DOI: https://doi.org/10.35790/ecl.v11i1.44315
URL Homepage: https://ejournal.unsrat.ac.id/index.php/eclinic

Bacterial Profile and Antibiotic Susceptibility Pattern of Patients at Pre- and Post-Urologic Endoscopy Procedures at Prof. Dr. R. D. Kandou Hospital, Manado, Indonesia

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Received: July 7, 2022; Accepted: November 8, 2022; Published online: November 11, 2022

Abstract: Development of antibiotics resistance condition has been at a concerning state while data on the distribution of bacterial profile and the incidence of resistances in Indonesia are currently still limited at hospital environment, including at Prof. Dr. R. D. Kandou Hospital in Manado, Indonesia. This study aimed to obtain the profile of bacteria and the pattern of susceptibility to antibiotics in patient's urine before and after urologic endoscopy procedures at RSUP Prof. Dr. R. D. Kandou. This was an observational study with a cross sectional design. Sampling was performed with the one-group test technique of Lemeshow. The data collection technique used urine culture test by calculating the percentages. The results obtained 42 patients as subjects. The urinary bacterial profile of patients who underwent urologic endoscopy procedures at Prof. Dr. R. D. Kandou Hospital were dominated by Gram-negative bacteria, namely *E. coli* (23.8%), *Klebsiella* (4.8%), *Acinetobacter baumannii* (2.4%); 69% of urine samples showed negative culture results. The susceptibility pattern of bacteria to antibiotics in the subjects' urine showed 100% sensitivity to the given antibiotics. No nosocomial infection was found, however, nosocomial infection yet could not be excluded. In conclusion, bacteria found in the patients' urine are dominated by Gram-negative bacteria namely *Escherichia coli, Klebsiella,* and *Acinetobacter baumannii* which are still sensitive to antibiotics. Most urine samples showed negative results, and no nosocomial infection was found.
Keywords: bacterial profile; bacterial susceptibility; antibiotic; urological endoscopic procedure

INTRODUCTION

Nosocomial infections are still a problem in health services related to increased rates of morbidity and mortality, length of stay in hospitals, and increased hospital costs. The incidence of nosocomial infections ranges from 1% in Europe and America, while more than 40% in Asia, Latin America, and Africa.[1] Several studies conducted on the prevalence of nosocomial infections in Southeast Asia and Sub-Saharan Africa showed that the results varied between 1.6% and 28.7%.[2-6] The overall incidence of nosocomial infections was three times higher in low-income and middle-income countries compared to high-income countries. Almost the same as global data, in Indonesia alone, research data related to nosocomial infections is still very limited.[1,7] Meanwhile, some developed countries such as America, Europe, Japan, and China reported that the prevalences were between 2.3% and 11.9%.[8,9]

Approximately 40-60% of nosocomial infections are urinary tract infections (UTIs). A UTI is an episode of significant bacteriuria (infection with colony count $>10^5$ single microorganisms per ml) affecting the upper or lower urinary tract. The American Urology Association (AUA, 2016) estimated that UTIs occur in 150 million people in the world annually.[10] Data from the Indonesian Ministry of Health in 2016 showed that the number of patients with UTI reached 90-100 cases per 100,000 populations per year. Meanwhile, for the East Java region, the number of UTI cases reached 3-4 cases per 100,000 populations per year. The Global Prevalence of Infection in Urology (GPIU) study has been conducted annually since 2003. There are 856 urology units from 70 countries have participated so far, including 27.542 patients. The proxy for antibiotic consumption is reflected by the rate of application used for antibiotic prophylaxis for urological intervention. The resistance rates of most uropathogens to antibiotics are high, especially with multidrug resistance records. The severity of healthcare-associated urogenital tract infections (HAUTI) has also increased with 25% turns to urosepsis in recent years.[11]

Healthcare-associated urogenital tract infections (HAUTI) are one of the most common nosocomial infections. A survey in the United States showed, in several states, it was reported that 12.9% of all nosocomial infections were caused by HAUTI. Meanwhile, the prevalence in several European countries based on survey conducted by the European Center for Disease Prevention and Control (ECDC) reported that 19% of all nosocomial infections were caused by HAUTI. For this reason, it is important to carry out the surveillance of urological patients.[8] Lately, the conventional incisional surgery in the field of urological surgery has been increasingly replaced by endoscopic surgery. Several studies related to the daily practice have proven that any urological surgical procedure using instruments is associated with increased risks of urinary tract infections and bacteremia.[12,13]

The management of UTIs requires supportive therapy and adequate antibiotics. Rational use of antibiotics is needed to overcome the problem of bacterial resistance. The current state of the development of microbial resistance is worrisome. Currently, bacterial mapping data in Indonesia is still limited to large hospitals. World Health Organization issued a statement regarding to the importance of assessing bacterial resistance factors and strategies to control the incidence of resistances by selecting appropriate antibiotics based on the acquired bacterial susceptibility patterns. The Centers for Disease Control and Prevention (CDC) estimates that 23.000 deaths in United States are caused by antibiotic-resistant pathogens infection.[14,15]

Based on the data previously described, the conditions faced by health practitioners today in the mean of the development of antibiotics resistance are concerning. In addition, the data on the distribution of bacterial profile and the incidence of resistance in Indonesia are currently still limited in the hospital environment, including Prof. Dr. R. D. Kandou Hospital. Based on the current situation, the authors are interested to analyze the bacteria profile and the pattern of bacterial sensitivity to antibiotics in the urine of patients undergoing urologic endoscopy procedures at the hospital. Therefore, it can help clinicians to overcome the

problem of nosocomial infections that prevail during the treatment process at the hospital and to provide data on the distribution of bacterial profile and the incidence of antibiotic resistance at Prof. Dr. R. D. Kandou Hospital which particularly concern with patients undergoing urologic endoscopy procedures.

METHODS

This study was conducted at Prof. Dr. R. D. Kandou Hospital, Manado. The sampling employed one-group test technique or Lemeshow towards 42 samples. The variables used in this study were bacteria profile and level of sensitivity of the bacteria to antibiotics. The objects of this study were urine samples of patients who underwent urologic endoscopy procedures.

This was a quantitative and descriptive analytical study with a cross-sectional design. Descriptive analysis was carried out to assess the characteristics of the results of the data collected which described the bacterial profile and the pattern of bacterial sensitivity to antibiotics at Prof. Dr. R. D. Kandou Hospital in the form of frequency distribution (in the form of mean, range, minimum and maximum, and percentage). The results were presented in tabular forms. The procedures of this study included: 1) Informed consent. Patients determined as samples were weight based on inclusion and exclusion criteria. Before taking urine samples, patients were educated about the objectives and benefits of this study conducted before the patient gave consent to participate in this study; 2) Data collection for both identity and urine samples was carried out twice, during the patient was in the room and after the urologic endoscopy procedure was completed at Prof. Dr. R. D. Kandou Hospital; 3) Urine sampling procedures included: The catheter tube had to be clamped at the top to allow the urine collection, disinfecting the catheter port or tubing wall using 70% alcohol before urine sampling, and taking 3 ml of urine immediately after catheter insertion post urologic endoscopy procedure through catheter aspiration with needle and syringe. Then, the urine container was labeled and immediately stored in an ice flask as to carry the urine samples to be cultured. Urine culture was carried out in the clinical laboratory of Prof. Dr. R. D. Kandou Hospital and cultured on blood agar and Mac Conkay media. If coccus/Gram (+) bacteria were found, then they would be cultured/subcultured on MSA media (Mannitol Salt Agar).

This study was approved by the Health Research Ethics Commission of Prof. Dr. R. D. Kandou Hospital, Manado, No. 033/EC/KEPK-KANDOU/III/2022.

RESULTS

There were 42 patients who underwent urologic endoscopy procedures in this study. The characteristics of patients based on sex were 55% males and 45% females. Table 1 showed the distribution of patients based on age. The highest percentages were found in age groups of 46-57 years and 58-69 years. Figure 1 showed the descriptive distribution statistic of bacterial urine culture divided into Gram negative and positive after an endoscopic urology procedure was performed at Prof. Dr. R. D. Kandou Hospital.

Table 1. Distribution of patients based on age

Age (years)	Percentage (%)
10-20	2
22-33	12
34-45	21
46-57	29
58-69	29
70-81	7

The five Gram-negative bacteria, namely *Proteus sp, E. coli, Klebsiela sp, Pseudomonas* and *Acinetobacter sp* showed negative results by 100% (42 patients). While the positive results on the three bacteria was by 0% (0 patients). The three Gram-positive bacteria i.e. *Staphylococcus aureus, Staphylococcus epidermis,* and *Streptococcus pyogenes* showed negative results by 100% (42 patients), while the positive results on the three bacteria were 0% (0 patients).

Figure 2 showed the statistic descriptive distribution of bacterial profile in the urine of patients who underwent urological endoscopic procedures in the upper urinary tract compared to urologic endoscopy procedures in the lower urinary tract at Prof. Dr. R. D. Kandou Hospital. Bacteria pattern in the upper urinary tract category showed a more dominant result, namely 76%, while in the lower urinary tract category was 24% out of 42 patients participated in this study.

Table 2 showed the descriptive distribution statistic of bacterial susceptibility patterns in patients' urine underwent urologic endoscopy procedures in the upper urinary tract compared to urologic endoscopy procedures in lower urinary tract at Prof. Dr. R. D. Kandou Hospital. The sensitivity pattern of the upper urinary tract category and the lower urinary tract category in 42 patients participated in this study showed absence. Therefore, it was concluded that there was no bacteria growth in the urine culture that had been carried out so that the bacterial sensitivity pattern could not be assessed to any further.

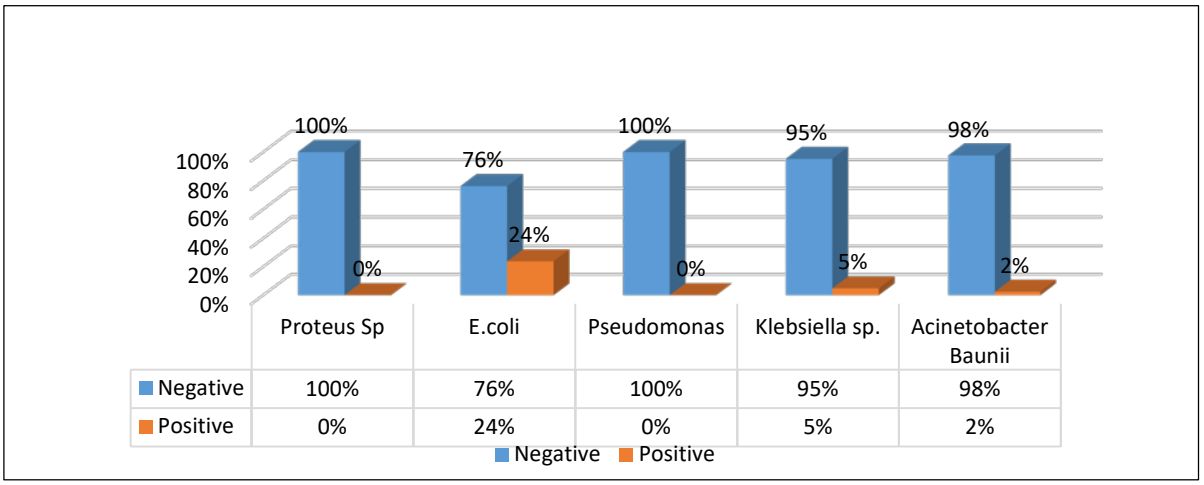

Figure 1. Descriptive distribution statistics of bacterial urine culture divided into Gram negative and positive bacteria before performing endoscopic urology procedures

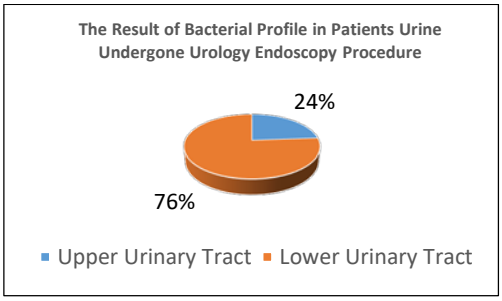

Figure 2. Bacterial profile in patients urine undergone urologic endoscopy procedure comparison

Table 2. The descriptive distribution statistic of bacterial susceptibility patterns in patients' urine

Category	Amount	Percentage
Upper urinary tract	0	0%
Lower urinary tract	0	0%
Amount	0	0%

Figure 3 showed the descriptive distribution statistic of bacterial patterns in the urine of patients at pre- and post-urologic endoscopy procedures at Prof. Dr. R. D. Kandou Hospital. The bacteria profile at pre-urologic endoscopy procedure was found in 12 patients equals to 29%, while the bacteria profile after the urological endoscopic procedure was 0 patients or 0% based on the results of the urine culture that showed zero bacteria found in 42 patients.

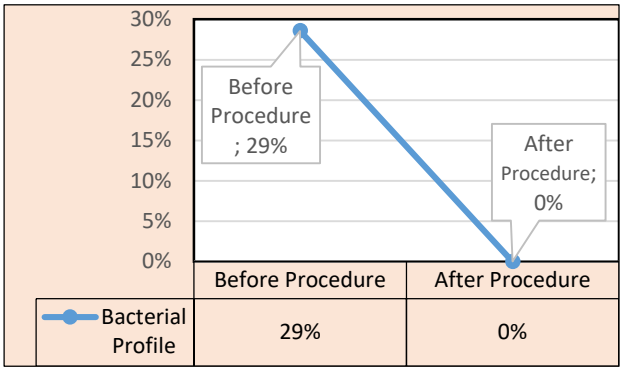

Figure 3. Comparative result of bacterial profile in patients' urine at pre- and post-urologic endoscopy procedures

Figure 4 showed the distribution comparison of the bacteria profile in the patient's urine before and after urologic endoscopy procedure at Prof. Dr. R. D. Kandou Hospital. There was 0 patient or 0% patient out of 42 populations who showed sensitivity response to the antibiotics given. This means 100% patients were antibiotics susceptible.

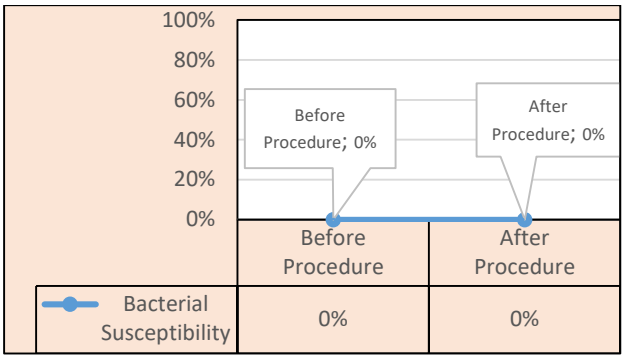

Figure 4. Comparative result between bacteria susceptibility pattern in patients at pre- and post-urologic endoscopy procedures

DISCUSSION

The results showed that most of the patients were male. The predominant ages were between the age of 45-57 and 58-69 years old. Out of the 42 patients, 12 (29%) had positive urine culture consisting bacteria while 30 (71%) were bacteria free. These results are in accordance with the study of Kausuhe et al[10] at GMIM Pancaran Kasih Hospital Manado explicating the relationship between catheter placement and urinary tract infections. Risdinar et al at RSUD Dr. H. Abdul Moelek Lampung also showed similar results where UTIs occured among catheterized patients with the highest age group of late elderly (56-65 years old) and female as the most frequent sex.[11]

Urine samples were taken by means of a catheter tube clamped at the top to allow collection of newly released urine, then disinfection of the catheter port or tubing wall using

70% alcohol before urine sampling. A 3 ml urine sample was taken immediately after catheter insertion after the urologic endoscopy procedure through catheter aspiration with a needle and syringe, then labeled the urine collection container and immediately stored in an ice flask as a means of transportation to carry urine samples to be cultured at the Microbiology Laboratory of Faculty of Medicine Universitas Sam Ratulangi, Manado. Urine was cultured on blood agar and Mac Conkay media. If coccus/Gram (+) bacteria were found, then they will be cultured/subcultured on MSA media (Mannitol Salt Agar).

The patients who underwent low-lying surgery (upper urinary tract category) were 32 people (76%), and those with high-position surgery (lower urinary tract category) were 10 people (24%). The comparison of the patient's urine sensitivity patterns showed that the bacteria sensitivity patterns of the upper and lower urinary tract category were nonexistence out of all 42 patients in this study. Therefore, it was concluded that there was no bacterial growth in the urine cultured, so that the bacterial susceptibility pattern could not be reassessed.

Of all patients, pre-treatment urine examination was performed and it was found that 13 of the 42 samples (31%) had positive urine bacteria results and 29 samples (69%) had negative urine bacteria results. After urine culture, it was found that 10 samples (23.8%) had positive urine culture results for *Escherichia coli*, two samples (4.8%) showed positive results for *Klebsiella pneumoniae* and one sample (2.4%) showed positive results for *Acinetobacter baumannii*. This is in accordance with the theory that nosocomial infections could be instigated by many microbes. Bacteria can cause about 90% of infections, meanwhile 10% are caused by protozoa, fungi, viruses, and mycobacteria. UTIs are usually caused by *E. coli*, while *S. aureus* often infects other parts of the body but rarely causes UTIs.[16,17]

This is in accordance with the study conducted by Andari et al at Sanglah Hospital which presented that the most common Gram-negative bacteria causing UTIs were *E. coli* followed by *Klebsiella pneumonia* and *Acinetobacter Baumannii*.[8] This is also supported by Pradani at PKU Muhammadiyah Hospital who stated that 11 bacterial isolates (45.46%) from UTI patients showed the presence of *E. Coli bacteria*.[18] Nisa' at Dr. Hospital. R. Sosodoro Djatikoesoemo Bojonegoro also showed similar result where it was found that positive urine culture results in patients with UTI were caused by *E. coli* infection.[14]

Urine culture was carried out at the Microbiology Laboratory of Faculty of Medicine Universitas Sam Ratulangi Manado after urologic endoscopy procedure was performed to determine the profile of bacteria against antibiotics in patients at RSUP Prof. Dr. R. D. Kandou. It was known that all positive and negative Gram bacteria showed negative urine bacteria growth with a percentage of 0%. So it was concluded that there was no further test of the patient's urine bacteria sensitivity pattern because there was no growth of bacteria found.

After urologic endoscopy was performed, all urine samples were re-examined and it was found that all samples had negative urine bacteria results. This indicates that no nosocomial infections were found in surgical patients (especially patients with urological procedures) at RSUP Prof. Dr. R. D. Kandou. This result contradicts the research of Baharutan, Rares, and Soeliongan at the Pediatric Intensive Care Room of Prof Dr. R. D. Kandou Hospital where it was found that there were nosocomial infections with Gram-negative bacteria as the most common causative bacteria. [15] The study of Londok et al at the ICU BLU RSUP Prof Dr. R. D. Kandou also showed that there were nosocomial infections with the most common bacterial cause being *Enterobacter agglomerans*.[19] The study of Japanto et al at the Irina F Eye Treatment Room, RSUP Prof. Dr. R.D. Kandou also showed conflicting results where there was nosocomial infection with the most common causative bacteria being *Bacillus subtilis*.[20] This happens because the pattern and sensitivity of bacteria will vary based on place and time.[21]

This study also shows that the entire study subjects responded to the antibiotics given. The use of antibiotics is divided into two types, namely prophylactic and therapeutic. The importance of knowing the bacterial profile and local antibiotic sensitivity is very essential in

both therapies. The use of antibiotics as indicated is very important to prevent the occurrence of resistance. The recommendations for the use of antibiotics are as follows: (1) Antibiotics with a sensitivity of more than or 80% can be selected as therapeutic antibiotics; (2) Antibiotic sensitivity data can be used as a guide if the number of isolated bacteria is ≥10% and adjusted for the type of specimen; (3) Coagulase negative *staphylococci* and *staphylococcus epidermidis* are normal flora of the skin and mucosa. The significance of this bacteria as a cause of infection or contamination alone depends on the clinical and patient markers of infection.[22]

Resistance is defined as the absence of bacterial growth stopping by systemic administration of antibiotics at normal doses or minimally inhibitory levels. Meanwhile, multiple drug resistance is defined as resistance to two or more drugs or drug classifications. While cross resistance is the resistance to a drug followed by another drug that has never been described. Resistance occurs when bacteria change in one way or another causing a decrease or loss of effectiveness of drugs, chemical compound, or other substance used to prevent or to treat infection.[23,24]

CONCLUSION

The urinary bacteria profile of patients who underwent urologic endoscopy procedures at RSUP Prof. Dr. R. D. Kandou was dominated by Gram-negative bacteria namely *Escherichia coli, Klebsiella* and *Acinetobacter baumannii* which were still sensitive to antibiotics. Most urine samples showed negative results, and no nosocomial infection was found.

Conflict of Interest

The authors affirm no conflict of interest in this study.

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