ANTIBIOTIC SUSCEPTIBILITY IN UROPATHOGEN FROM INTENSIVE CARE PATIENTS WITH URINE CATHETER

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Abstract

Background*: Multi-Drug Resistance Organisms (MDROs) are defined as organisms that acquired non-susceptibility to more than one antimicrobial agent. Intensive care patients are immune-compromised patients, using catheter and are given broad-spectrum antibiotics. Hence, the chance to develop microbial resistance is high. The aim of this study is to see the etiology and the microbial susceptibility pattern of catheter-associated urinary tract infection patients treated in intensive care.*

Materials and Methods*: The urine samples were taken from catheterized patients admitted to intensive care in Siloam Lippo Village, Tangerang, Indonesia in a one year period from July 2013 until June 2014. We confirmed species identification with Vitex-2 Compact® from Biomérieux, France. The susceptibility of antibiotics is according to Clinical and Laboratory Standard Institute (CLSI).*

Results*: We managed to get 113 urine culture results with mean of age 57.03 ± 18.505 (years). There were 67 males (59.3%) and 46 females (40.70%) that were acquired in the sample. The result of species identification showed that Escherichia coli was the dominant isolate from the urine culture (40.63%), followed by Klebsiella pneumoniae (12.5%). The percentage of MDRO was found to be 71.9%. The antibiotics susceptibility of Escherichia coli for Amoxicilin, Ampicillin/Sulbactam, Ciprofloxacin and Levofloxacin are 50%, 58%, 76% and 75% respectively. Meanwhile the susceptibility against Amikacin and Meropenem are 100% for Escherichia coli and Klebsiella pneumoniae.*

Conclusion*: The proportion of Escherichia coli was the highest among with susceptibility of Meropenem was still high susceptibility for both gram negative and gram positive bacteria.*

Keywords: Foley Catheter, Uropathogen, Intensive Care

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Introduction

Catheter Associated Urinary Tract Infection (CAUTI) is a type of nosocomial infection that infects urinary tract which occurred after 48 hours since the usage of urine catheter, without any urinary tract infection before usage.[1] 12-16% adult patient that is admitted to hospital will be using urine catheter.[2] Furthermore, the most frequent type of nosocomial infection is CAUTI which occurs around 70-80% of nosocomial infection cases.[3,4] Catheter is the median in which biofilm formed, these biofilms is the place where micro-organisms colonies.[5]

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The infection of CAUTI could be caused by either bacteria or fungi. Multi-Drug Resistance Organisms (MDROs) are defined as organisms that are acquired non-susceptibility to more than one antimicrobial agent.[6,7] The incidence of CAUTI-MDRO is around 36%.

The number of antibiotic resistance in uropathogen isolates are increasing[9] and some are developing resistance to newer antibiotics[10], many of these isolates are highly resistant to broad-spectrum antibiotics. These emerging of MDRO could be due to the inappropriate usage of antibiotics.

The incidence of CAUTI in intensive care is found in 20% of the samples, and around 20% of those isolates are found to be MDRO. The mortality due to nosocomial infection in intensive care patients is higher than those in normal wards due to the usage of medical

devices during their stay in hospital.The aim of this study is to see the etiology and the microbial resistance pattern of catheter-associated urinary tract infection patients treated in intensive care.

Materials and Methods

This study was a retrospective, descriptive study of uropathogens taken from patients with urine catheter admitted to intensive care in a period of 12 months from July 2013 until June 2014.

The data that were taken in this study was the result of urine culture and the antimicrobial susceptibility. The study was conducted in Faculty of Medicine, University of Pelita Harapan, Tangerang, Indonesia using the urine samples from Siloam Lippo Village, Tangerang, Indonesia.

The microbiological data were acquired and collected from medical record of patients. The identification and antibiotic susceptibility performed using automated dilution method by Vitex-2 Compact® (Biomérieux, France) and interpreted according to Clinical and Laboratory Standard Institute (CLSI).

Results

We managed to get 113 urine culture results with mean of age is 57.93 ± 18.5 (years). There were 67 males (59.3%) and 46 females (40.70%) that were included in this study. Along this period of study, we managed to get (32/113) 28.32% positive urine culture as shown in Figure 1.

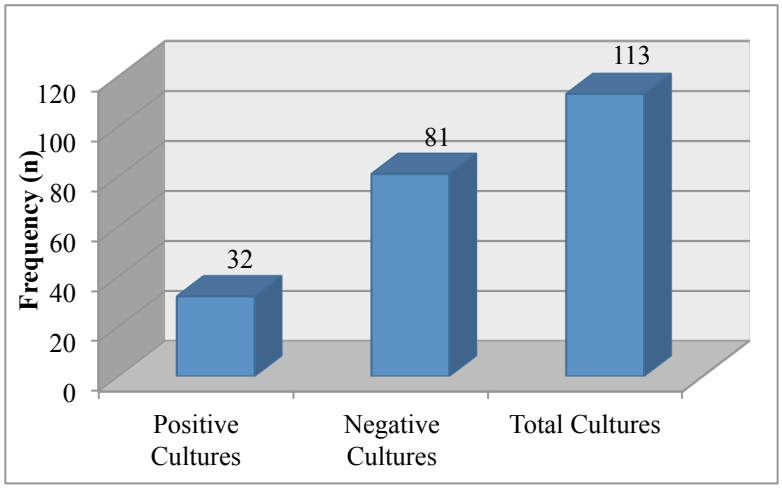

Figure 1. Culture positivity of uropathogens from July 2013 – June 2014

The result of species identification showed that *Escherichia coli* was the dominant isolate from the urine culture 13/32 (40.63%), followed by *Klebsiella pneumoniae* 4/32 (12.5%) and the rest was distributed almost equally (Figure 2). The percentage of Multi Drug Resistant Organisms (MDRO) was found to be (23/32) 71.9%, among these, there were (8/23) 34.78% Extended-Spectrum Beta Lactamase (ESBLs) and (2/23) 8.7% Carbapenemase Production Enterobacteriaceae (CPEs) as shown in Table 1.

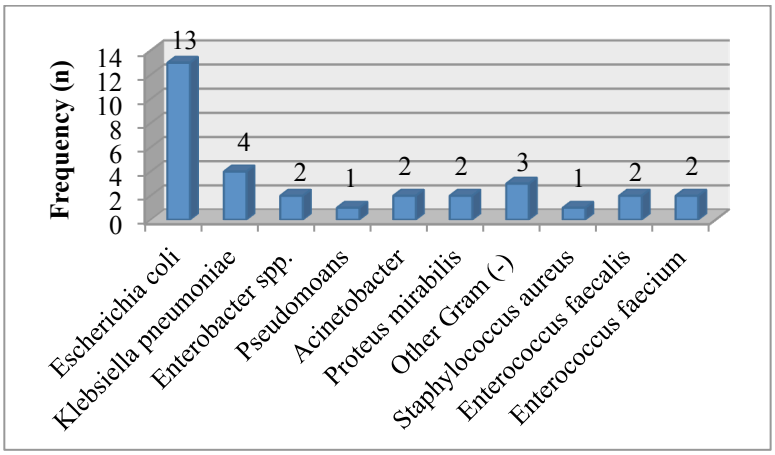

Figure 2: Distribution of isolate from urine culture July 2013-June 2014

Table 1. Percentage of MDRO isolates in urine sample from catheterized patients

Organisms	Percentage n/n total (%)
MDRO	23/32 (71.9)
ESBLs	8/23 (34.78)
CPEs	2/23 (8.7)
Non-MDRO	9/32 (28.1)

Table 2. Susceptibility Percentage of Gram Negative Bacilli and Gram Positive Cocci in Urine Culture

Antibiotics	*E.coli* (%)	*K. pneumonia* (%)	Other Gram Negative Bacteria[a] (%)	Gram Positive Cocci[b] (%)
Ampicillin	50	0	13	25
Amikacin	100	100	90	-
Amoxicilin	50	0	20	20
Ampicillin/Sulbactam	58	25	38	-
Cefazolin	69	25	30	100
Cefepime	69	25	88	100
Cefotaxime	69	25	57	100
Ceftazidime	69	25	70	100
Ceftriaxone	69	25	56	100
Ciprofloxacin	76	25	67	40
Erythromycin	-	-	-	20
Gentamicin	92	50	70	60
Imipenem	100	100	56	67
Levofloxacin	75	25	63	40
Meropenem	100	100	70	100
Moxifloxacin	-	-	-	40
Pipiracillin/Tazobactam	100	50	80	100
Tigecycline	100	75	50	100
Vancomycin	-	-	-	100

[a] *Enterobacter aerogenes, Burkholderia cepacia, Citrobacter koseri, Pseudomonas aeruginosa, Acinetobacter baumannii, Proteus mirabilis, Enterobacter cloacae*
[b] *Enterococcus faecium, Staphylococcus aureus, Enterococcus faecalis*

From the susceptibility results (Table 2), the antibiotic susceptibility of Amikacin ranges from 90-100% for gram negative bacteria. While Meropenem are still 100% susceptible for *Escherichia coli, Klebsiella pneumoniae,* and gram positive cocci; 70% susceptible for other gram negative bacteria.

Many of these isolates are resistant to Amoxicillin with susceptibility ranging from 0% - 50%. While, Cefazolin is still effective towards Gram positive coccus, the susceptibility of it towards gram negative bacteria was quite low. Fluoroquinolones such as ciprofloxacin has susceptibility ranging from 25%-76%; while Levofloxacin ranges from 25%-75%.

Discussion

The mean of age in this study is quite similar to the study that was conducted in Manado, Indonesia which has the most positive urine culture was in patients > 60 years old.[16] Along with study that was conducted by Arnoldo, et al. in Italy[17] as well as in Tehran, Iran by Ghadiri.[18] Elder age, along with the presence of comorbid, decrease of immune status and the usage of urine catheter are the risk factors of bacteria colonization or CAUTI.

Escherichia coli was the most found uropathogen in this study and followed by *Klebsiella pneumoniae*.

This result is similar with several other studies that were conducted in other places which comes out to be around 40-70%.[19,20,21] Both *Escherichia coli* and *Klebsiella pneumoniae* were bacteria that produce pathogenic biofilms that surround and grow on the surface of the urinary catheter.[22,23] The formation of biofilm is the strategy of bacteria to survive from the surrounding environments. On the other hand, these bacteria also produce plasmid enzyme Extended-Spectrum Beta Lactamase (ESBL) that can hydrolyzed antibiotics such as penicillin, 1st, 2nd and 3rd generation of cephalosporin, and aztreonam.

Staphylococcus spp. and *Enterococci* did not become the main lead of CAUTI incidence or colonization in this study. Comparable results with other studies found that the reason was that these microorganisms were commonly found in long-term urinary catheter usage along with prolonged usage of broad-spectrum antibiotics, especially in patients that were admitted in intensive care facilities.

Antibiotics susceptibility pattern in this study showed little differences compared to other studies such as lowest susceptibility level in Ampicillin and Amoxicillin, followed by Ciprofloxacin, Levofloxacin and Cephalosporin respectively, along with Carbapenem with the highest susceptibility rate. These results could be predicted as those antibiotics were frequently and with long-term usage to the hospitalized patients.

Conclusion

The proportion of *Escherichia coli* was the highest among with susceptibility of Meropenem was still high susceptibility for both gram negative and gram positive bacteria.

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Conflict of Interest

None.

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