Bacteriological and Antibiotic Susceptibility Profile of Urinary Tract Infection among Online Motorcycle Drivers in Jakarta, Indonesia

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RESEARCH ARTICLE

Bacteriological and Antibiotic Susceptibility Profile of Urinary Tract Infection among Online Motorcycle Drivers in Jakarta, Indonesia

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Abstract

Urinary tract infection (UTI) is a bacterial infection that contributes significantly to morbidity rates. UTI is a health concern due to multidrug-resistant (MDR) organisms. Therefore, the profile of bacteria and antibiotic susceptibility patterns are very important to know in order to make the best treatment choice. Working as an online motorcycle (*ojol* driver) carries a risk of urinary tract infections. Online drivers are assumed to often hold their urination for short or long periods. The descriptive study with a cross-sectional design was conducted to obtain the prevalence of urinary tract infections, bacteria profile, and antibiotic susceptibility in urine specimens collected from Jakarta *ojol* drivers in September 2022–March 2023. Of 98 midstream urine specimens, 17 samples are considered to have UTI (17.34%). The identification of the 17 isolates shows that the microorganisms' distribution was more likely to be caused by Gram-positive than Gram-negative bacteria (70.59%). The causative bacteria were coagulase-negative *Staphylococcus* (17.65%), *Escherichia coli* (11.76%), and *Enterococcus faecalis* (11.76%). Our results showed that the prevalence of urinary tract infections in *ojol* drivers is high with the distribution of the causative organisms by coagulase-negative *Staphylococcus*, *Escherichia coli*, and *Enterococcus faecalis* and still showed good susceptibility to narrow-spectrum antibiotics such as cotrimoxazole.

Keywords: Antibiotic susceptibility, bacteria, *ojol* drivers, urinary tract infection prevalence

Introduction

It has been estimated that about 150 million people worldwide develop urinary tract infections each year, with high social costs in terms of hospitalizations and medical expenses.[1] Urinary tract infections (UTI) are a significant cause of morbidity in infant boys, older men, and females of all ages.[2] Urinary tract infection is an infection that is often found in women aged 16–35 years; 10% of these women suffer from UTI annually, and more than 40–60% suffer from UTI at least once during their life. Recurrent infections are common; almost half will get a second infection within one year. Urinary tract infections occur at least four times more often in women than men. In men, UTI generally occurs at the age of over 50 years; infection under 50 years occurs with a lower prevalence.[3]

A definite diagnosis of urinary tract infection can be established if significant bacteriuria is found. Bacteriuria is a general term indicating the presence of bacteria in the urine on laboratory findings.[4] Based on the findings of the number of bacteria in the urine, it was significant bacteriuria if the urine culture showed the growth of pure microorganisms more than ≥105 colony forming units/ml (CFU/ml) in two consecutive sampling.[5–7] Bacteriuria with a bacterial count of 1,000–100,000 CFU/ml accompanied by a clinical presentation can be managed according to urinary tract infections. Asymptomatic bacteriuria occurs when bacteria are found in urine culture with a count of >105 CFU/ml and do not cause clinical symptoms of UTI.[5,7] Asymptomatic bacteriuria is not defined as a urinary tract infection.[8] Gram-negative, Gram-positive, and fungi can be found in bacteriuria. A single bacterial species causes most cases of UTI. Symptomatic bacteriuria (UTI) is generally caused by uropathogenic colonization of the urinary tract.[9] Uropathogenic *Escherichia coli* (UPEC) is the dominant infectious agent in UTI. Meanwhile, infection by the Gram-positive bacteria *Staphylococcus saprophyticus* is less common. The use of antibiotics in cases of

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infection (UTI) is very recommended, but incorrect use and overuse create new health problems. The relative frequency of uropathogens varies depending on age, sex, catheterization, hospitalization, and previous antimicrobial exposure.[9] Some bacteria can develop resistance to certain antimicrobials. It is essential to update the sensitivity patterns of antimicrobials periodically because they vary and change in place and at different times.[10] UTI is a health concern due to multidrug-resistant (MDR) organisms.[11]

In recent years, the profession of an online motorcycle driver (online driver/*ojol*) has been popular due to public demand, and it can provide a good income. The non-governmental organization Prakarsa surveyed 213 online drivers and obtained results showing that 30% of online drivers tended to work beyond working hours (>8 hours/day).[12] The profession as an online driver has a risk of urinary tract infections caused by lack of hydration and the behavior of frequently holding urine for short or long periods.[7,13] In most cases, holding your urine briefly is not dangerous. However, urine retained in the bladder decreases bacterial eradication and increases bacterial growth, associated with an increased risk of infection in the urinary tract. [14]

This study aimed to provide information regarding the bacteria and its susceptibility profile as the frequent infectious agent found in *ojol* drivers' community urinary tract infections.

Methods

A descriptive study with a cross-sectional approach was conducted at the Faculty of Medicine Universitas Trisakti, West Jakarta city, Indonesia between September 2022–March 2023. The inclusion criteria were ojol drivers of all genders aged 17–60 years old. Consumption of any antibiotics in the last week was excluded. The information about gender, age, and length of work was collected by filling out the form. Data about the clinical manifestation of urinary tract infection was collected from the questionnaire. Collection of midstream urine is required to perform bacteria culture. We used a 0.01 µl sterile loop to streak the specimen to media cultivation and incubate it at 2–8°C for 18–24 hours before we did a colony count to obtain the number of colonies in CFU/ml. Species identification and antibiotic testing are performed from isolates with colony number 100,000 CFU/ml or 1,000–10,000 CFU/ml with UTI symptoms data. Data analysis was performed descriptively using tables and narrative statements, which include the distribution of respondents' characteristics (age, sex, length of work, clinical manifestations, UTI status, bacterial profile, and antibiotic susceptibility pattern. All data were shown as numbers and percentages. Ethics Committee approval was given for this research (ethical clearance number: 167/KER/FK/VIII/2022).

Results

This study obtained 98 urine specimens from 98 respondents (Table 1). The respondents were men-dominant (78.94%). The age group is between 17 and 40 years (67.35%). The average respondent has worked for 1–5 years as an online driver (72.63%). After the urine culture was performed, there were three samples with a colony count of >105 CFU/ml (significant bacteriuria) on agar culture and 14 samples with a colony count of 1,000–100,000 with clinical symptoms of a urinary tract infection. Of the total respondents who filled out the questionnaire, 25 respondents stated that they had at least one of the symptoms of cloudy colored urine, urinating more than one time during sleep at night, urinating in small quantities and frequently, voiding feeling incomplete, pain or burning feeling while urinating.

In this study, culture identification and

Table 1 Distribution of Respondents

Respondents Characteristics	n=98 (%)
Gender	
Male	77 (78.57)
Female	21 (21.43)
Age (years)	
17–40	66 (67.35)
41–60	32 (32.65)
Length of work (year)	
<1	2 (2.04)
1–5	69 (70.41)
>5	27 (27.55)
UTI manifestation	
Yes	25 (25.51)
No	73 (74.49)
Confirmed UTI	
Confirmed	17 (17.34)
Not confirmed	81 (82.65)

Table 2 Distribution of Bacteria Causing Urinary Tract Infections

Microorganisms	n=98 (%)
Gram-negative	5 (29.41)
Eschericia coli	2 (11.76)
Enterobacter cloacae complex	1 (5.88)
Pantoea sp.	1 (5.88)
Sphingomonas paucimobilis	1 (5.88)
Gram-positive	
Enterococcus faecalis	2 (11.76)
Staphyococcus aureus	1 (5.88)
Coagulase-negative *Staphylococcus*	3 (17.65)
Streptococcus agalactiae	1 (5.88)
Kochuria rosea	1 (5.88)
Corynebacterium minutissimum	2 (11.76)
Corynebacterium amycolatum	1 (5.88)
Corynebacterium sp.	1 (5.88)

antibiotic sensitivity were carried out in specimens with bacteriuria ≥100,000 CFU/ml or 1,000-100,000 CFU/ml with clinical manifestation of UTI. Seventeen isolates from 17 samples were identified. Data were obtained from the identification of bacteria (Table 2).

From Table 2, the infectious agents of urinary tract infections in ojol drivers in this study were more commonly caused by Gram-positive bacteria than Gram-negative bacteria. In the Gram-negative group, *Escherichia coli* is the most common species found in UTIs. In the Gram-positive group, coagulase-negative *Staphylococcus* is the most common species, followed by *Enterococcus faecalis*.

The antibiotic sensitivity test was carried out with the identification test to obtain the sensitivity pattern of the tested bacteria. Tables 3 and Table 4 show the description and pattern of sensitivity of Gram-negative and Gram-positive bacteria, respectively.

We use 9–17 antibiotic disks in the Gram-negative bacteria sensitivity test. All *Escherichia coli* bacteria are sensitive (100%) to the antibiotics amikacin, aztreonam, cefazolin, cefepime, ceftazidime, ceftriaxone, ertapenem, fosfomycyn, meropenem, nitrofurantoin, piperacillin-tazobactam, tigecycline, trimethoprim-sulfamethoxazole. The *Escherichia coli* bacteria obtained were excluded from the extended-spectrum beta-lactamase (ESBL) group.

In Gram-positive bacteria, 6–18 antibiotic discs are used for sensitivity testing. Cefoxitin test was only carried out on *Staphylococcus* sp. bacteria (*Staphylococcus aureus*, *Staphylococcus shiurim*, *Staphylococcus xylosus*, and *Staphylococcus haemolyticus*) with negative results. All *Enterococcus faecalis* bacteria show sensitivity (100%) to the antibiotics ampicillin, benzylpenicillin, ciprofloxacin, gentamycin, levofloxacine, linezolid, nitrofurantoin, streptomycin, tigecycline, and vancomycin.

Discussion

Urinary tract infections (UTIs) are among the most common and severe infections in community and hospital environments. They are an important health concern because the number of multiresistant bacteria that cause them is increasing.

The prevalence of UTI in this study was 17.34%. This figure is higher than the prevalence of UTI stated by Mayangsari et al.[15] and Rosana et al.[16] This study showed that the incidence of UTI was more common in women (52.90%). Urinary tract infections occur at least four times more often in women than men in a previous study by Bono et al.[3] Syaikacitta et al.[17] also found in their

Table 3 Bacterial Profile and Antibiotic Susceptibility Pattern of Gram-negative Bacteria

No	Microorganisms Gram-negative	No of Isolate	Antibiotics																				
			AK	AMP	AMS	ATM	CZO	FEP	CAZ	CRO	CXM	CIP	DOR	ETP	FOS	GEN	IPM	LVX	MEM	NIT	TZP	TGC	SXT	ESBL
1	*Eschericia coli*	2	100	0	0	100	100	100	100	100	–	50	–	100	100	50	–	–	100	100	100	100	100	Neg
2	*Enterobacter cloacae* complex	1	100	0	0	100	0	100	100	100	–	0	–	100	100	100	–	–	100	100	100	100	100	–
3	*Pantoea* sp.	1	100	–	100	–	–	100	–	–	100	–	100	–	100	–	–	100	0	–	–	–	0	–
4	*Sphingomonas paucimobilis*	1	100	–	100	–	–	100	–	–	0	100	–	–	0	–	0	0	0	–	–	–	–	–

Note: n=5, –: not tested, AK: amikacin, AMP: ampicillin, AMS: ampicillin-sulbactam, ATM: aztreonam, CZO: cefazoline (urine), FEP: cefepime, CAZ: ceftazidime, CRO: ceftriaxone, CXM: cefuroxime, CIP: ciprofloxacin, DOR: doripenem, ETP: ertapenem, fosfomycyn: FOS, gentamycin: GEN, imipenem: IPM, levofloxacin: LVX, meropenem: MEM, nitrofurantoin: NIT, TZP: , TGC: piperacillin-tazobactam tigecycline, SXT: trimethoprim-sulfamethoxazole, ESBL: extended-spectrum beta-lactamase

Table 4 Bacterial Profile and Antibiotic Susceptibility Pattern of Gram-positive Bacteria

No	Microorganisms Gram-negative	No of Isolate	Antibiotics																			
			AMP	P	FEP	C	CIP	DA	GEN	LVX	LZD	MFX	NIT	OXA	QD	RIF	STR	TE	TGC	SXT	VAN	CS	ICR
1	*Enterococcus faecalis*	2	100	100	–	–	100	–	100	100	100	–	100	–	0	–	100	50	100	–	100	–	–
2	*Staphylococcus aureus*	1	–	0	–	–	100	100	100	100	100	100	100	100	100	100	–	100	100	100	100	Neg	Neg
3	*Coagulase-negative Staphylococcus*	3	–	33.3	–	–	100	100	100	100	100	100	100	100	100	100	–	66.7	100	100	100	Neg	Neg
4	*Streptococcus agalactiae*	1	100	100	–	–	–	100	–	100	100	100	100	–	100	–	–	0	100	–	100	–	–
5	Kochuria rosea	1	–	–	100	100	–	–	–	–	100	–	–	–	–	–	–	0	–	100	–	–	–
6	*Corynebacterium minutissimum*	2	–	–	0	100	–	–	–	–	100	–	–	–	–	–	–	100	–	0	–	–	–
7	*Corynebacterium amycolatum*	1	–	–	0	0	–	–	–	–	100	–	–	–	–	–	–	100	–	0	–	–	–
8	*Corynebacterium* sp.	1	–	–	0	100	–	–	–	–	100	–	–	–	–	–	–	100	–	0	–	–	–

Note: n=12, –: not tested, AMP: ampicillin, P: benzylpenicillin, FEP: cefepime, C: chloramphenicol, CIP: ciprofloxacin, DA: clindamycin, E: erythromycin, GEN: gentamycin, LVX: levofloxacine, LZD: linezolid, MFX: moxifloxacin, NIT: nitrofurantoin, OXA: oxacillin, QD: quinupristin-dalfopristin, RIF: rifampicin, STR: streptomycin, TE: tetracycline, TGC: tigecycline, SXT: trimethoprim-sulfamethoxazole, VAN: vancomycin, CS: cefoxitin screen, ICR: inducible clindamycin resistance

research that the highest incidence of UTI was in females (57.58%) compared to males (12.12%). Anatomically, women have shorter urethra and the proximity of the external urethral meatus to the anus compared to men, and these are risk factors that increase urinary tract infections through the ascending route.[6]

Bacteria found were more Gram-positive (70.59%) than Gram-negative (29.41%). *Escherichia coli* is the most Gram-negative bacteria (40%). At the same time, the most Gram-positive is coagulase-negative *Staphylococcus* (25%), followed by *Enterococcus faecalis* (16.67%). The results of this study showed a different variety of etiological agents from previous research. Previous retrospective research showed the most common bacteria found were Gram-negative, namely *Escherichia coli* and *Klebsiella pneumonia*.[10] Similar studies in Pawe General Hospital in Northwest Ethiopia showed that the most predominant bacterium isolated from urine is *Escherichia coli*, which belongs to Gram-negative.[18] Study results in 2019–2020 from patients with UTI at Islamic Hospital Surabaya, Indonesia, showed the proportion Gram-negative and Gram-positive was 52.0% and 48% with dominantly *Escherichia coli* and *Enterococcus* sp.[17]

Most of the Gram-positive bacteria found are sensitive to all antibiotics. Coagulase-negative *Staphylococcus* is 100% sensitive to the antibiotics ciprofloxacin, levofloxacin, moxifloxacin, vancomycin, linezolid, tigecycline, and cotrimoxazole. *Staphylococcus* sp. bacteria were found to be 100% sensitive to cefoxitin and not included in the methycillin-resistant *Staphylococcus* group, so they can still be killed with beta-lactam antibiotics, for example, cephalosporins 1st and 2nd generation. Other narrow-spectrum antibiotics, such as cotrimoxazole, have susceptibility test results that are still very good (100%). *Enterococcus faecalis* bacteria were found 100% sensitive to the antibiotics penicillin, ampicillin, ciprofloxacin, levofloxacin, vancomycin, linezolid, and tigecycline, while other studies showed many *Enterococcus* spp. were resistant to vancomycin (vancomycin-resistant enterococci, VRE) and beta-lactams vary in each region due to intrinsic and acquired antibiotic resistance genes.[19,20]

Meanwhile, the most common Gram-negative bacteria isolate, *Escherichia coli*, is not an ESBL-producing strain. This bacterium is still sensitive to most beta-lactam antibiotics and cotrimoxazole. Other studies showed vast differences in bacteria and their susceptibility patterns. According to the sensitivity profiles, Zúniga-Moya et al.[21] found the most effective antibiotics were fosfomycin (68.9%), amikacin (68.4%), nitrofurantoin (62.5%), gentamicin (60.5%), and ceftriaxone (50.1%).

Antibiotic cotrimoxazole (trimethoprim-sulfamethoxazole) has been a first-line drug in urinary tract infections since 1960. It shows good effectiveness against most *Enterobacteriaceae* and *Staphylococcus* sp. in UTI.[22] Our study demonstrated that narrow-spectrum antibiotics such as cotrimoxazole can still be used as a choice for uncomplicated UTI therapy since it has 100% sensitivity. This result is in concordance with a study conducted by Rosana et al.[16] that revealed the effectiveness of cotrimoxazole for uncomplicated UTI in outpatients in Indonesia.

Decreased susceptibility was found

in quinolones antibiotics. The activity of ciprofloxacin against *Escherichia coli* and *Enterobacter cloacae* in this study was 50% and 0%. Quinolones were found to have a high percentage of resistance in a study conducted by Zuniga-Moya et al.[21] The study result showed that quinolones have resistance to Gram-negative and Gram-positive bacteria tested.

The limitation of this study was the number of isolates tested. In this study, 17 isolates were tested for identification and antibiotic sensitivity. Further studies with larger sample sizes are needed to make an antibiotic recommendation for UTI.

Conclusion

The prevalence of UTI in the *ojol* driver community was found to be high, and the causative bacteria were coagulase-negative *Staphylococcus*, *Escherichia coli*, and *Enterococcus faecalis*, which is highly sensitive to narrow-spectrum antibiotics such as cotrimoxazole.

Conflict of Interest

The authors affirm no conflict of interest in this study.

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