Research Article

The Characteristics Urinary Tract Infection and Antimicrobial Sensitivity Patterns in Pregnant Women

Karakteristik Infeksi Saluran Kemih dan Pola Sensitivitas Antimikroba pada Ibu Hamil

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Abstract

Objective: To determine the comparison of uropathogenic patterns and antimicrobial sensitivity tests in pregnant women in Manado.

Methods: This study was a cross-sectional study on 28 pregnant women with UTI who presented to Prof. Dr. R. D. Kandou General Central Hospital, Pancaran Kasih Hospital, and Manado City Bhayangkara Hospital in Manado from February 2021 to April 2021. The data were analyzed using Microsoft Excel software.

Results: Most pregnant women with UTI were within the age range of 20-35 years, namely 16 subjects (57.14%). Most had parity status of multipara, namely 15 subjects (53.57%). For the history of UTI, most subjects had no history of UTI, namely 16 subjects (57.14%), and had no history of contraception uses, namely 20 subjects (71.43%). Most subjects also had no history of vaginal discharge, namely 18 subjects (64.29%). Of 28 pregnant women with UTI, 23 (82.14%) were asymptomatic, while 5 (17.86%) were symptomatic. E.coli was the most commonly found pathogen and was still sensitive to most antibiotics.

Conclusion: The description of pregnant women with UTI in Prof. Dr. R. D. Kandou General Central Hospital, Pancaran Kasih Hospital, and Bhayangkara Hospital in Manado City was pregnant women aged 17-34 years, multigravida, in the 3rd trimester, had an education level of Elementary-High school, unemployed, under the minimum wage, had no history of UTI or contraception uses and had a history of vaginal discharge. Most pregnant women with UTI were asymptomatic. The most common bacterial growth was in E.coli, and it was still sensitive to most antibiotics.

Keywords: antimicrobial, microorganism, pregnancy, UTI.

Abstrak

Tujuan: *Untuk mengetahui perbandingan pola uropatogen dan uji kepekaan antimikroba pada perempuan hamil di kota Manado.*

Metode: *Penelitian ini merupakan penelitian yang menggunakan pendekatan potong lintang terhadap 28 perempuan hamil dengan ISK yang datang memeriksakan diri di RSUP Prof dr. R. D. Kandou Manado, RS Pancaran Kasih, dan RS Bhayangkara kota Manado dari Februari 2021 hingga April 2021. Analisis data dilakukan menggunakan program Microsoft Excel.*

Hasil: *Kelompok usia terbanyak dengan ISK pada ibu hamil adalah 20-35 tahun sebanyak 16 orang (57,14%). Karakteristik graviditas paling banyak adalah pada kelompok multipara yaitu sebanyak 15 orang (53,57%). Hasil karakteristik kelompok tanpa riwayat ISK merupakan yang paling banyak yaitu sebanyak 16 orang (57,14%). Mayoritas peserta penelitian tidak mempunyai riwayat pemakaian KB yaitu sebanyak 20 orang (71,43%). Mayoritas peserta penelitian mempunyai riwayat flour albus yaitu sebanyak 18 orang (64,29%). Hasil sebaran distribusi ibu hamil dengan ISK, didapatkan dari 28 subyek, terdapat 23 orang (82,14%) yang tidak memiliki gejala, sedangkan 5 orang (17,86%) memiliki gejala. Hasil sebaran jenis mikroorganisme yang tumbuh pada kultur paling banyak adalah E. coli dan mikroorganisme ini masih sensitif terhadap mayoritas antibiotik.*

Kesimpulan: *Gambaran sebaran perempuan hamil dengan ISK di RSUP Prof. Dr. R. D. Kandou, RS pancaran Kasih, dan RS Bhayangkara di kota Manado adalah pada perempuan hamil dengan usia 17-34 tahun, multigravida, hamil trimester 3, berpendidikan SD-SMA, tidak bekerja, memiliki penghasilan di bawah UMR, tidak memiliki riwayat ISK, tidak memiliki riwayat KB, dan memiliki riwayat fluor albus. Mayoritas perempuan hamil dengan ISK tidak memiliki gejala Pertumbuhan bakteri terbanyak adalah E.coli dan mikroorganisme tersebut masih sensitif terhadap mayoritas antibiotik.*

Kata kunci: *antimikroba, ISK, kehamilan, mikroorganisme.*

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INTRODUCTION

Pregnant women are a group that is of concern in healthcare services. Urinary tract infection is an issue in pregnant women. Urinary tract infection (UTI) is the most commonly found bacterial infection in pregnancy, with a mean prevalence of 2-10%.[1,2] Data has shown that approximately 150 million people suffer from UTI annually.[3] In Indonesia, the prevalence of asymptomatic bacteriuria is 7.3%.[5]

Physiological changes in the urinary tract during pregnancy increase the risk of UTI. Progesterone hormone and obstruction from the uterus cause pelvicalyceal system and ureter dilatation and increased vesicoureteral reflux. The pressure generated by the fetus head also obstructs blood and lymph drainage from the vesica, therefore causing edema and susceptibility to trauma.[6] UTI is the leading cause of poor pregnancy outcomes. It is associated with poor outcomes such as premature labor, intrauterine growth retardation, chorioamnionitis, and stillbirth, which increases neonatal mortality.[2]

According to SDKI in Indonesia, Infant Mortality Rate (IMR) has dropped from 35/1000 live birth (LB) in 2004 to 34/1000 live birth in 2007.[7] This complication is not only caused by symptomatic UTI but also asymptomatic bacteriuria.[8] Urinary tract infection is a condition that cannot be ignored since the prevalence of asymptomatic bacteriuria in pregnancy is still 7.3%. The incidence in adult women is higher than men or children.[9] Studies have shown that approximately 7% of pregnant women have a bacterial count in the urine of >100.000 cfu (colony forming unit)/ml. In nonpregnant women, the frequency ranges from 2.8%-22%. True infection occurs between gestational age 26 to 36 weeks, with the peak incidence in gestational age 30-32 weeks.[7] A study reported that 24% of pregnant women with urinary tract infection had preterm labor, and with the appropriate treatment, the premature labor could be reduced to 10%.[10,11]

Antimicrobial drugs as a pillar in modern medicine play a critical role in prophylaxis and treatment for infectious diseases. Large quantities and inappropriate uses are the leading cause of such a high number of resistant pathogenic microorganisms and commensal bacteria globally, which increases the demand for new antimicrobial drugs. Reducing the number of inappropriate antimicrobial drugs is the best approach to control bacterial resistance to antimicrobial drugs.[12,15] For this reason, the authors aimed to conduct a study to determine the comparison of uropathogenic patterns and antimicrobial sensitivity tests in pregnant women in Manado.

METHODS

This study was a cross-sectional study to evaluate the microorganism pattern of UTI in pregnant women. The study population was pregnant women who presented to Prof. Dr. R. D. Kandou General Central Hospital, Pancaran Kasih Hospital, and Manado City Bhayangkara Hospital in Manado from February 2021 to April 2021. The subjects in this study were selected by consecutive sampling who met the inclusion criteria and had signed informed consent. The total sample size was 28 women. The Hospital Ethics Committees and Institutional Review Board Approval approved this study.

The inclusion criteria for the subjects of this study were pregnant women with UTI who presented for antenatal care in the Department of Obstetrics and Gynecology, Prof. Dr. R. D. Kandou General Central hospital and Pancaran Kasih Hospital, and Manado City Bhayangkara Hospital in Manado; and willing to participate in the study and signing the Informed Consent. The exclusion criteria of this study were ongoing antimicrobial treatment, ongoing immunosuppressive treatment, history of urinary catheter use, history of sexual intercourse in the last 24 hours, and not willing to participate in the study. The sample was examined for urinalysis and culture tests.

The variables in this study were age, parity, gestational age, educations, occupations, socioeconomic background, history of UTI, history of contraception uses, history of vaginal discharge, UTI symptoms, types of microorganism, and antimicrobial sensitivity pattern. The data were analyzed using Microsoft Excel software.

RESULTS

The study population were pregnant women with UTI who presented to Prof. Dr. R. D. Kandou General Central Hospital, Pancaran Kasih Hospital, and Bhayangkara Hospital in Manado from February 2021 to April 2021 (Table 1).

Table 1. Characteristics of the Subjects

Characteristics	Total	
	N	%
Age range (years)		
<20	2	7.14
20-35	16	57.14
>35	10	35.72
Parity		
Primipara	13	46.43
Multipara	15	53.57
Gestational Age (trimester)		
1st	4	14.2
2nd	5	17.9
3rd	19	67.90
Education Level		
Elementary-High school	20	71.43
University/higher degree	8	28.57
Occupation		
Unemployed	21	75.00
Employed	7	25.00
Socioeconomic Status (wage)		
< Minimum	19	67.86
> Minimum	9	32.14
History of UTI		
Yes	12	32.14
No	16	42.86
History of contraception		
Yes	8	28.57
No	20	71.43
History of vaginal discharge		
Yes	18	64.29
No	10	35.71
UTI symptoms		
Yes	5	17.86
No	23	82.14

Most pregnant women with UTI were within the age range of 20-35 years, namely 16 subjects (57.14%). Most had parity status of multipara, namely 15 subjects (53.57%). For the history of UTI, most subjects had no history of UTI, namely 16 subjects (57.14%), and had no history of contraception uses, namely 20 subjects (71.43%). Most subjects also had no history of vaginal discharge, namely 18 subjects (64.29%). Of 28 pregnant women with UTI, 23 (82.14%) were asymptomatic, while 5 (17.86%) were symptomatic.

Table 2. Microorganism Growth

Microorganism Type (n=28)	Total N	%
E. coli	11	39.30
Enterobacter sp	3	10.71
Staphylococcus sp	4	14.29
Klebsiella sp	2	7.14
Streptoccocus sp	2	7.14
Stenotrophomonas sp	2	7.14
Others	2	7.14
Negative / No growth	2	7.14
Total	28	100

Table 2 showed that *E.coli* was the most commonly found pathogen in our study (11 subjects or 39.30%), followed by *Staphylococcus sp.* (4 subjects or 14.29%), *Enterobacter sp.* (3 subjects or 10.71%), *Klebsiella sp.* (2 subjects or 7.14%), *Streptococcus sp.* (2 subjects or 7.14%), *Stenotrophomonas sp.* (2 subjects or 7.14%), and other microorganisms (2 subjects or 7.14%). Other microorganisms included *Acinetobacter baumannii* (1 subject) dan *Trichosporon asahii* (1 subject). 2 subjects (7.14%) had no growth in their urinary bacterial culture test.

Table 3. Microorganism Sensitivity Test Result Found in UTI in Pregnancy

Antibiotics	E.coli			Enterobac-ter sp.			Staphylococ-cus sp.			Klebsiella sp.			Streptococcus sp.			Stenotroph-omonas sp.		
	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R
Amikacin	9	1	1	3	0	0	3	0	1	2	0	0	1	0	1	2	0	0
Azithromycin	8	1	2	1	1	1	2	1	1	2	0	0	2	0	0	1	0	1
Ampicillin	9	0	2	2	0	1	3	1	0	1	0	1	2	0	0	1	1	0
Amoxiclav	8	2	1	3	0	0	3	0	1	2	0	0	1	1	0	2	0	0
Cefotaxime	7	3	1	1	1	1	3	1	0	1	0	1	1	1	0	2	0	0
Cefazolin	9	2	0	3	0	0	4	0	0	2	0	0	1	0	1	2	0	0
Ampicillin/ Sulbactam	10	1	0	3	0	0	3	1	0	1	1	0	1	0	1	1	0	1
Cefixime	9	1	1	1	2	0	3	0	1	2	0	0	1	1	0	2	0	0
Cefuroxime	8	1	2	2	1	0	2	1	1	2	0	0	2	0	0	2	0	0
Ceftriaxone	7	3	1	2	0	1	2	0	2	1	0	1	1	1	0	1	1	0
Chloramphenicol	7	2	2	2	0	1	3	0	1	1	1	0	1	0	1	2	0	0
Ceftazidine	8	1	2	3	0	0	4	0	0	2	0	0	2	0	0	1	0	1
Clindamycin	9	1	1	2	1	0	3	0	1	1	0	1	2	0	0	2	0	0
Ciprofloxacin	8	1	2	1	2	0	2	0	2	2	0	0	1	1	0	2	0	0
Doxycyclin	7	3	1	3	0	0	3	0	1	1	1	0	2	0	0	2	0	0
Fosfomycin	9	0	2	2	1	0	2	0	2	1	0	1	2	0	0	2	0	0
Levofloxacin	8	1	2	2	1	0	3	0	1	1	1	0	1	0	1	2	0	0
Linezolid	8	2	1	3	0	0	3	1	0	2	0	0	1	1	0	1	1	0
Meropenem	8	1	2	3	0	0	4	0	0	1	0	1	1	0	1	2	0	0
Moxifloxacin	9	1	1	2	0	1	3	1	0	2	0	0	2	0	0	1	0	1
Mincocycline	7	1	3	3	0	0	3	0	1	2	0	0	1	1	0	2	0	0
Ofloxacin	9	2	0	3	0	0	2	1	1	2	0	0	2	0	0	1	1	0
Pipemidic Acid	7	1	3	2	1	0	3	0	1	1	1	0	1	0	1	2	0	0
Sulbactam/ Cefoperzone	10	1	0	2	1	0	2	1	1	1	1	0	2	0	0	2	0	0
Sulfametoxazole/ trimethoprim	9	1	1	1	1	1	2	1	1	1	0	1	1	1	0	1	0	1
Ticarcillin/ Clavulanic acid	10	0	1	2	1	0	3	0	1	2	0	0	2	0	0	2	0	0
Vancomycin	9	2	0	2	0	1	2	2	0	1	1	0	2	0	0	2	0	0
Tetracycline	9	0	2	2	0	1	3	0	1	1	0	1	1	0	1	2	0	0
Ticarcillyn	8	3	0	2	0	1	2	2	0	1	0	1	2	0	0	1	1	0
Trimetoprim	9	0	2	1	1	1	3	0	1	2	0	0	2	0	0	2	0	0
Novobiovim	8	3	0	2	1	0	3	1	0	2	0	0	2	0	0	2	0	0

Notes : S = Sensitive, I = Intermediate, R = Resistant

DISCUSSION

Of 28 subjects who met the inclusion and exclusion criteria, we obtained 26 (92.86%) subjects with positive urinary culture (detected bacterial growth) and 2 subjects (7.14%) with negative urinary culture (no bacterial growth detected). Most pregnant women with UTI were in the age range of 20-35 years, compared to <20 years and >35 years (57.14% vs. 7.14% vs. 35.72%, respectively). Most subjects were in multigravida, namely 15 subjects, compared to primigravida, 13 subjects (46.43% vs. 53.73%, respectively). As for the gestational age, most subjects were in their 3rd trimester, namely 19 subjects (67.9%). Most subjects had a low educational level, namely 20 subjects, compared to a higher degree (71.43% vs. 28.57%). Most subjects were also unemployed/ housewives, namely 21 subjects (75% vs. 25%). A higher number of subjects with UTI was found in the reproductive age, multipara, and the 3rd trimester. This result is in line with other studies, which suggested that women in these categories are sexually active.[16]

Most patients had no history of UTI (57.14% vs. 42.86%), no history of contraception uses (71.43% vs. 28.57%), had a history of vaginal discharge (64.29% vs. 35.71%), and were asymptomatic (82.14% vs. 17.86%). For the microorganism type distribution in the urinary culture, we found that the most common cause of UTI in pregnant women in Manado City was *E.coli,* namely 11 subjects (39.30%), followed by *Staphylococcus sp.* (14,29%), *Enterobacter sp.* (10,71%), Klebsiella sp. (7,14%), Streptococcus sp. (7,14%), *Stenotrophomonas sp.* (7,14%), and other microorganisms (7,14%) including *Acinetobacter baumannii* (1 subject) and *Trichosporon asahii* (1 subject).

E.coli is a commensal flora in the perineum region; thus, it can easily invade the urinary tract. The orifice of the urethra near the anus and a significantly shorter urethral length than men are the cause of such susceptibility

to urinary tract infection. The incidence of asymptomatic bacteriuria of 15% and caused mainly by E.coli.[17]Ethiopia found that the most common microorganism that causes UTI is E.coli (45.7%).[18,19] E.coli as the most microorganism (34.6%).[20] Studies in Hongkong, Pakistan, India, and Poland also found E.coli as the most common organism causing UTI.[14,21]

Half of *Staphylococcus sp* is normal flora on the skin, respiratory tract, and gastrointestinal tract in humans; however, there is also a primary pathogen in humans. Urinary tract infection caused by *Staphylococcus sp.* Typically occurs secondary to blood-borne infection. In this study, contamination was prevented by rinsing the genital with water and soap and drying it according to the standard protocol to obtain a midstream urinary sample. The time interval between taking the urine sample to examination was under 1 hour; therefore, contamination bacteria did not grow over 100.000 cfu (colony forming unit)/ml. The urine sample was midstream urine during the subject's ANC visit.

In this study, we found that *E. coli* microorganism was still sensitive to most antibiotics, such as amikacin, azithromycin, ampicillin, amoxiclav, cefotaxime, cefazolin, ampicillin/sulbactam, cefixime, cefuroxime, ceftriaxone, chloramphenicol, ceftazidime, clindamycin, ciprofloxacin, doxycycline, levofloxacin, meropenem, moxifloxacin, ofloxacin, sulfamethoxazole / trimethoprim, vancomycin, tetracycline, and novobiovim. *Staphylococcus sp.* was still sensitive to amikacin, azithromycin, ampicillin, amoxiclav, cefotaxime, cefazolin, ampicillin/sulbactam, cefixime, cefuroxime, ceftriaxone, chloramphenicol, ceftazidime, clindamycin, ciprofloxacin, doxycycline, levofloxacin, meropenem, moxifloxacin, ofloxacin, sulfamethoxazole / trimethoprim, ticarcillin / clavulanic acid, vancomycin, tetracycline, and novobiovim. *Enterobacter sp.* was still sensitive to amikacin, azithromycin, ampicillin, amoxiclav, cefotaxime, cefazolin, ampicillin / sulbactam, cefixime, cefuroxime, ceftriaxone, chloramphenicol, ceftazidime, clindamycin, ciprofloxacin, doxycycline, levofloxacin, meropenem, moxifloxacin, minocycline, ofloxacin, sulfamethoxazole/trimethoprim, sulbactam / cefoperazone, vancomycin, and tetracyclin

CONCLUSION

The description of pregnant women with UTI in Prof. Dr. R. D. Kandou General Central Hospital, Pancaran Kasih Hospital, and Bhayangkara Hospital in Manado City was pregnant women aged 17-34 years, multigravida, in the 3rd trimester, had an education level of Elementary-High school, unemployed, under the minimum wage, had no history of UTI or contraception uses and had a history of vaginal discharge. Most pregnant women with UTI were asymptomatic. The most common bacterial growth was in *E.coli,* followed by *Staphylococcus sp.,* and *Enterobacter sp.*The microorganisms in the urinary culture were still sensitive to most antibiotics. *E. coli* was sensitive to ampicillin/sulbactam, sulbactam/ cefoperazone, *clavulanic acid*, amikacin, ampicillin, cefazolin, cefixime, clindamycin, Fosfomycin, and moxifloxacin.

DECLARATIONS

ACKNOWLEDGMENT

None to declare

FINANCIAL DISCLOSURE or FUNDING

None to declare

CONFLICT of INTEREST

There is no conflict of interests.

INFORMED CONSENT

Obtained

INSTITUTIONAL REVIEW BOARD APPROVAL

Approved

ETHICAL COMPLIANCE with HUMAN

This study was conducted in compliance with the ethical standards of the responsible institution on human subjects as well as with the Helsinki Declaration. The Hospital Ethics Committees approved this study.

DATA AVAILABILITY

The authors declare that data supporting the findings of this study are available within the article.

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