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ORIGINAL ARTICLE

Profile of urinary tract infections in the Urology Polyclinic of Imelda Pekerja Indonesia General Hospital

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ABSTRACT

Urinary tract infection (UTI) is one of the most common infectious diseases in the world, affecting 150 million people every year.The purpose of this study was to determine the profile of urinary tract infection patients in the urology polyclinic at Imelda Pekerja Indonesia General Hospital.The type of research used in this study was observational analytic with a cross sectional study design. In this study, the population and sample included patients who experienced UTI infection at Imelda Pekerja Indonesia General Hospital. Univariate and bivariate analyses were performed. The results showed that sex was a significant risk factor for UTI. High-risk female gender can increase risk of UTI 4.442 times. Age was not a significant risk factor for UTI. Occupation was not a significant risk factor for UTI. A history of DM was not a significant risk factor for UTI. High-risk patients with a history of DM can increase risk of UTI 1.462 times, this risk was not statistically significant. A history of BSK is a significant risk factor for UTI. High-risk patients with a history of UTI can increase risk of UTI 4.929 times, this risk is statistically significant. Sex and a history of BSK were significant risk factors for UTI. Age, occupation, and history of DM were not significant risk factors for UTI.

Keywords: urinary tract infection, profile, risk factor

Introduction

The urinary system consists of the kidneys, ureters, bladder, and urethra, and its main function is to filter blood by removing waste products and excess water.[1] The urinary system plays an important role in the removal of metabolic waste products from the bloodstream. Other important functions performed by this system are normalizing the concentration of ions and solutes in the blood and regulating blood volume and blood pressure.[2] In healthy people, urine is sterile or contains very few microorganisms that can cause infection.[3] Urinary tract infections (UTIs) are infections that can occur in the urethra (urethritis), bladder (cystitis), or kidneys (pyelonephritis) and are one of the most common infectious diseases in the world, affecting 150 million people each year, with significant morbidity and high medical costs (e.g., it is estimated that the economic burden of recurrent UTIs in the United States is more than USD$5 billion per year).[4]

Although symptoms vary depending on the location of these infections, UTIs negatively impact patients' relationships, both intimate and social, resulting in decreased quality of life.[5] UTIs are classified as either uncomplicated (uISK) or complicated (cISK).[6] uISK typically affects healthy patients in the absence

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of structural or neurological abnormalities of the urinary tract.[5] cISK is defined as complicated when associated with urinary tract abnormalities that increase susceptibility to infection, such as catheterization or functional or anatomical abnormalities (e.g., obstructive uropathy, urinary retention, neurogenic bladder, renal failure, pregnancy, and presence of stones) (Flores-Mireles et al, 2015).[7]

According to the Ministry of Health of the Republic of Indonesia, in 2014, the number of patients with tract infections in Indonesia was estimated to reach 90 to 100 cases per 100,000 people per year or equivalent to approximately 180,000 cases per year.[8] Urinary tract infections (UTIs) are the leading cause of bacterial infections in women and are among the most common bacterial infections in general, with the majority caused by *Escherichia coli*.[9] These infections tend to recur, and this tendency increases with each additional infection. The frequency of recurrence varies depending on the type of infection, as well as the age and gender of the patient.[5] Despite acute treatment, 30-50% of women with UTIs experience recurrence within 6-12 months. The current European Association of Urology (EAU) guidelines define recurrent urinary tract infection (UTI) as the recurrence of uncomplicated and/or complicated UTIs with a frequency of at least three UTIs in the past year, or two UTIs in the past 6 months.[10]

Cai[11] discussed the risk factors for recurrent UTIs in depth and found that the main risk factor in sexually active premenopausal women is the frequency of sex. Other behaviors, including spermicide use, having a new sexual partner in the past year, urination habits before and after coitus, delayed urination/periodicity of urination, and vaginal washing also affect the risk of recurrence. In addition, early onset (<15 years), family history, body mass index and urination disorders all increase the risk in younger women.[12] The main risk factors in older women appear to be substantially related to the effects of reduced estrogen levels and include atrophic vaginitis, cystocele, increased post-voiding urine volume and decreased functional status.[13] The aim of this study was to determine the urinary tract infection profile of patients in the urology polyclinic at Imelda Pekerja Indonesia General Hospital.

Method

This study used a cross-sectional study design, which is included in the type of analytic observational research. The research was conducted during the period April 1 to June 30, 2024 at Imelda Pekerja Indonesia General Hospital, Medan. This research has received ethical approval from the Health Research Ethics Commission, Universitas Prima Indonesia, with registration number 1271012S. The population in this study were all medical records of patients hospitalized in the hospital in 2023, both those who experienced UTI and those who did not. The samples taken were 30 patients with UTI and 150 patients without UTI. Research data were obtained from patient medical records. The data analysis used included univariate analysis to analyze each variable separately to get an overview of the data. Furthermore, bivariate analysis was performed to analyze the relationship between two variables using the chi-square test or Fisher exact test. This analysis aims to determine whether there is a significant relationship between the UTI variable and the other variables studied.

Results

The population for this study was all medical record data of patients affected by UTI and not UTI, with a study sample of 30 people suffering from UTI and 150 people not suffering from UTI. The study involved 30 participants, with the majority being male (63.3%) and the most common age group being 20-44 years old (53.3%). Occupationally, the sample was diverse, with civil servants/BUMN employees, self-employed individuals, and private employees constituting 20% of the group. Housewives and students were also represented along with a smaller number of retired individuals and farmers.

E. coli is the most prevalent causative bacteria of urinary tract infections (UTIs), accounting for 50% of cases. *Klebsiella* and *Enterococcus* followed, with 23.3% and 6.7% respectively. A smaller proportion of cases was attributed to *Proteus*, *Staphylococcus*, and other bacteria. Regarding medical history, 70% of the participants had no history of diabetes mellitus (DM), while 30% were at risk of DM. Similarly, 70% of the patients had no history of urinary stones, while 30% were at risk due to a history of such stones (see Table 1).

As shown in Table 2, the majority of male patients (90.8%) had never experienced UTI, whereas the rest (9.2%) had UTI. Among female patients, the percentage of those who never experienced UTI was slightly lower (68.9 %), while the rest (31.1%) had experienced it. Statistical analysis showed a significant association between sex and UTI incidence ($p = 0.001$). The Odds Ratio (OR) was 4.442, with 95%

confidence limits (95% CI) between 1.994 and 10.122. Since the OR value is greater than 1 and does not include the number 1 in the confidence interval, it can be concluded that female sex is a significant risk factor for UTI incidence. This means that women have a 4.442 times higher risk of UTI than men. This result is statistically significant; therefore, it can be believed that sex is one of the factors that influence the occurrence of UTI.

Table 1. Characteristics of UTI patients (n=30)

Characteristics	n	%
Gender		
Female	19	36.7
Male	11	63.3
Age (years)		
20-44	16	53.3
45-65	12	40.0
>65	2	6.7
Occupation		
Civil servant/BUMN employee	6	20.0
Self-employed	5	16.7
Private employee	6	20.0
Housewive	7	23.3
Student	3	10.0
Retired	2	6.7
Farmer	1	3.3
UTI-causing bacteria		
E.coli	15	50.0
Enterococcus	2	6.7
Klebsiela	7	23.3
Proteus	4	13.3
Staphylococcus	1	3.3
Other	1	3.3
Medical history of DM		
None (not at risk)	21	70.0
Present (at risk)	9	30.0
History of urinary stones		
None (not at risk)	21	70.0
Present (at risk)	9	30.0

Table 2 shows that most respondents aged 20-45 years (79.5%) had never experienced a urinary tract infection (UTI). The remaining 20.5% had experienced UTI. In the 45-65 years age group, the proportion of respondents who had never experienced UTI was even higher at 86.7%. Meanwhile, 13.3% of the respondents in this age group had experienced UTIs. For the over 65 age group, the percentage of respondents who had never experienced a UTI was 83.3%, whereas 16.7% had experienced one. Although proportionally the 20-45 years age group had a slightly higher percentage of UTI sufferers, statistical analysis showed that there was no significant association between age and UTI incidence. This was indicated by a p-value of 0.461, which was greater than the general significance level of 0.05. As the age variable in this study had more than two categories, a commonly used statistical test to measure the strength of the association between two categorical variables, the odds ratio test, could not be applied.

Most respondents who worked as civil servants (85.7%) stated that they had never experienced UTIs, while the rest (14.3%) did. A similar pattern was also found among the self-employed (83.9% never, 16.1% ever) and private employees (77.8% never, 22.2% ever). However, the proportion of respondents who had experienced UTIs was higher among housewives (68.2% never and 31.8% ever). However, statistical analysis showed no significant association between age and UTI incidence (0.404). This means that age was not a factor influencing a person's risk of UTI in the respondent group in this study. As there were more than two age categories, the statistical test commonly used to compare risks (odds ratio) could not be applied to the age variable in this study.

Table 2. Association of risk factors with UTI (n=150)

Risk factor	Urinary tract infection			p	OR
	No	Yes	Total		
Gender					
Female	42 (68.9)	19 (31.1)	119 (100.0)	0.001	4.442 (1.949-10.122)
Male	108 (90.8)	11 (9.2)	61 (100.0)		
Age (years)					
20-44	62 (79.5)	16 (20.5)	78 (100.0)	0.461	
45-65	78 (86.7)	12 (13.3)	90 (100.0)		
> 65	10 (83.3)	2 (16.7)	12 (100.0)		
Occupation					
Civil servant/BUMN employee	36 (85.7)	6 (14.3)	36 (100.0)	0.404	
Self-employed	26 (83.9)	5 (16.1)	26 (100.0)		
Private employee	21 (77.8)	6 (22.2)	21 (100.0)		
Housewive	15 (68.2)	7 (31.8)	15 (100.0)		
Student	22 (88.0)	3 (12.0)	22 (100.0)		
Retired	20 (90.9)	2 (9.1)	20 (100.0)		
Farmer	10 (90.9)	1 (9.1)	10 (100.0)		
Medical history of DM					
None (not at risk)	116 (84.7)	21 (15.3)	137 (100.0)	0.481	1.462 (0.613-3.488)
Present (at risk)	34 (79.1)	9 (20.9)	43 (100.0)		
History of urinary stones					
None (not at risk)	138 (86.8)	21 (13.2)	159 (100.0)	0.002	4.929 (1.852-13.114)
Present (at risk)	12 (57.1)	9 (42.9)	21 (100.0)		

Most patients (84.7 %) without a history of diabetes mellitus (DM) did not experience urinary tract infections (UTIs). The remaining 15.3% of the patients experienced UTI. Similarly, the majority of patients with a history of DM did not experience UTI (79.1%). However, the proportion of patients with a history of DM who experienced UTI was slightly higher (20.9 %). Statistical analysis showed a significant association between a history of DM and the incidence of UTI. The significance value of 0.001 was less than 0.05, indicating a statistically significant association. The odds ratio (OR) test yielded a value of 1.462, indicating that patients with a history of DM had a 1.462 times higher risk of developing UTI than those without a history of DM. However, the 95% confidence interval (0.613-3.488) includes 1, indicating that this result was not statistically significant.

The results showed a significant association between a history of urinary tract stones and the incidence of urinary tract infection (UTI). Patients with a history of urinary tract stones had a 4.929 times higher risk of UTI than those without a history of urinary tract stones. This finding indicates that urinary stones are a strong independent risk factor for UTI. Although most patients, both with and without a history of urinary tract stones, did not experience UTI, the proportion of patients with a history of urinary tract stones who experienced UTI was significantly higher (42.9%) than that of patients without a history of urinary tract stones (13.2%).

Discussion

UTI are one of the most common infectious diseases in humans. Every year, more than 150 million people worldwide experience UTIs. Complicated UTI cases are a huge burden to the healthcare system, becoming a major cause of hospitalization.[14] The data show that UTIs cause 8 million visits to hospital emergency departments and 100,000 hospitalizations each year. More alarmingly, 27% of septicemia (serious blood infection) cases presenting to emergency departments are caused by urinary tract infections, a condition called urosepsis. This percentage increased to 42% in hospitalized patients.[15]

Research has shown that sex is a significant risk factor for UTIs. Women have a 4.442 times higher risk of UTI than men. This finding is in line with previous studies, which state that almost half of women who have experienced UTIs will experience recurrent infections within one year.[16] It is estimated that between 30% and 44% of women experience a second UTI within 6 months of the first infection. In contrast,

tract infections are much less common in men. Less than 10 cases per 10,000 men under the age of 65 are reported annually.[17]

The results of this study differed from those of previous studies. Although 20-45 years old experienced more UTIs in this study, this result contradicts the study of Öztürk and Murt[14] which showed an increase in the prevalence of UTIs in the elderly. Decreased immune system function and hormonal changes in the elderly are thought to be the main causes of the increased risk of UTI in this age group. Although housewives experienced more UTIs in this study, the association between occupation and UTI incidence was not statistically significant. This is in contrast to Öztürk and Murt[14] who highlighted factors in the work environment, such as limited toilet access and physical work demands, that may increase the risk of UTIs, especially in adult women.

The results of this study also showed that a history of diabetes mellitus (DM) did not significantly increase the risk of UTI, although there was a trend towards an increased risk of 1.462 times. This finding is not in line with previous study, which reported an increased risk of UTI in patients with DM. A UK study found that people with diabetes had a higher UTI rate than those without diabetes. Another UK study showed that women with long-term diabetes had a higher UTI risk than those recently diagnosed. A large international study involving over 6,000 people confirmed a higher UTI incidence in both men and women with diabetes. Two American studies also supported these findings, showing that people with type 2 diabetes were more likely to be diagnosed with UTIs, especially women and older individuals.[18–21]

This study showed a strong association between a history of urinary tract stones and a high risk of developing UTI. Patients with a history of UTI were 4.929 times more likely to experience recurrent UTI, which was a statistically significant difference. This can be explained by the following mechanism, as investigated by Öztürk and Murt[14]: urinary tract stones can block the normal flow of urine, causing it to pool within the urinary tract. This creates a stagnant and warm environment suitable for bacterial growth. As a result, bacteria originally present in small numbers can multiply rapidly and cause infections in the urinary tract.

Conclusion

Females were found to be at a significantly higher risk of developing UTIs than males. While there was a trend suggesting that individuals with a history of diabetes mellitus might have a higher risk of UTIs, this association was not statistically significant in this study. A strong association was found between a history of urinary stones and the incidence of UTIs. Individuals with a history of urinary stones were significantly more likely to experience UTIs. The relatively small sample size may have limited the generalizability of our findings. Reliance on self-reported medical history could introduce a potential bias. Longitudinal studies could help to establish a more definitive causal relationship between risk factors and UTI development. By addressing these limitations and conducting further research, a more comprehensive understanding of the factors that contribute to UTIs can be achieved. This knowledge can inform preventive strategies and treatment approaches for reducing the burden of UTIs on public health.

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