Research Article

Asymptomatic Bacteriuria in Women with Infertility

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Abstract

Objective: To determine the incidence of asymptomatic bacteriuria in infertile women and to compare its prevalence between women with primary and secondary infertility.

Methods: This retrospective cohort study utilized medical records of female patients with primary and secondary infertility who underwent routine urine screening using flow cytometry (Sysmex UF-5000) as part of infertility management at Kariadi Hospital from 2018 to 2020. Asymptomatic bacteriuria was defined as a bacterial count ≥58/μL in the absence of urinary symptoms.

Results: A total of 137 infertile women with complete medical records were included in the analysis. The overall incidence of asymptomatic bacteriuria was 80.3% (110/137). Among 88 women with primary infertility, 70 (79.5%) had asymptomatic bacteriuria, compared to 40 of 49 women (81.6%) with secondary infertility. There was no statistically significant difference between the two groups (p = 0.76). In 59.1% of bacteriuria cases, the findings were accompanied by positive markers such as leukocyturia, leukocyte esterase, or nitrite.

Conclusion: The incidence of asymptomatic bacteriuria among women presenting with infertility is notably high. No significant difference was observed between primary and secondary infertility groups. These findings suggest that routine urine screening may be a valuable, though currently underutilized, component of the initial infertility evaluation.

Keywords: asymptomatic bacteriuria, flow cytometry, infertility, urinalysis, urinary tract infection.

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INTRODUCTION

Urinary Tract Infection (UTI) represents a spectrum of conditions, ranging from Asymptomatic Bacteriuria (ABU) to cystitis and pyelonephritis.[1] ABU is defined as the presence of a significant quantity of bacteria in the urine ($\geq 10^5$ colony-forming units per milliliter) in the absence of attributable urinary symptoms.[2] Women are disproportionately affected by UTIs throughout their lifetime, with an estimated 50–60% experiencing at least one episode, primarily due to anatomical factors.[3]

The pathogenesis of most UTIs involves the ascending spread of uropathogens, predominantly originating from the gut flora, via the urethra into the bladder.[4] Host factors that influence susceptibility include behavioral factors (e.g., sexual intercourse and spermicide use), genetic predisposition (e.g., non-secretor blood group phenotype), and alterations in the vaginal microbiota that compromise colonization resistance.[5,6] The vaginal ecosystem, particularly the dominance of hydrogen peroxide–producing *Lactobacillus* species, plays a crucial role in protecting against uropathogenic colonization.[6,7] Disruption of this balance, as observed in conditions such as Bacterial Vaginosis (BV), increases the risk of both UTIs and upper genital tract infections.[8]

The association between genital tract infections and female infertility is of significant clinical importance. Pelvic Inflammatory Disease (PID), often resulting from ascending cervical infections, is a leading cause of tubal factor infertility due to post-inflammatory scarring and tubal occlusion.[9] Notably, a substantial proportion of PID cases are associated with BV-related anaerobic bacteria rather than classic sexually transmitted pathogens.[10] BV itself has been independently linked to infertility, with proposed mechanisms including the induction of a hostile inflammatory endometrial environment, immune-mediated damage to sperm, and increased susceptibility to other pathogens.[11,12] Furthermore, a strong clinical association exists between BV and concurrent UTIs, suggesting shared risk factors or impaired local mucosal immunity.[13]

In clinical practice, urinalysis serves as a first-line, rapid diagnostic tool for evaluating UTIs. Automated urine flow cytometry, such as the Sysmex UF-5000 analyzer, has enhanced the screening process by providing quantitative counts of bacteria (BACT) and other urinary particles. This technology enables rapid and sensitive exclusion of UTIs, thereby reducing unnecessary urine cultures.[14,15]

Infertility, defined as the failure to achieve a clinical pregnancy after 12 months of regular, unprotected sexual intercourse, affects a substantial proportion of couples.[16] Although the etiologies are diverse, infectious and inflammatory causes represent preventable and treatable contributors. Current Indonesian guidelines for infertility management (Konsensus Penanganan Infertilitas HIFERI-POGI) do not include routine urinalysis as a standard screening test for female partners.[17]

Given the high prevalence of UTIs in women, the established and potential pathophysiological links between urogenital tract infections and infertility, and the availability of efficient screening tools, investigating the prevalence of ABU in infertile women is warranted. This study aimed to determine the incidence of ABU in women presenting with infertility and to compare its frequency between those with primary and secondary infertility.

METHODS

This was a descriptive observational study with a retrospective cohort design. Data were collected from the medical records of infertile female patients at Dr. Kariadi General Hospital, a tertiary referral center in Central Java, Indonesia. The study period covered patients who underwent evaluation from January 2018 to December 2020, with data abstraction performed from April to July 2021. The study protocol received ethical approval from the Health Research Ethics Committee of Dr. Kariadi Hospital.

The study population consisted of women of reproductive age (15-49 years) diagnosed with either primary or secondary infertility who underwent a routine urine screening test as part of their initial infertility workup. The sampling technique was non-probability consecutive sampling. Inclusion criteria were; diagnosis of primary or secondary infertility, and availability of a complete urinalysis report from the Sysmex UF-5000 analyzer. Exclusion criteria included; presence of symptoms suggestive of a UTI (dysuria, urgency, frequency, suprapubic pain), diagnosis of other active genital tract infections at the time of screening, and incomplete medical records.

Data were extracted from electronic and paper-based medical records using a standardized form. Variables collected included patient age, type and duration of infertility, Body Mass index (BMI), presence of other gynecological conditions (e.g., endometrial polyp, ovarian cyst, uterine myoma), and results of the urine analysis.

Clean-catch midstream urine samples were analyzed using the Sysmex UF-5000 automated fluorescence flow cytometry analyzer at the hospital's central laboratory. This instrument provides quantitative parameters including bacterial count (BACT/µL), white blood cell count (WBC/µL), and flags for leukocyte esterase and nitrite. Based on the validated cutoff for screening, asymptomatic bacteriuria (ABU) for this study was defined as a bacterial count (BACT) ≥ 58/µL in the absence of urinary symptoms[15] Urine culture was not routinely performed following a positive screen in these asymptomatic patients, aligning with standard protocols for ABU in non-pregnant women.[2]

Data were processed and analyzed using IBM SPSS Statistics software (version 25). Descriptive statistics were presented as frequencies and percentages for categorical data, and means with standard deviations or medians with interquartile ranges for continuous data, as appropriate. The Chi-square test (or Fisher's exact test where applicable) was used to compare the proportion

of ABU between primary and secondary infertility groups and across other categorical variables. A p-value of <0.05 was considered statistically significant.

RESULTS

From 154 identified records, 137 infertile women met the inclusion criteria and had complete data for analysis. The clinical characteristics of the subjects are detailed in Table 1. The mean age was 29.5 ± 4.8 years, with the majority (65.7%) under 30 years. Most women (43.1%) had an infertility duration of 12-24 months. According to Asia-Pacific BMI classifications, 43.8% had a normal BMI, while 48.2% were overweight or obese. The most common concomitant gynecological condition was endometrial polyp (48.2%), followed by ovarian cyst (38%) and uterine myoma (7.3%).

Table 1. Clinical Characteristics of Study Subjects (N=137)

Characteristics	Total	Negative Bacteriuria	Positive Bacteriuria
	137 (100)	27 (19.7)	110 (80.3)
Age (Years)			
<30	90 (65.7)	20 (74.1)	63.6)
30-34	34 (24.8)	5 (18.5)	29 (26.4)
> 34	13 (9.5)	2 (7.4)	11 (10)
Duration of infertility (Months)			
12-24	59 (43.1)	14 (51.8)	45 (40.9)
>24 -36	28 (20.4)	6 (22.2)	22 (20)
>36	50 (36.5)	7 (25.9)	43 (39.1)
Body Mass Index			
Underweight (<18.5)	11 (8)	2 (7.4)	9 (8.2)
Normal (18.5 – 22.9)	60 (43.8)	9 (33.3)	51 (46.4)
Overweight (23 – 24.9)	29 (21.2)	7 (25.9)	22 (20)
Obese grade I (25-30)	27 (19.7)	8 (29.6)	19 (17.3)
Obese grade II (≥ 30)	10 (7.3)	1 (3.7)	9 (8.2)
Other gynecological diseases			
Endometrium polyp	66 (48.2)	15 (55.6)	51 (46.4)
Ovarian cyst	52 (38)	10 (37)	42 (38.2)
Uterine myoma	10 (7.3)	1 (3.7)	9 (8.2)
Others	9 (6.6)	1 (3.7)	8 (7.3)

**BMI: Body Mass Index (kg/m^2)*

Of the 137 infertile women, 110 (80.3%) were found to have ABU based on the flow cytometry cutoff (BACT ≥ 58/µL). The prevalence of ABU was 79.55% (70/88) in the primary infertility group and 81.63% (40/49) in the secondary infertility group. As shown in Table 2, the difference in ABU proportion between the two groups was not statistically significant (p=0.76).

Table 2. Incidence of Asymptomatic Bacteriuria by Infertility Type

Group	Normal urine	Asymptomatic Bacteriuria	Total	*P-value*
Primary Infertility	18 (20.5)	70 (79.5)	88 (100)	0.76
Secondary Infertility	9 (18.4)	40 (81.6)	49 (100)	
Total	27 (19.7)	110 (80.3)	137 (100)	

(a) = x^2 ,p < 0,05 = statistically significant

Among the 110 women with ABU, 65 (59.1%) had concomitant positive markers for leukocyturia, leukocyte esterase, or nitrite on the urinalysis, indicating subclinical inflammation. The proportion was slightly higher in the secondary infertility group (65.0%) compared to the primary infertility group (55.7%), but this difference was not statistically significant (p=0.34). See Table 3.

Table 3. Proportion of Bacteriuria with Inflammatory Urinalysis Markers

	Primary Infertility	Secondary Infertility	Total	*P-value*
Bacteriuria	31 (44.3)	14 (35.0)	45 (40.9)	0.34
Bacteriuria + (Leukocyturia/ Leukocyte esterase/ Nitrite)	39 (55.7)	26 (65.0)	65 (59.1)	
Total	70 (100)	40 (100)	110 (100)	

x^2 ,p < 0,05 = statistically significant

The mean bacterial count was higher in the primary infertility group (2,435.33/µL) compared to the secondary infertility group (1,991.51/µL), but this difference was not statistically significant (p=0.39). The bacterial counts ranged from 107/µL to 13,768/µL.

DISCUSSION

This retrospective study reveals a strikingly high incidence (80.3%) of asymptomatic bacteriuria among women undergoing evaluation for infertility at a tertiary hospital in Indonesia. We found no significant difference in ABU prevalence between women with primary and secondary infertility. Furthermore, in nearly 60% of ABU cases, the bacteriuria was associated with markers of inflammation (leukocyturia, positive leukocyte esterase, or nitrite), suggesting an active, though subclinical, host response.

The observed prevalence of ABU in this infertile population far exceeds the 1-5% expected in healthy, non-pregnant, premenopausal women.[2] This elevation aligns with the known increased risk of UTI in women with factors that alter urogenital flora. Bacterial vaginosis (BV), a condition strongly linked to both infertility and UTI risk, could be a key intermediary [11,13] The dysbiotic state in BV, characterized by a loss of protective lactobacilli and an overgrowth of anaerobes, may facilitate the ascension and persistence of uropathogens in both the vagina and urinary tract.[8,18] Our finding that a majority of ABU cases co-presented with inflammatory markers supports the notion that this is not merely passive colonization but may involve low-grade tissue irritation.

The lack of difference in ABU prevalence between primary and secondary infertility groups is intriguing. It suggests that the factors predisposing to ABU in this clinical setting whether anatomical, behavioral, microbiological, or immunological are similarly distributed across both infertility types. This reinforces the idea that ABU might be a common background finding or a shared risk factor rather than a direct consequence of the infertility etiology itself. However, the high prevalence warrants consideration of a potential pathogenic role. Chronic, subclinical inflammation in the genital tract, possibly fueled by persistent or recurrent bacteriuria, could create an unfavorable environment for implantation or early embryo development.[12,19]

Our study utilized automated flow cytometry (Sysmex UF-5000) for screening, which offers high sensitivity (99.4%) for detecting significant bacteriuria, as validated in prior studies[15]. This method is efficient for screening large cohorts and reduces laboratory workload by filtering out negative samples. The cutoff of 58 BACT/µL used in our study is derived from this validation and is appropriate for a screening context where high negative predictive value is prioritized.[15]

The current Indonesian guidelines for infertility management do not recommend routine urinalysis.[17] Our findings challenge this stance. Given the high prevalence of ABU and its potential links to genital tract inflammation a known detriment to fertility routine urine screening could be a simple, low-cost intervention to identify a treatable condition. Screening and appropriate management of ABU, particularly when inflammatory markers are present, might form part of a broader strategy to optimize the urogenital microenvironment prior to fertility treatments. This is especially relevant in populations with high rates of genitourinary infections.

This study has several limitations. Its retrospective design limits the depth of clinical data available (e.g., detailed sexual history, contraceptive use, history of BV). The diagnosis of ABU was based on flow cytometry without confirmatory urine culture, although the cutoff used is validated. We also did not perform a comparative analysis with a control group of fertile women. Furthermore, the single-center design may limit generalizability, although Kariadi Hospital serves a large and diverse population.

CONCLUSION

The incidence of asymptomatic bacteriuria among women presenting with infertility is exceptionally high, exceeding 80%, with no significant difference between primary and secondary infertility types. A substantial proportion of these cases show signs of concomitant urinary inflammation. These findings highlight a potential gap in current infertility evaluation protocols. We recommend that routine urinalysis be considered as a simple screening tool in the initial workup of infertile women. Future prospective studies, incorporating urine culture confirmation, detailed gynecological microbiological assessment (e.g., for BV), and correlation with fertility outcomes following treatment, are needed to elucidate the clinical significance and optimal management of ABU in this population.

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CONFLICT of INTEREST

The authors declare no conflicts of interest regarding the publication of this paper.

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