

## Bacteriuria in pregnancy in Sanglah Hospital: a descriptive study



I Wayan Megadhana<sup>1</sup>, Dewa Gede Sidan Pradnyandita<sup>2\*</sup>, Putu Doster Mahayasa<sup>1</sup>,  
I Gede Ngurah Harry Wijaya Surya<sup>1</sup>

### ABSTRACT

**Introduction:** Bacteriuria in pregnancy is quite common, with the prevalence of asymptomatic bacteriuria occurring in about 2-5% of pregnancies, acute cystitis occurring in 1.3% of pregnancies and acute pyelonephritis occurring in about 3%. If not treated properly, asymptomatic bacteriuria can increase the risk of pyelonephritis and the incidence of low birth weight (LBW). This study aims to describe the characteristics of patients with bacteriuria in pregnant women at Sanglah Hospital. Acknowledging the characteristics of patients with bacteriuria may help the screening process establish an early diagnosis and management.

**Methods:** This study is a retrospective descriptive study carried out at Sanglah Hospital Denpasar from January 2018 to January 2020. Pregnant women diagnosed with bacteriuria in pregnancy from January 2018 to January 2020 at Sanglah Hospital Denpasar who had met the inclusion criteria and did not meet the exclusion criteria were included in the study. Data regarding the patient's age, gestational age when bacteriuria was diagnosed, UTI complaints, bacterial urine levels, and culture results were collected for each subject.

**Results:** Based on the results of this study, it was found that the prevalence of positive bacteriuria from January 2018 to 2020 was 0.89%. Most of the pregnant women diagnosed with bacteriuria were aged 20-35 years (77.1%), had gestational age of 0 - 28 weeks (64.9%), were multigravida (52.7%), and had high school education level (50.8%). The majority of pregnant women who experience bacteriuria were included in the group of asymptomatic bacteriuria (64.9%). The urinalysis results on pregnant women with bacteriuria showed that most of the pregnant women (45.6%) had +1 bacteria levels, followed by +2 and +3 bacteria levels, namely 28% and 26.4%, respectively.

**Conclusion:** Bacteriuria in pregnancy is still a problem that is often encountered in daily practice.

**Keywords:** bacteriuria, pregnancy, urinary tract infection.

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<sup>1</sup>Obstetric and Gynecology Department,  
Faculty of Medicine, Universitas  
Udayana-Sanglah General Hospital, Bali,  
Indonesia;

<sup>2</sup>Obstetric and Gynecology Resident,  
Faculty of Medicine, Universitas  
Udayana-Sanglah General Hospital, Bali,  
Indonesia;

\*Corresponding author:

Dewa Gede Sidan Pradnyandita;  
Obstetric and Gynecology Resident,  
Faculty of Medicine, Universitas  
Udayana-Sanglah General Hospital, Bali,  
Indonesia;  
[drsidadanpradnyandita@gmail.com](mailto:drsidadanpradnyandita@gmail.com)

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### INTRODUCTION

Bacteriuria is diagnosed when there are significant amounts of bacteria in the urine. The number of significant bacteria has limits that vary depending on the method of collection, clinical complaints and supporting data such as urinalysis results, blood tests, and imaging. In pregnancy, bacteriuria is differentiated into asymptomatic and symptomatic bacteriuria or urinary tract infection (UTI). Both conditions are clinically significant because they have the potential to cause unwanted effects on pregnancy, such as pyelonephritis, premature birth, stunted fetal growth and so on.<sup>1</sup>

Bacteriuria in pregnancy is quite common. Asymptomatic bacteriuria occurs in about 2-5% of pregnancies.<sup>1</sup> While UTI depends on the site of

infection, acute cystitis occurs in 1.3% of pregnancies while acute pyelonephritis occurs in about 3%, and with a recurrence rate of 23% in the same pregnancy.<sup>2</sup> In Indonesia alone, the prevalence of bacteriuria in pregnancy in Indonesia is 7.3%.<sup>2</sup> The prevalence of bacteriuria in Bali is not known with certainty. Still, based on research conducted by Amalia et al.<sup>3</sup> the incidence of UTI in pregnant women at Sanglah Hospital in 2014 reached 50%. On culture examination, the most frequently identified causative bacteria is *Escherichia coli* (*E. coli*) both asymptomatic and symptomatic.<sup>3</sup> Other bacteria that may be identified include *Streptococcus B*, *Klebsiella*, *Enterobacter*, *Proteus* and *Staphylococcus saprophyticus*. *Proteus*, *Coagulase-negative Staphylococcus*, *Klebsiella*, and *Pseudomonas* are urea-splitting bacteria.<sup>4</sup>

Bacteriuria in pregnancy is often based on several risk factors, both external and internal, including anatomical or physiological changes that occur during pregnancy. External factors such as low economic status and sexual activity, while internal factors such as diabetes, multiparity, age, urinary tract abnormalities, and other diseases facilitate bacteriuria.<sup>4</sup> Changes in hormone concentrations in pregnancy cause urethral dilatation and decreased bladder muscle tone resulting in urinary stasis. Increased concentrations of nutrients such as glucose, amino acids, and other nutrients also increase the risk of bacteriuria. A history of a previous UTI also increases the risk of a UTI developing a subsequent UTI.<sup>5,6</sup>

Asymptomatic bacteriuria increases the risk of developing pyelonephritis

if untreated. The administration of antibiotics effectively reduces low birth weight (LBW) and pyelonephritis.<sup>7</sup> Screening for asymptomatic bacteriuria in pregnant women is important to determine appropriate early management. This study aims to describe the characteristics of bacteriuria in pregnancy at Sanglah Hospital. It is hoped that knowing the characteristics of bacteriuria patients can help the screening process, establish a diagnosis and determine early management of bacteriuria.

## METHOD

This research is a retrospective descriptive study, which was carried out at Sanglah Hospital Denpasar by taking data from the register of patients who came to the Obstetrics and Gynecology Emergency Department and weekly report data (weekly report) of Obstetrics and Gynecology Residence Program from January 2018 to January 2020. The population of this study was pregnant women who experienced bacteriuria at Sanglah Hospital from January 2018 to January 2020, with inclusion criteria: pregnant women diagnosed with bacteriuria from January 2018 to January 2020, had complete data (records) of maternal age at diagnosis, gestational age at the time of diagnosis. Examination, number of gravida, and urinary bacteria levels based on urinalysis examination, as well as exclusion criteria: pregnant women with complications of early pregnancy; ectopic pregnancy, hydatidiform mole, abortion. The research sample was taken by total sampling technique.

The procedure of this study is as follows, the selection of subjects was carried out based on pregnant women with a diagnosis of bacteriuria in pregnancy from January 2018 to January 2020 at Sanglah Hospital Denpasar. The patient's diagnosis was obtained from the anamnesis and the physical examination results recorded in the medical record. Subjects included in the study met the inclusion criteria and did not meet the exclusion criteria. Every subject, data were collected on age, gestational age when bacteriuria was diagnosed, UTI symptoms, urine bacterial levels and culture results. The data of this study were taken at one time. Gestational

age data were tabulated based on maternal age group, gestational age group, gravida, and bacterial levels on urinalysis. All of the data will be processed descriptively.

## RESULT

The results of this study showed that of the 6,356 pregnant women who visited from January 2018 to January 2020, as many as 57 pregnant women had bacteriuria. Thus, positive bacteriuria in pregnant women at Sanglah Hospital in 2018 - 2020 was 0.89%. The majority of pregnant women diagnosed with bacteriuria were aged 20-35 years (77.1%), had a gestational age of 0-28 weeks (64.9%), were multigravida (52.7%), and had a high school education level (50.8%). Most of the pregnant women with bacteriuria in this study had no clinical complaints or symptoms, so they were included in the category of asymptomatic bacteriuria (64.9%). The distribution of the characteristics of this subject is shown in detail in [Table 1](#).

The diagnosis of bacteriuria in pregnant women involved in this study

was established based on the results of urinalysis examinations obtained from the medical records of pregnant women during antenatal care (ANC) visits at the Obstetrics and Gynecology Polyclinic of Sanglah Hospital Denpasar from January 2018 to January 2020. [Table 2](#) shows that most pregnant women (45.6%) had a bacterial concentration of +1 based on the results of urinalysis which was equivalent to < 4 cells/LPB. The number of pregnant women with +2 and +3 bacteria levels was almost the same, namely 16 pregnant women (28%) and 15 pregnant women (26.4%), respectively.

## DISCUSSION

This study found that the prevalence of positive bacteriuria in pregnant women from 2018 to 2020 at Sanglah Hospital was 0.89% (57 patients). Most of the pregnant women diagnosed with bacteriuria were aged 20-35 years (77.1%) and no pregnant women with bacteriuria were aged <20 years. This is in accordance with previous studies where bacteriuria in pregnancy

**Table 1. Study participant characteristics.**

Characteristics	n (%)
<b>Maternal age</b>	
<20 years	0 (0)
20-35 years	44 (77.1)
>35 years	13 (22.9)
<b>Gestational age</b>	
0-28 weeks	37 (64.9)
29-36 weeks	20 (35.1)
≥ 37 weeks	0 (0)
<b>Gravida</b>	
Primigravida	27 (47.3)
Multigravida	30 (52.7)
<b>Educational status</b>	
Elementary school	0 (0)
Junior high school	19 (33.3)
Senior high school	29 (50.8)
University graduate	9 (15.9)
<b>Complaint</b>	
Symptomatic	20 (35.1)
Asymptomatic	37 (64.9)

**Table 2. Distribution of bacterial levels based on urinalysis examination.**

Urinalysis	n (%)
<b>Bacteriuria</b>	
+1 (<4 cell/high visual fields)	26 (45.6)
+2 (5-9 cell/high visual fields)	16 (28.0)
+3 (10-30 cell/high visual fields)	15 (26.4)
+4 (>30 cell/high visual fields)	0 (0)
<b>Total</b>	<b>57 (100)</b>

was most commonly found in women of reproductive age. Wabe et al.<sup>8</sup> conducted a study on asymptomatic bacteriuria in 290 pregnant women in Ethiopia. His research showed that the mean age of pregnant women with bacteriuria was  $27 \pm 4.5$  years and the majority of pregnant women (58.3%) with bacteriuria were found in the age group of 26-34 years. Similar results were shown by the research of Bose et al.<sup>9</sup> where 26 of 55 pregnant women (48.29%) with asymptomatic bacteriuria were in the 21-25 year age group and the second highest age group (32.79%) was found in the 26-30 year age group. A cohort study involving 497 pregnant women with bacteriuria showed that there was a significant relationship between maternal age and the incidence of bacteriuria during pregnancy ( $p=0.032$ ) with the majority of pregnant women being in the 25-34 year age group.<sup>10</sup>

Although most previous studies have shown that the majority of bacteriuria in pregnant women occurs at reproductive age, Nguetack et al.<sup>11</sup> in his research in Douala showed that the majority of pregnant women with bacteriuria were found in the older age group, namely 38-42 years. This study also proved no significant relationship between maternal age and the incidence of bacteriuria in pregnancy ( $p=0.95$ ). Study by Elzayat et al.<sup>12</sup> also showed that the majority of pregnant women with bacteriuria were aged 20-30 years (70.5%) and no pregnant women with bacteriuria were aged <20 years in the study. However, Elzayat et al.<sup>12</sup> showed no significant relationship between the incidence of bacteriuria in pregnancy and maternal age ( $p=0.29$ ).

Previous studies have linked older age as a risk factor for asymptomatic bacteriuria in pregnancy due to decreased glycogen deposition and decreased lactobacilli due to aging. This will further facilitate the adhesion and invasion of pathogenic bacteria in the urinary tract of pregnant women so that older pregnant women are generally more susceptible to bacteriuria during pregnancy. In addition, the incidence of bacteriuria is more often found in the reproductive age group (20-35 years) presumably due to higher sexual activity in this age group. Sexual intercourse will increase the transfer of

uropathogens from the perineum to the urethra during sexual intercourse, causing bacteriuria. Therefore, education related to genital cleaning from front to back and advice to urinate immediately after sexual intercourse is needed to reduce the risk of bacteriuria in pregnant women.<sup>12</sup>

Most of the pregnant women with bacteriuria in this study had a gestational age of 0-28 weeks (64.9%) and no pregnant women with bacteriuria had a gestational age of 37 weeks. Bose et al.<sup>9</sup> also showed that the incidence of bacteriuria in pregnant women was more dominantly found at a younger gestational age, which was mostly at 5-10 weeks of gestation (50%), followed by 10-15 weeks of pregnancy (26.92%) and gestational age of 15-20 weeks (19.23%). The same thing was also found by Nguetack et al.<sup>11</sup> in his study where the majority of pregnant women (45.7%) with bacteriuria were found in the second trimester (13-27 weeks) gestational age group and the least was found in the first trimester (0-13 weeks). However, the relationship between gestational age and the incidence of bacteriuria in pregnant women in this study was not significant ( $p = 0.55$ ).

The different results were found by Elzayat et al.<sup>12</sup> where the majority of pregnant women with bacteriuria were found in the third trimester gestational age group (28-40 weeks) although there was no proven significant relationship between gestational age and the incidence of bacteriuria ( $p = 0.86$ ). Wabe et al.<sup>8</sup> also showed that the majority of pregnant women with bacteriuria were found in the third trimester (28-40 weeks) gestational age group. However, the results of statistical analysis showed that the relationship between the two variables was not significant ( $p = 0.712$ ). Previous studies have shown that the relationship between gestational age and bacteriuria is controversial.

Bacteriuria in pregnancy is closely related to maternal and fetal morbidity and mortality. Bacteriuria occurring at <20 weeks gestation is associated with spontaneous abortion. Bacteriuria that occurs at gestational weeks 20 to 37 weeks is closely related to the occurrence of sepsis and preterm delivery. Therefore, various existing guidelines, including

the Canadian Task Force on Preventive Health Care, the United States Preventive Services Task Force, and The American Academy of Pediatrics (AAP) recommend screening for asymptomatic bacteriuria in pregnant women, especially at 12 to 16 weeks of gestation or at the first prenatal visit, whichever comes first.<sup>13</sup> The study conducted by Farazi et al. (2019) even recommends that screening for bacteriuria in pregnant women be carried out in the first trimester and if no bacteriuria is found, the examination can be repeated at ANC visits in the second and third trimesters of pregnancy.<sup>14</sup>

Based on the results of the study, it was found that the majority of pregnant women who experienced bacteriuria were multigravida (52.7%), while the others were primigravida (47.3%). The same results were reported by Farazi and Jabbariasl in 2018 who conducted a study of pregnant women with a higher proportion of pregnant women experiencing asymptomatic bacteriuria in the multipara/multigravida group (92.3%) than the nulliparous group with  $p<0.05$ .<sup>14</sup> Emiru et al., 2013 also reported the same result where the proportion of patients experiencing bacteriuria was greater in the multigravida group compared to nulliparous group with a proportion of 59.1% and 40.9%, respectively. However, in this study there was no association between gravida and urinary tract infections.<sup>15</sup>

In contrast to the results of our study, Fakhrizal et al.<sup>16</sup> who conducted a study in Riau reported that the proportion of pregnant women who had urinary tract infections was higher in the primiparous group (55.6%) compared to the multiparous group (44.4%). However, there was no relationship between gravida and the incidence of urinary tract infections ( $p = 0.65$ ). Similar results were also reported by Ranjan et al.<sup>17</sup> 2017 where the incidence of bacteriuria was found to be highest in the primigravida group (60%), but no statistically significant relationship was found between gravida and bacteriuria ( $p=0.25$ ). A study conducted by Chandel et al., 2012 on 463 pregnant women also reported that the proportion of positive culture results for asymptomatic bacteriuria was found to be

greater in the primigravida group (52.9%) compared to the multigravida group (47.1%).<sup>18</sup>

Until now, there are still differences in results between studies regarding the relationship between gravida and parity with urinary tract infections or bacteriuria. However, it is known that multiple pregnancies are associated with a decrease in the pelvic organs and cause a widening of the urethral orifice, making it easier for microorganisms to ascend and cause urinary tract infections. This factor has been reported as an important risk factor and can increase the rate of asymptomatic bacteriuria twofold. However, these changes differed between patients and were more likely to occur in women who had shorter intervals between pregnancies.<sup>19</sup> The high rate of asymptomatic bacteriuria in primiparous can occur due to anatomic and physiological changes that are more prominent in the first pregnancy.<sup>18</sup> The combination of mechanical, hormonal, and physiological changes in the form of an enlarged uterus pressing on the ureter can cause urinary stasis which is a medium for growth of pathogens. Increased estrogen levels, progesterone, and prostaglandin-like agents cause uterine dilatation and decreased uterine peristalsis and bladder tone also cause urinary stasis even though there is no obstruction due to pregnancy. These hormones can also cause vesicouterine valve incompetence which causes reflux, thereby increasing the risk of infection.<sup>20</sup>

The level of education in the results of this study showed that the majority of pregnant women with bacteriuria were in the high school group (50.8%), where this level of education included a fairly high level of education. There were no pregnant women with bacteriuria who had an elementary education level. The same thing was reported by the research of Elzayat et al.<sup>12</sup> where the majority of pregnant women with positive urine bacterial cultures were in the high school education group (58.8%), but there was no significant relationship between bacteriuria and education level of pregnant women ( $p=0.69$ ). Different things were found by the research of Nguefack et al.<sup>11</sup> In this study, it was found that the level of education had a

significant relationship with the incidence of bacteriuria in pregnant women with a lower level of education risk of the incidence of bacteriuria in pregnant women. Lower levels of education are associated with health-related knowledge and lower levels of personal hygiene so that pregnant women are more susceptible to urinary tract infections or bacteriuria during pregnancy.<sup>11</sup> The difference found in this study may be because this study was conducted at a tertiary hospital, the final referral center where people with low levels of education tend to seek medical services less frequently to perform routine pregnancy check-ups.

Most of the pregnant women with bacteriuria in this study belonged to the group of asymptomatic bacteriuria (64.9%). Nguefack et al.<sup>11</sup> also found the prevalence of bacteriuria in pregnant women was 9.9% of which 57% of the bacteriuria population were asymptomatic bacteriuria. Tadesse et al.<sup>21</sup> also stated that the majority of urinary tract infections in pregnant women were asymptomatic. Asymptomatic bacteriuria is commonly found in pregnant women because hormonal changes and uterine enlargement occur during pregnancy, resulting in increased pressure in the urinary tract. This increase in pressure will cause urine output to be slow so that it becomes a good medium for bacterial growth.<sup>21</sup> Pregnant women with diabetes, previous history of recurrent urinary tract infections, polycystic kidney disease, and other renal anomalies have an even higher risk of bacteriuria during pregnancy.<sup>13</sup>

The prevalence of bacteriuria during pregnancy has been reported to range from 3% to 12.8%. The prevalence range is influenced by various factors, such as age, parity, gestational age, socioeconomic status, and other factors. Various studies have reported that pregnant women who experience bacteriuria during pregnancy are more at risk for complications.<sup>22</sup>

In asymptomatic patients, bacteriuria was defined as the presence of >5 bacteria/high visual fields, equivalent to a culture finding of 105 colony-forming units (CFU)/ml. Meanwhile, in conditions where a culture examination complements the urinalysis examination, bacteriuria can be confirmed by finding 1 bacteria/

LPB. In symptomatic patients, bacteriuria can be confirmed by finding 102 CFU/ml and in such conditions antibiotics should be considered.<sup>23</sup>

In this study, it was found that of all cases of bacteriuria, the largest proportion of urinalysis results found was bacterial concentration +1 which was equivalent to <4 cells/high visual field of 45.6%, followed by bacterial levels of +2 (equivalent to 5-9 cells/high visual field) and +3 (equivalent to 10-29 cells/high visual field) which is nearly identical at 28% and 26.4%, respectively. No urinalysis results were found with a bacterial concentration of +4 (equivalent to > 30 cells/high visual field). Suppose the results of the proportions of +2 and +3 bacteria are combined (equivalent to the results of the examination 105 CFU/ml) to 54.4%. In that case, the results of this study are similar to the study of Chandel et al., 2012 which reported the proportion of culture results with significant bacteriuria (105 CFU/ml) was greater (7.3%) than the insignificant proportion of culture yields (1.3%). However, this study involved all pregnant women, both those with urinary tract infections and those without.<sup>18</sup>

Different results were reported by Shruthi et al., 2015 who said that the proportion of bacteriuria culture results was not significantly greater (15.8%) compared to significant bacteriuria (8.5%), while another 75.5% showed contaminated or sterile results. This difference could be due to the fact that the study used the definition of significant bacteriuria based on a culture result of 105 CFU/ml, while a culture result of 103 - <105 CFU/ml was defined as insignificant bacteriuria and samples with three or more types of organisms were considered contaminated. In addition, this study involved the entire population of pregnant women who had outpatient visits, whether or not they had urinary tract infections, while our study involved only patients who had been diagnosed with bacteriuria.<sup>24</sup>

Urine culture is still the gold standard for diagnosing bacteriuria is urine culture, but this test is quite expensive and requires 24-48 hours to get the results. Therefore, other examination modalities, such as microscopic urinalysis performed either by manual or automatic light microscopy, are still considered a fairly good diagnostic

test and are available in various health facilities.<sup>20</sup> Findings of bacteriuria or pyuria from urinalysis can help confirm the presence of infection, but different cutoffs have different sensitivity and specificity. The meta-analysis conducted by Rogozinska et al.<sup>25</sup> found that there was one study that conducted research on the bacterial count of microscopic urinalysis which reported that the cut-off value of bacteriuria with >20 cells/LPB had a sensitivity and specificity of 78% and 92%, respectively.<sup>25</sup> Bacteriuria itself has a higher sensitivity and specificity than the criteria for pyuria. The results of bacteriuria found from microscopic urinalysis are useful in excluding and diagnosing UTI if it is associated with the patient's clinical manifestations, but less good if used independently (not adjusted for clinical manifestations).<sup>26</sup>

In this study, it was not explained whether or not the results of a second culture or urinalysis were generally performed to confirm asymptomatic bacteriuria, so there is a possibility that there may be contaminated urine results that we have not been able to exclude.<sup>14</sup> In addition, our study was conducted at a tertiary health facility so that the population of pregnant women with bacteriuria who did not experience symptoms was generally less, considering that the majority of pregnant women who did not have comorbidities or were asymptomatic did not undergo an examination at a tertiary health facility.

## CONCLUSION

In pregnancy, both symptomatic and asymptomatic bacteriuria require clinical attention because of the potential for unwanted effects on pregnancy. Most pregnant women diagnosed with bacteriuria are in the 25-34 year age group. The incidence of bacteriuria is more often found in the reproductive age group (20-35 years) presumably due to higher sexual activity in this age group. This study also found that pregnant women diagnosed with bacteriuria had a gestational age of 0-28 weeks, was multigravida, and had a high school education level. However, analytical research on a larger scale is still needed to determine the risk factors that play a role in the occurrence of bacteriuria in pregnant women.

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## CONFLICT OF INTEREST

All authors declare there is no conflict of interest regarding publication of this article.

## AUTHOR CONTRIBUTION

All authors had contributed to manuscript writing and agreed to the final version of the manuscript for publication.

## ETHICAL STATEMENT

Research Ethic Committee Faculty have approved this study of Medicine, Universitas Udayana/RSUP Sanglah Denpasar with ethical clearance reference number 1298/UN14.2.2.VII.14/LT/2021.

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