

# Risk Factors Related to Asymptomatic Bacteriuria in Pregnant Women

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**Objective:** To determine the risk factors related to asymptomatic bacteriuria (ABU) in pregnant women.

**Material and Method:** Three hundred and sixty asymptomatic pregnant women who attended their first antenatal appointment at Rajavithi Hospital from August 1 and October 31 2005 were enrolled. Those with symptoms of urinary tract infection within one month, those who had been prescribed antibiotics during the previous seven days, and those with medical or obstetric complications, vaginal bleeding, and history of urinary tract disease were excluded. Urine specimens were collected by clean-catched midstream urine technique for culture. Several risk factors related to ABU and obstetric and demographic characteristics were recorded.

**Results:** The prevalence of ABU in pregnant women was 10.0%. The significant risk factors related to ABU in pregnancy was lower education level  $\leq$  grade 6 ( $p < 0.05$ ) with 2.17-time risk of ABU compared with higher education level  $>$  grade 6. Maternal and gestational age, occupation, monthly income, gravidity, previous history of urinary tract infection and anemia were not statistically associated with ABU.

**Conclusion:** Lower education level ( $\leq$  grade 6) should be the only significant risk factor related to ABU in Thai pregnant women under limited sample size.

**Keywords:** Bacteriuria, Pregnancy, Risk factors

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Routine screening for asymptomatic bacteriuria (ABU) by midstream urine culture early in pregnancy is recommended as routine care for the healthy pregnant women by national collaborating centre for women's and children's health in the UK<sup>(1)</sup>. Risk of preterm delivery or low birthweight babies and development of pyelonephritis decreased in the treatment group of ABU compared with placebo or no treatment<sup>(2)</sup>.

However, the antenatal urine culture routine for all pregnant women is costly and not feasible in many parts of the world including Thailand. Reduction of the necessity of urine culture for pregnant women by using the cheaper denominator such as the reported risk factors related to ABU may be an appropriate alternative management *i.e.* anemia, multiparity,

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advanced maternal age, lower education level, illiteracy, advanced gestational age, lower social class, lower socioeconomic status, poverty, sickle cell anemia<sup>(3-10)</sup>. Therefore, the authors planned to conduct a cross-sectional analytical study to determine the cheaper denominator such as the risk factors related to ABU in pregnant women.

## Material and Method

The present study recruited 360 pregnant women who attended their first antenatal appointment at Rajavithi Hospital, Bangkok between August 1 and October 31 2005. Those with symptomatic urinary tract infection (UTI), those who received antibiotics during the past seven days, and those with medical or obstetric complications, vaginal bleeding, and history of UTI were excluded. The hospital's ethics committee approved the present study and the written consent forms were obtained from the participants.

Eligible women were advised how to correctly collect clean midstream urine into sterile containers. After hand washing, their perineums were then cleaned with soap, rinsed out with clean water and dried with sterile cotton. Randomly voided, clean-catch midstream urine were obtained into sterile containers and sent to the laboratory for urine culture within 30 minutes after collection. Urine culture was performed using blood and Mac Conkey agar incubating at 35°-37° for 24-48 hours and read at 12, 24, and 72 hours. The presence of  $\geq 10^5$  colony forming units of a single type of bacteria per milliliter of urine indicated bacteriuria<sup>(11)</sup>. Antibiotic sensitivities were determined by the tube dilution method. Contamination was interpreted when the urine culture revealed more than one type of organism, then urine culture was repeated within seven days. If repeated urine culture was still contaminated, it would be interpreted as negative culture.

Pregnant women with positive urine cultures were treated with a single course of appropriate antibiotics according to susceptibility tests. In order to determine the success of treatment, they were asked to follow-up with second urine culture one week after complete treatment. Potential risk factors for ABU were initially determined by univariate analysis and multiple logistic regression analysis for controlling confounding effect. Data were collected and analyzed by using computer software program SPSS/PC version 10.2. A p-value of less than 0.05 was considered statistical significant.

## Results

Three hundred and sixty pregnant women were enrolled in the present study, thirty-six were positive from urine culture. Forty-eight showed contamination in the first urine culture and in the

**Table 1.** Microorganisms of asymptomatic bacteriuria in pregnant women

Organism	Number	(%)
<i>Lactobacillus species</i>	9	25.0
<i>Escherichia coli</i>	8	22.2
<i>Streptococcus viridans</i>	8	22.2
<i>Gardnerella vaginalis</i>	5	13.8
<i>Proteus mirabilis</i>	2	5.6
<i>Staphylococcus saprophyticus</i>	2	5.6
<i>Enterococcus faecalis</i>	1	2.8
<i>Klebsiella pneumoniae</i>	1	2.8
Total	36	100.0

repeated urine culture, fifteen were still contaminated and thirty-three were negative culture (contamination rate 4.2%) The prevalence of ABU in the present study was 10.0%. Table 1 shows the uropathogens responsible for infection in these women. *Lactobacillus* species was the most common uropathogens (25.0%).

There were thirty-six subjects with ABU and three hundred and twenty-four without ABU available for the assessment of risk factors for ABU. Table 2 shows the risk factors related to asymptomatic bacteriuria. Educational level was the only significant risk factor for ABU (p = 0.049).

## Discussion

The prevalence of ABU in pregnant women in the present study was 10.0%. This was close to the average of prevalence found in previous studies, which varied from 8.1% to 21.1%<sup>(3,12-15)</sup>. In the present study, lower education was the only significant risk factor related to ABU in pregnancy similar to one of two significant risk factors in Chongsomchai's study<sup>(3)</sup> during 1994-1995 at Srinakarind Hospital, Khon Kaen University, Thailand. There were difficulties in evaluating some risk factors such as lower social class, lower socioeconomic status, and poverty in the present study because there were no clear definitions of these terms in the previous studies<sup>(4,5,9)</sup>. The authors tried to use income and education level to classify the patient in the same way as social class, but they were no significant risk factor as in Chongsomchai's study<sup>(3)</sup>. Sick cell anemia was not screened as a risk factor in the present study because it was quite a rare disease in Thailand. The causes of anemia were not identified in the present study. However, anemia was not the risk factor similar to Fatima's study in Bakawalpur<sup>(9)</sup>. The prevalence of ABU increasing from 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> trimester were reported as 0.9%, 1.83%, and 5.6%, respectively in Tugrul's study<sup>(10)</sup> and 5.9%, 8.2%, and 15.9%, respectively in Suntharasaj's study<sup>(12)</sup> in southern region of Thailand. Both the present study in Bangkok and Chongsomchai's study<sup>(3)</sup> in northeastern region of Thailand showed no significant difference in prevalence of ABU in each trimester.

Advanced maternal age ( $\geq 35$  years) and younger maternal age (< 20 years) were reported as risk factors related to ABU in pregnancy by Tugrul et al<sup>(10)</sup> and Hazhir<sup>(7)</sup>, respectively. However, Chongsomchai et al<sup>(3)</sup> and Fatima and Ishrat<sup>(9)</sup> found that advanced or younger maternal age was not a risk factor related to ABU in pregnancy. Multiparity was reported as a risk factor related to ABU in pregnancy<sup>(8,9)</sup>

**Table 2.** The risk factors related to asymptomatic bacteriuria in pregnant women

Factors	Culture result				p-value	Odd ratio
	Positive		Negative			
	(n = 36)	(%)	(n = 324)	(%)		
Age (years)						
15-19	7	15.9	37	84.1	0.197	-
20-34	27	10.0	244	90.0		
≥ 35	2	4.4	43	95.6		
(Mean ± SD)	24.5 ± 5.4		27.0 ± 5.9			
Occupation						
Housewife	12	10.5	102	89.5	0.901	-
General employee	20	9.3	196	90.7		
Government service	1	14.3	6	85.7		
Trader	3	13.0	20	87.0		
Income (Baht/month)						
2,501-5,000	1	4.3	22	95.7	0.902	-
5,001-7,500	6	10.2	53	89.8		
7,501-10,000	14	9.7	130	90.3		
10,001-12,500	4	10.8	33	89.2		
> 12,500	11	11.3	86	88.7		
(Mean ± SD)	8,750 ± 3,000		8,250 ± 3,000			
Education*						
≤ primary school (≤ grade 6) (low education)	17	13.0	114	87.0	0.049	2.17
≤ secondary school (> grade 6) (high education)	19	8.3	210	91.7		
Gravidity						
1	20	12.1	145	87.9	0.287	-
2	14	10.6	118	89.4		
3	1	2.0	48	98.0		
4	1	7.7	12	92.3		
5	0	0	1	100		
Gestation (week)						
≤ 14	13	10.0	116	90.0	0.607	-
15-28	12	11.8	90	88.2		
≥ 29	11	8.5	118	91.5		
(Mean ± SD)	21.4 ± 11		22.7 ± 11.2			
Previous UTI (more than one month ago)						
Yes	3	13.6	19	86.4	0.410	-
No	33	9.8	305	90.2		
Hemoglobin (g/dl)						
< 11	11	13.0	74	87.0	0.345	1.436
≥ 11	25	9.1	250	90.9		
(Mean ± SD)	34.7 ± 3.8		35.3 ± 3.6			

\* p-value &lt; 0.05

but not in the present and Chongsomchai's study<sup>(3)</sup>. Difference in significant risk factors related to ABU in pregnancy between papers was suggested from different uropathogens, sample size, and demographic characteristics in each country. The appropriate sample size for testing the following risk factors related to ABU

in pregnancy such as hemoglobin ≤ 11 g/dl, previous UTI, first trimester, second trimester and third trimester were 41, 2608, 20800, 504 and 368 cases, respectively for the ABU study-cases, and 369, 7824, 187200, 4596, and 3474, respectively for the ABU control-cases when the results from Chongsomchai's study<sup>(3)</sup> were used to

calculate the proper sample size. In the present study the study-case: control-case ratio was 1: 9 (36 cases:324 cases). The authors suggested that multicenter study should be performed in the future to test these risk factors related to ABU in pregnancy. E Coli was the most common pathogen in ABU in pregnant women varying from 62.9% to 81.4%<sup>(11,13,15,16)</sup> in most previous studies while Lactobacillus sp was the most common (25%) and E. Coli and Streptococcus viridians were the second most common uropathogen in the present study. The result of the present study revealed that identification of pregnant women at higher risk of ABU and performing urine culture to detect ABU should not be appropriate alternative management because only one significant risk factor was demonstrated.

In conclusion, lower education level ( $\leq$  grade 6) should be the only significant risk factor related to ABU in Thai pregnant women under limited sample size.

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## ปัจจัยเสี่ยงต่อการเกิดภาวะการติดเชื้อแบคทีเรียในปัสสาวะแบบไม่มีอาการของสตรีตั้งครรภ์ ในระยะก่อนคลอด

เอกชัย ไคววาริสารัช, เมทินา วิชัยพฤษ, สุวัฒนา กาญจนหฤทัย

**วัตถุประสงค์:** เพื่อหาปัจจัยเสี่ยงต่อการเกิดภาวะการติดเชื้อแบคทีเรียในปัสสาวะ แบบไม่มีอาการในสตรีตั้งครรภ์ **วัสดุและวิธีการ:** สตรีตั้งครรภ์ทั้งหมด 360 คน ที่มาฝากครรภ์ครั้งแรกที่โรงพยาบาลราชวิถี จากวันที่ 1 สิงหาคม พ.ศ. 2548 ถึงวันที่ 31 ตุลาคม พ.ศ. 2548 ได้รับการคัดเลือก ส่วนสตรีที่มีอาการของการติดเชื้อ ในทางเดินปัสสาวะ ภายใน 1 เดือน ได้รับยาปฏิชีวนะภายใน 7 วันที่ผ่านมา มีภาวะแทรกซ้อนทางสูติกรรม หรือ อายุรกรรม มีเลือดออกทางช่องคลอด และมีประวัติโรคทางระบบทางเดินปัสสาวะมาก่อน ถูกคัดออกจากการศึกษา เก็บปัสสาวะโดยวิธีเก็บส่วนกลางอย่างสะอาดเพื่อทำการตรวจปัสสาวะโดยเพาะเชื้อ และเก็บข้อมูลเกี่ยวกับปัจจัยเสี่ยงต่อการเกิดภาวะการติดเชื้อแบคทีเรียในปัสสาวะ ตลอดจนลักษณะทางประชากรศาสตร์ และสูติศาสตร์

**ผลการศึกษา:** ความชุกของภาวะการติดเชื้อแบคทีเรียในปัสสาวะแบบไม่มีอาการของสตรีตั้งครรภ์ในระยะก่อนคลอด เท่ากับร้อยละ 10 ระดับการศึกษาต่ำกว่าหรือเท่ากับชั้นประถมศึกษาปีที่ 6 เป็นปัจจัยเสี่ยงที่มีนัยสำคัญเพียงอย่างเดียวต่อการเกิดภาวะการติดเชื้อแบคทีเรียในปัสสาวะแบบไม่มีอาการของสตรีตั้งครรภ์ในระยะก่อนคลอด โดยมีความเสี่ยงเพิ่มขึ้น 2.17 เท่า เมื่อเทียบกับหญิงตั้งครรภ์ที่มีการศึกษาสูงกว่าชั้นประถมศึกษาปีที่ 6 ไม่พบว่าความสัมพันธ์กับการเกิดภาวะการติดเชื้อแบคทีเรียในปัสสาวะอย่างมีนัยสำคัญในปัจจัยอื่น ๆ ที่ศึกษาดังต่อไปนี้ อายุมารดา, อายุครรภ์, อาชีพ, รายได้ต่อเดือน, จำนวนการตั้งครรภ์, ประวัติเคยติดเชื้อระบบทางเดินปัสสาวะ และภาวะโลหิตจาง

**สรุป:** การศึกษาต่ำกว่าหรือเท่ากับชั้นประถมศึกษาปีที่ 6 อาจเป็นปัจจัยเสี่ยงที่มีนัยสำคัญเพียงปัจจัยเดียวต่อการเกิดภาวะการติดเชื้อแบคทีเรียในปัสสาวะแบบไม่มีอาการของสตรีตั้งครรภ์ในระยะก่อนคลอดภายใต้ขนาดตัวอย่างของกลุ่มประชากรเท่าที่มีอยู่ในการศึกษานี้

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