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Original Article

Asymptomatic pyuria in pregnant women during the first trimester is associated with an increased risk of adverse obstetrical outcomes



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ABSTRACT

Objective: Urinalysis is included in the prenatal examination in the first trimester in Taiwan, in contrast to Western countries. We aimed to investigate whether asymptomatic pyuria as detected by urinalysis was associated with adverse perinatal outcomes.

Materials and Methods: A total of 1187 singleton pregnant women who received prenatal care at Kaohsiung Chang Gung Memorial Hospital between January 2012 and December 2013 were included for retrospective analysis. We defined asymptomatic pyuria as the presence of 15 or more white blood cells/ μL in midstream urine without symptoms. Adverse perinatal outcomes including preterm delivery, preterm premature rupture of membrane, low birth weight, and Apgar scores were analyzed. Univariate and multivariate logistic regression analyses were used to identify independent predictors.

Results: The prevalence of asymptomatic pyuria was 21.3% in our cohort. Univariate analysis showed that pyuria was the only factor associated with preterm delivery before 36 weeks of pregnancy, preterm premature rupture of membrane, and low birth weight. In multivariate analysis, both pyuria (odds ratio: 4.89, 95% confidence interval: 1.80–13.25, $p = 0.002$) and a maternal age of 35 years or older (odds ratio: 3.46, 95% confidence interval: 1.11–10.78, $p = 0.033$) were significant independent predictors for a low 5 minute Apgar score (<7).

Conclusion: The identification of asymptomatic pyuria via urinalysis in the first trimester may be a predictor for adverse perinatal outcomes.

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Introduction

Urinary tract infections (UTIs) are the most common type of infection during pregnancy [1]. Pregnant women are at increased risk of UTIs because of anatomical and hormonal changes, which lead to ureteral dilatation and urinary stasis [2,3]. Asymptomatic bacteriuria (ASB) is the occurrence of a significant amount of bacteria in the urine without symptoms of infection. The diagnosis of ASB is based on laboratory cultures, and is marked by significant bacteriuria (defined as $\geq 10^5$ colony forming units/mL in urine cultures of a midstream specimen) with no clinical manifestations of infection [4,5]. The reported incidence of ASB ranges from 4% to 40% of pregnant women [6–10]. A previous study reported a strong association between untreated ASB during pregnancy and preterm

delivery as well as low birth weight (LBW) [11]. As a result, performing routine *antepartum* urine cultures in the first trimester to screen for ASB is a standard practice in obstetric care, and is suggested by most antenatal guidelines worldwide [12–15].

However, urinalysis is the first step when evaluating a UTI. The benefits of urinalysis over cultures include a shorter examination time and a much lower cost. Pyuria is a laboratory finding defined as the presence of 15 or more white blood cells (WBC)/ μL in the urine; however, contamination of urine samples may occur if squamous epithelial cells are present [16,17]. Women with symptomatic pyuria may have a UTI, and the gold standard for the diagnosis of a UTI is the presence of pathogens in a urine culture. The National Health Insurance program in Taiwan provides comprehensive prenatal care for all women, and urinalysis is included in the routine prenatal examination during the first trimester. However, no previous study has investigated the association between asymptomatic pyuria and poor pregnancy outcomes. In clinical practice, clinicians in Taiwan usually ignore

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asymptomatic pyuria and do not perform urine cultures or treat the condition because these pregnant women usually have their next visit in 1 month. Therefore, the purpose of this study was to evaluate whether untreated asymptomatic pyuria is associated with adverse perinatal outcomes.

Materials and methods

We conducted this 2-year retrospective study between January 2012 and December 2013. During this period, a total of 3249 pregnant women delivered their babies at Kaohsiung Chang Gung Memorial Hospital, Taiwan. Ethical approval was obtained from the Institutional Ethics Committee of Chang Gung Memorial Hospital (approval date May 26, 2015). The Institutional Review Board of Chang Gung Memorial Hospital approved the chart evaluation of this retrospective study. The inclusion criteria were as follows: (1) singleton pregnancy; (2) urinalysis data at the first trimester prenatal visit; and (3) babies that were delivered at our hospital. Quantitative urine WBC counts were measured using a hemocytometer (CLINITEK Atlas Automated Urine Chemistry Analyzer, Siemens, Munich, Germany). Pyuria was defined as the presence of 15 or more WBC/ μL (equivalent to >5 WBC per high power field) in clean-voided midstream urine. If there were more than 15 squamous epithelial cells/ μL in the urine sample, the sample was considered to be contaminated [16,17]. The exclusion criteria were women: (1) who delivered their fetus after medical induction earlier than 36 weeks of gestation due to variable reasons; (2) who received a cesarean delivery earlier than 36 weeks of gestation due to medical indications such as severe preeclampsia or others; (3) with symptomatic pyuria who had received medical treatment; and (4) with asymptomatic pyuria but suggestive of sample contamination.

Medical records were reviewed for demographic information including maternal age, gravidity, parity, body mass index (BMI) at first prenatal examination, WBC count in maternal plasma at the first trimester prenatal examination, results of screening urinalysis, pregestational diabetes, gestational diabetes, and the results of group B streptococcus cultures. Data on perinatal outcomes were obtained from maternal and neonatal medical records, and included gestational age at delivery, gestational age at rupture of the membrane if preterm, fetal birth weight, and Apgar score at 1 and 5 minutes.

SPSS software version 20.0 (SPSS Inc., Chicago, IL, USA) was used for all statistical analyses. Qualitative variables were compared using the Chi-square test, and quantitative variables were compared using the Student *t* test. Univariate and multivariate logistic regression analyses were used to identify factors predicting adverse perinatal outcomes. A *p* value < 0.05 was considered to be statistically significant.

Results

Of the 3249 women who delivered their babies at our hospital, 1234 met the inclusion criteria. Forty-seven of these 1234 women were further excluded for the following reasons: 21 due to medical induction earlier than 36 weeks (11 for medical indications such as severe preeclampsia and fetal distress; 3 for trisomy 21; 1 for trisomy 18; 2 for hydrops fetalis with intrauterine demise; 1 for acrania; and 3 for fatal structural abnormalities); 8 due to treatment for symptomatic pyuria; and 18 due to contaminated urine samples. The remaining 1187 pregnant women were then entered into the analysis; 934 had normal screening urinalysis data and 253 had pyuria. Thus, the prevalence of asymptomatic pyuria was 21.3% in our cohort. The clinical characteristics of the women with and without pyuria detected in first trimester urinalysis are shown in Table 1. The mean gestational age at delivery was significantly

Table 1

Clinical characteristics of women with and without pyuria in first trimester urinalysis.

Characteristic	No pyuria N = 934 (%)	Pyuria N = 253 (%)	<i>p</i>
Maternal age (y)	33.16 \pm 4.17	33.20 \pm 4.29	0.296
Parity			0.342
Nulliparous	430 (46)	108 (42.7)	
Multiparous	504 (54)	145 (57.3)	
Gestational age at delivery (wk)	38.92 \pm 1.90	38.29 \pm 3.50	0.006
Preterm delivery before 36 wk	31 (3.3)	18 (7.1)	0.007
BMI (kg/m ²)	21.96 \pm 3.33	22.78 \pm 3.62	0.143
WBC count at first prenatal exam	8851 \pm 2200	9049 \pm 2263	0.918
Leukocytosis ($>10.3 \times 10^9/\text{L}$)	115 (12.3)	27 (10.7)	0.476
Pregestational diabetes	8 (0.86)	6 (2.40)	0.048
Gestational diabetes	49 (5.25)	14 (5.54)	0.856
Delivery			0.064
Vaginal	669 (71.6)	196 (77.5)	
Abdominal	265 (28.4)	57 (22.5)	
GBS colonization			0.877
Yes	180 (19.3)	50 (19.8)	
No	581 (62.2)	166 (65.6)	
Unknown	173 (18.5)	37 (14.6)	

Data are expressed as means \pm standard deviation or *n* (%). *p* < 0.05 was considered to be statistically significant.

BMI = body mass index; GBS = group B streptococcus; WBC = white blood cells.

lower in the pyuria group (38.29 \pm 3.50 weeks vs. 38.92 \pm 1.90 weeks, *p* = 0.006). There was also a statistically significant higher rate of pregestational diabetes in the pyuria group (2.4% vs. 0.86%, *p* = 0.048). However, there were no significant differences in other clinical characteristics including maternal age, parity, BMI, gestational diabetes, maternal plasma WBC count, mode of delivery, and group B streptococcus colonization between the groups.

The perinatal outcomes of the women with and without pyuria are presented in Table 2. There was a statistically significantly higher rate of preterm delivery before 36 weeks in the pyuria group (7.1% vs. 3.3%, *p* = 0.007), and also statistically significantly higher rates of preterm premature rupture of membrane (PPROM) in the pyuria group before 28 weeks (2.4% vs. 0.1%, *p* < 0.001) or 34 weeks of gestation (3.6% vs. 0.9%, *p* = 0.001). The mean fetal birth weight was significantly lower in the pyuria group (2999 \pm 657 g vs. 3153 \pm 486 g, *p* = 0.007), and the rate of LBW, defined as <2500 g, was higher in the pyuria group (9.1% vs. 5.1%, *p* = 0.033). The

Table 2

Perinatal outcomes of the women with and without pyuria in first trimester urinalysis.

Outcome	No pyuria N = 934(%)	Pyuria N = 253(%)	<i>p</i>
Admission of tocolysis			0.064
Yes	40 (4.3)	18 (7.1)	
No	894 (95.7)	235 (92.9)	
Preterm premature rupture of membrane			<0.001
<28 wk			<0.001
Yes	1 (0.1)	6 (2.4)	
No	933 (99.9)	247 (97.6)	
<34 wk			0.001
Yes	8 (0.9)	9 (3.6)	
No	926 (99.1)	244 (96.4)	
Preterm delivery before 36 wk	31 (3.3)	18 (7.1)	0.007
Birth weight, mean (g)	3153 \pm 486	2999 \pm 657	0.007
Low birth weight (<2500 g)	48 (5.1%)	23 (9.1%)	0.033
Apgar score			
1 min	8.86 \pm 0.81	8.55 \pm 1.70	0.006
5 min	9.89 \pm 0.75	9.61 \pm 1.72	0.011
1 min <7	13 (1.4)	14 (5.5)	<0.001
5 min <7	7 (0.8)	9 (3.6)	0.001

p < 0.05 was considered to be statistically significant.

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