



## Urinary tract infection in premature rupture of membrane (PROM): an academic hospital based study

Muhammad Nurhadi Rahman\*, Rivaldi D. Liligoly, Nuring Pangastuti

Department of Obstetrics and Gynaecology, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada/Dr. Sardjito General Hospital, Yogyakarta, Indonesia

### ABSTRACT

Submitted: 2018-12-18

Accepted : 2019-03-23

Premature rupture of membrane (PROM) and preterm PROM (PPROM) are commonly related with poor maternal and perinatal outcomes. Urinary tract infection (UTI) has been known as one of its risk factors. The aim of study was to ascertain the frequency and pattern of urinary symptoms as well as the risk factors for UTI in PROM and PPROM. A retrospective study was conducted at Dr. Sardjito General Hospital, Yogyakarta, Indonesia. All pregnancy cases with the history of PROM/PPROM from January to December 2015 were included. The research subjects were obtained from medical records, using the format of basic data collection to identify the risk factors of UTI in pregnancy. One hundred cases of complicated pregnancy with either PROM or PPROM were obtained. The mean of maternal age, gestational age, and birth weight were  $28 \pm 5.99$  yr;  $34.05 \pm 4:28$  wk;  $2170.79 \pm 835.447$  g; respectively. Urinalysis was done in 58 patients. The prevalence of bacteriuria was 55.17%. Symptomatic vs. asymptomatic bacteriuria showed statistically significant differences ( $p < 0.001$ , OR = 0.409; CI = 0287-0584). In multivariate analysis using linear regression, maternal age, gestational age and parity were not directly related to the occurrence of UTI ( $p = 0.367$ ;  $p = 0.697$ ;  $p = 0.385$ ; respectively). In conclusion, the proportions of symptomatic bacteriuria in pregnancy are significantly higher than asymptomatic. However, maternal age, gestational age, and parity are not directly related to the prevalence of UTI in pregnancy complicated with PROM and PPROM.

### ABSTRAK

Ketuban pecah dini (PROM) dan preterm PROM (PPROM) umumnya berkaitan dengan hasil maternal dan perinatal yang buruk. Infeksi saluran kemih (ISK) telah dikenal sebagai salah satu faktor risiko. Penelitian ini bertujuan untuk memastikan frekuensi dan pola gejala kemih serta faktor risiko ISK pada PROM dan PPROM. Penelitian retrospektif dilakukan di Rumah Sakit Umum Dr. Sardjito, Yogyakarta, Indonesia. Seluruh kasus kehamilan dengan riwayat PROM/PPROM dari Januari hingga Desember 2015 diikuti dalam penelitian ini. Subjek penelitian diperoleh dari catatan medis. Data dikumpulkan untuk mengidentifikasi faktor risiko ISK pada kehamilan. Sebanyak seratus kasus kehamilan rumit dengan PROM atau PPROM dengan masing-masing rerata usia ibu, usia kehamilan, dan berat lahir adalah  $28 \pm 5,99$  tahun;  $34,05 \pm 4:28$  minggu;  $2170.79 \pm 835.447$  g. Urinalisis dilakukan pada 58 pasien. Prevalensi bakteriuria adalah 55,17%. Terdapat perbedaan yang signifikan secara statistik ( $p < 0,001$ , OR = 0,409; CI = 0287-0584) antara bakteriuria simtomatik dengan asimtomatik. Hasil analisis multivariat menggunakan regresi linier menunjukkan bahwa usia ibu, usia kehamilan, dan paritas tidak secara langsung terkait dengan terjadinya ISK ( $p = 0,367$ ;  $p = 0,697$ ;  $p = 0,385$ ). Sebagai kesimpulan, proporsi bakteriuria simtomatik pada kehamilan secara signifikan lebih tinggi daripada bakteriuria asimtomatik. Namun, pada kehamilan yang rumit dengan PROM dan PPROM, usia ibu, usia kehamilan, dan paritas tidak secara langsung berhubungan dengan prevalensi ISK.

### Keywords:

urinary tract infection, premature rupture of membranes, preterm premature rupture of membrane

## INTRODUCTION

Preterm labor and birth are a major cause of perinatal morbidity and mortality. Despite modern advances in obstetric and neonatal management, the rate of preterm birth in the developed world is increasing.<sup>1</sup> Preterm premature rupture of membranes (PPROM) is associated with inflammation and infection, and it may involve the loss of a barrier to ascending infection from the vagina. It is suspected that prolonged PPRM could be an independent risk factor for neonatal sepsis.<sup>2</sup>

Several maternal risk factors can be a reason of spontaneous preterm labor and delivery such as infection, short cervix or cervical dysfunction, genital tract hemorrhage, lower body mass index, lower socioeconomic status, idiopathic uterine contractions, multifetal pregnancy and spontaneous rupture of the fetal membranes are also associated with the condition.<sup>1</sup> Other studies mainly discuss about maternal lower genital tract infection and association with PROM and PPRM.<sup>3</sup> However, urinary tract infection (UTI) has to be investigated as the risk factors of PROM and PPRM.

Urinary tract infection is a common problem in pregnancy which can be classified as lower (cystitis and asymptomatic bacteriuria) or upper (pyelonephritis) tract infections.<sup>4</sup> The anatomical, hormonal changes, also increased plasma volume during pregnancy decreases urine concentration and pregnant women may develop glucosuria, which leads to increased bacterial growth in the urine. Therefore, the pregnant women are more prone to UTI than the non-pregnant.<sup>5</sup> Maternal UTI can be either symptomatic or asymptomatic. The presence of symptomatic UTI is associated with an increased risk of intrauterine growth retardation (IUGR) and low-birth weight (LBW).<sup>6</sup> In addition;

ignored asymptomatic bacteriuria may progress to the development of cystitis and pyelonephritis.<sup>7</sup>

Therefore, it is essential to screen for UTI in pregnancy so that timely treatment could be offered. The present study was conducted to find out the symptomatic and asymptomatic conditions in maternal UTI cases complicated with PROM and PPRM. In addition, the study was also undertaken to determine the risk outcomes of UTI in pregnancy to maternal and perinatal conditions.

## MATERIALS AND METHODS

### Protocol of study

The retrospective study was conducted to ascertain the outcomes of UTI in pregnancy complicated with PROM and PPRM in Dr Sardjito General Hospital, Yogyakarta, Indonesia from January to December 2015. Maternal age, parity, gestational age, urinary symptoms and birth weight were recorded from all pregnant women with the history of PROM or PPRM. The diagnosis of PPRM and PROM were made when the rupture of fetal membranes occurred before and after 37 wk, respectively. The presence of IUGR was assessed using Lubscencho birth weight curve. Low birth weight was defined as less than 2500 g birth weight. Fifty-eight women underwent complete examinations of urine. Dipstick test was performed on midstream urine. The diagnosis of UTI was established from the presence of either bacteriuria or leucocyte esterase or nitrite from the urinalysis.

### Data analysis

The odds ratio (OR) and 95% confidence interval (95%CI) were calculated among the categorical parameters. The multivariate analysis using linear regression was used to determine the correlation between maternal age, gestational age and parity to UTI prevalence.

## RESULTS

As many as 100 cases of complicated pregnancies with PROM and PPROM, urinalysis was performed in 58 patients (47 PROM cases and 11

PPROM cases). The mean of maternal age, gestational age, birth weight were  $28.13 \pm 5.82$  yr,  $32.71 \pm 4.16$  wk,  $1907.05 \pm 752.18$  g, respectively. Characteristics of subjects according to the presence of UTI were compared, as shown in TABLE 1.

TABLE 1. Characteristics of subjects

Variable	UTI (n = 32)	Non UTI (n = 26)	p
Age (mean $\pm$ SD)	28.68 $\pm$ 6.03	27.46 $\pm$ 5.58	0.43
Gestational age (mean $\pm$ SD)	32.46 $\pm$ 4.67	33.00 $\pm$ 3.51	0.63
Birthweight (mean $\pm$ SD)	1858.29 $\pm$ 815.77	1975.77 $\pm$ 664.70	0.58
Parity			
• Multipara (n, %)	17 (53.1)	12 (46.2)	0.59
• Primigravida (n, %)	15 (46.9)	14 (53.8)	

Maternal age, gestational age, and birthweight were analyzed using independent t-test

The diagnosis of UTI was established based on the presence of bacteriuria in 20 (62.5%) patients and 12 (37.5%) patients without the finding bacteriuria but having positive results of leukocyte esterase and nitrite. TABLE 2 showed

25 (78.1%) patients with PPROM and 7 (21.9%) patients with PROM were diagnosed with UTI, which has no differences statistically compared to patients with no UTI ( $p=0.53$ ;  $OR=0.64$ ;  $95\%CI=0.16-2.51$ ).

TABLE 2. Maternal and perinatal outcomes (n or %) associated with urinary tract infection

Variable	UTI (n =32)	No UTI (n =26)	p	OR	95%CI
PPROM	25 (78.1)	22 (84.6)	0.530	0.64	0.16-2.51
PROM	7 (21.9)	4 (15.4)			
Symptomatic	14 (43.8)	0 (0)	0.001	N/A	N/A
Asymptomatic	18 (56.3)	26 (100)			
IUGR	4 (12.5)	1 (3.8)	0.240	3.57	0.37-34.11
No IUGR	28 (87.5)	25 (96.2)			
LBW	24 (77.4)	14 (63.6)	0.270	1.95	0.58-6.56
Normal	7 (22.6)	8 (36.4)			

PPROM/PROM, Symptoms, IUGR, and LBW were analyzed using Chi-square ( $\chi^2$ )

The study showed that symptomatic bacteriuria cases in the presence of UTI in pregnancy was different significantly ( $p < 0.001$ ; OR=N/A). The presence of IUGR was found in 4 (12.5%) patients with UTI in pregnancy with no significant differences statistically compared to UTI in pregnancy cases without the presence IUGR ( $p = 0.24$ ; OR=3.57; 95%CI=0.37-34.11). Low birth weight cases were found in 24 (77.4%) cases of UTI in pregnancy complicated with either PPROM or PROM ( $p = 0.27$ ; OR=1.95; 95%CI=0.58-6.56).

## DISCUSSION

Urinary tract infection in pregnancy still becomes one of the most common clinical problems in pregnancy. The condition is a serious problem for pregnant women. If left untreated, UTI can lead to pyelonephritis, preterm labor or infection in the newborn.<sup>8</sup> The present study was conducted to determine the outcomes of urinary tract infection in pregnancy complicated with PROM or PPROM such as UTI symptoms, IUGR, and LBW. In the present study, it was revealed that the proportion of PPROM and PROM cases were not different significantly between those with and without UTI. There were no previous studies investigating this issue. Other studies mainly focusing on the association between maternal infection and preterm labor.<sup>3,9,10</sup> However, a study found that preterm labor associated with PPROM is more commonly caused by the infection of the genital tract rather than urinary tract.<sup>11</sup>

The symptomatic UTI cases in pregnancy were different significantly in this study. There was no asymptomatic bacteriuria cases found in this symptomatic UTI cases. However, asymptomatic bacteriuria is known to be the major risk factor for developing a symptomatic UTI. Therefore, screening and treatment of asymptomatic bacteriuria in pregnancy may prevent

morbidity associated with symptomatic UTIs.<sup>12</sup> In this study, because of the small number of subjects involved, the assessment of IUGR and LBW babies in UTI cases had no significant differences compared to those without the condition in this study. On the other hand, other study with larger number of subjects found that patients with UTI had significantly higher rates of IUGR<sup>13</sup> and LBW.<sup>14</sup>

## CONCLUSION

The proportions of symptomatic bacteriuria in pregnancy are significantly higher than asymptomatic. However, maternal age, gestational age, and parity are not directly related to the prevalence of UTI in pregnancy complicated with PROM and PPROM.

## ACKNOWLEDGEMENTS

This research was supported by Department of Obstetrics and Gynaecology, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia. We thank our colleagues from Department of Obstetrics and Gynaecology, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia who provided insight and expertise that greatly assisted the study.

## REFERENCES

1. Georgiou HM, Di Quinzio MKW, Permezel M, Brennecke SP. Predicting preterm labour: current status and future prospects. *Disease Markers* 2015, Article ID 435014, 9 pages, 2015. <https://doi.org/10.1155/2015/435014>.
2. Drassinower D, Friedman AM, Običan SG, Levin H, Gyamfi-Bannerman C. Prolonged latency of preterm premature rupture of membranes and risk of neonatal

- sepsis. *Am J Obstet Gynecol* 2016; 214: 743. e1-6.  
<http://dx.doi.org/10.1016/j.ajog.2015.12.031>
3. Karat C, Madhivanan P, Krupp K, Poornima S, Jayanthi NV, Suguna JS, et al. The clinical and microbiological correlates of premature rupture of membranes. *Indian J Med Microbiol* 2006; 24(4):283-5.  
<http://dx.doi.org/10.4103/0255-0857.29388>
  4. Schnarr J, Smaill F. Asymptomatic bacteriuria and symptomatic urinary tract infections in pregnancy. *Eur J Clin Invest* 2008; 38(suppl 2):50-7.  
<http://dx.doi.org/10.1111/j.1365-2362.2008.02009.x>
  5. Haider G, Zehra N, Munir AA, Haider A. Risk factors of urinary tract infection in pregnancy. *J Pak Med Assoc* 2010; 60(3):213-6.
  6. Bolton M, Horvath DJ Jr, Li B, Cortado H, Newsom D, White P, et al. Intrauterine growth restriction is a direct consequence of localized maternal uropathogenic *Escherichia coli* cystitis. *PLoS One* 2012; 7(3):33897.  
<http://dx.doi.org/10.1371/journal.pone.0033897>
  7. Andrades M, Paul R, Ambreen A, Dodani S, Dhanani RH, Qidwai W. Distribution of lower urinary tract symptoms (LUTS) in adult women. *J Coll Physicians Surg Pak* 2004; 14(3):132-5.  
<http://dx.doi.org/03.2004/JCPSP.132135>
  8. Morgan KL. Management of UTIs during pregnancy. *MCN Am J Matern Child Nurs* 2004; 29(4):254-8.  
<http://dx.doi.org/10.1097/00005721-200407000-00011>
  9. Muglia LJ, Katz M. The enigma of spontaneous preterm birth. *N Engl J Med* 2010; 362(6): 529-35.  
<http://dx.doi.org/10.1056/NEJMra0904308>
  10. Sheiner E, Mazor-Drey E, Levy A. Asymptomatic bacteriuria during pregnancy. *J Matern Fetal Neonatal Med* 2009; 22(5):423-7.  
<http://dx.doi.org/10.1080/14767050802360783>
  11. Pararas MV, Skevaki CL, Kafetzis DA. Preterm birth due to maternal infection: causative pathogens and modes of prevention. *Eur J Clin Microbiol Infect Dis* 2006; 25(9):562-9.  
<http://dx.doi.org/10.1007/s10096-006-0190-3>
  12. Macejko AM, Schaeffer AJ. Asymptomatic bacteriuria and symptomatic urinary tract infections during pregnancy. *Urol Clin North Am* 2007;34(1):35-42.  
<http://dx.doi.org/10.1016/j.ucl.2006.10.010>
  13. Mazor-Dray E, Levy A, Schlaeffer F, Sheiner E. Maternal urinary tract infection: is it independently associated with adverse pregnancy outcome? *J Matern Fetal Neonatal Med* 2009; 22(2):124-8.  
<http://dx.doi.org/10.1080/14767050802488246>
  14. Foxman B. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. *Am J Med* 2002; 113(Suppl 1):5-13.  
[http://dx.doi.org/10.1016/S0002-9343\(02\)01054-9](http://dx.doi.org/10.1016/S0002-9343(02)01054-9)