

# The Assessment of Association Between Urinary Tract Infection and Premature Rupture of Membrane

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## Abstract

**Background:** PREM and PPROM are linked to poor maternal and perinatal outcomes. Risk factors include UTI. Lower (cystitis and silent bacteriuria) and higher (pyelonephritis) urinary tract infections are frequent in pregnancy. Due to anatomical and hormonal changes, pregnant women may have glucoseuria, which increases bacterial growth in the urine. Pregnant women are more susceptible to UTIs than non-pregnant women. Aim of study: To ascertain the frequency and pattern of urinary symptoms as well as the risk factors for urinary tract infection in premature rupture of membranes. **Patients and methods:** This study was a prospective cross sectional study conducted in labor ward of Obstetrical department of Basra Maternity and Children Hospital in Basra city /Iraq during the period from 1<sup>st</sup> of January till 1<sup>st</sup> of September, 2022 on sample of eighty-five pregnant women with premature ruptured membranes. The diagnosis of premature rupture of membranes was made when the rupture of fetal membranes occurred before and after 37 weeks. Urinary tract infection was detected through general urine examination. **Results:** Sixty percent of pregnant women with premature rupture of membranes had urinary tract infection. The pregnant women with premature rupture of membranes and urinary tract infection were significantly related to symptomatic presentation ( $p < 0.01$ ). Low birth weight is the common adverse neonatal outcome of pregnant women with premature rupture of membranes and urinary tract infection, while high rate of cesarean sections is the common adverse maternal outcome. **Conclusions:** The prevalence of urinary tract infection in pregnant women with premature rupture of membranes is high.

**Keywords:** Premature rupture of membranes, Urinary tract infection, Low birth weight.

## Introduction

Normal parturition includes spontaneous membrane rupture. When it happens before active labour, it can harm the mother and baby<sup>1</sup>. Perinatal morbidity and death are negatively related to gestational age. Its care creates a therapeutic problem because of the requirement to balance premature delivery and chorioamnionitis risk<sup>2</sup>. PREM occurs when the sac carrying the foetus and amniotic fluid ruptured before childbirth. Usually at term, when labour begins. Membranes can breach before 37 weeks<sup>3</sup>. PROM causes preterm birth (20–40%) and foetal death (10%). PROM was 2–10% of the time<sup>4</sup>. Lower (cystitis and silent bacteriuria) and higher (pyelonephritis) urinary tract infections are frequent in pregnancy. Anatomical, hormonal, and increased plasma volume during pregnancy reduce urine concentration and cause glucosuria, which increases bacterial growth in the urine. Pregnant women are more prone to UTI than others. Symptomatic or asymptomatic maternal UTI. Symptomatic UTI is linked to intrauterine growth retardation (IUGR) and low-birth weight (LBW)<sup>5</sup>. Ignored asymptomatic bacteriuria can lead to cystitis and UTI. pyelonephritis Pregnant women must be screened for UTIs to receive prompt treatment<sup>6</sup>. Premature rupture of the membranes (PROM) is usually defined as rupture of membranes at any time before the onset of uterine contractions. PROM which occurs prior to 37 weeks of gestation is referred as preterm

premature rupture of membranes (PPROM), whereas; PROM which occurs after 37 weeks of gestation is referred as premature rupture of membranes. The latent period is defined as the duration from rupture of the membranes until the onset of true labor<sup>7</sup>. PROM affects 8–10% of pregnancies<sup>8</sup>. PROM at term usually causes spontaneous or induced labour within 12–24 hours. Preterm premature rupture of membranes (PPROM) complicates 2%–4% of singleton pregnancies and 7%–20% of twin pregnancies<sup>8,9</sup>. PROM occurs in 5% to 10% of deliveries, and PPROM in 3%. In referral facilities, more than 50% of PROM cases occur in preterm pregnancies. PROM causes one-third of premature births<sup>7</sup>. Iraq's PROM demonstrated poor mother or foetal outcomes. Prolonged PROM and absence of ANC visits were variables. Early correct identification of PROM is critical for a successful pregnancy and reduces maternal and foetal morbidity<sup>10</sup>. Pregnancy promotes UTI: According to studies, UTIs start around week 6. At 22–24 weeks, this probability peaks. Increased bladder volume, expansion, and ureter 32 expansion enhance infection risk in pregnant women. Anatomical and physiological changes during pregnancy modify bacteriuria and render pregnant women more susceptible to UTI complications such pyelonephritis<sup>11</sup>. PPROM is caused by a complex combination of variables. Direct infiltration of infections, harm to the inflammatory response, excessive breakdown of matrix metalloproteinases in foetal membranes, apoptosis, the oxidative stress response, tissue

acetylation, and microelement insufficiency are implicated <sup>12</sup>. Researchers worry about STIs. Over 60% of PPRM is connected to infection and associated inflammatory cascade <sup>13</sup>. Group B Streptococcus, Candida, Chlamydia trachomatis, Ureaplasma urealyticum, Neisseria gonorrhoeae, human herpes simplex virus, and some anaerobes cause PPRM <sup>14</sup>. **Aim of study** to ascertain the frequency and pattern of urinary symptoms as well as the risk factors for UTI in PROM.

**Method**

A prospective cross sectional study conducted in labor ward of Obstetrical department of Basra Maternity and Children Hospital in Basra city /Iraq during the period from 1st of January till 1st of September, 2022. All pregnant women with premature ruptured membranes and preterm premature ruptured membranes admitted to labor ward of Obstetrical department of Basra Maternity and Children Hospital were the study population. **Inclusion criteria:** Singleton pregnancy, Premature ruptured membranes (PROM) and Preterm Premature ruptured membranes (PPROM), Gestational age 28 weeks and more. **Exclusion criteria:** Twin pregnancy, History of renal system anomaly, polyhydramnios, Uterine anomalies, History of PROM in previous pregnancy, Abdominal trauma, vaginal bleeding before delivery. A convenient sample of eighty five pregnant women with premature ruptured membranes (PROM and PPRM) was selected from labor ward of Obstetrical department of Basra Maternity and Children Hospital were eligibility to inclusion and exclusion criteria. The data was collected from all women

who been admitted to labor ward with history of PROM and PPRM were included in the study and demographic characteristics was taken such as Age, Gestational age, Gravidity, parity, previous miscarriage, previous mode of delivery, clinical features of UTI like frequency, dysuria, loin pain and fever. The diagnosis of PPRM and PROM were made when the rupture of fetal membranes occurred before and after 37 wk, respectively. Each woman included in this study after taken full history and examination. The gestational age was calculated by LMP or by ultrasound. Each included woman was sent for general urine examination in the Laboratory of the hospital. The urine sample was collected by mid-stream urine in sterilized container, then sent for Laboratory. The result of urine examination By dipstick test was performed on mid-stream urine. **Statistical analysis:** All women's data entered using computerized statistical software; Statistical Package for Social Sciences (SPSS) version 22 was used. Descriptive statistics presented as (mean ± standard deviation) and frequencies as percentages. Multiple contingency tables conducted and appropriate statistical tests performed, Chi square test was used for categorical variables (Fishers exact test was used when expected variable was less than 20% of total variable). In all statistical analysis, level of significance (p value) set at ≤ 0.05 and the result presented as tables and/or graphs.

**Results**

According to fig 1, This study included 85 pregnant women with PROM which around 60% of studied cases had UTI and 40% had No UTI with PROM.

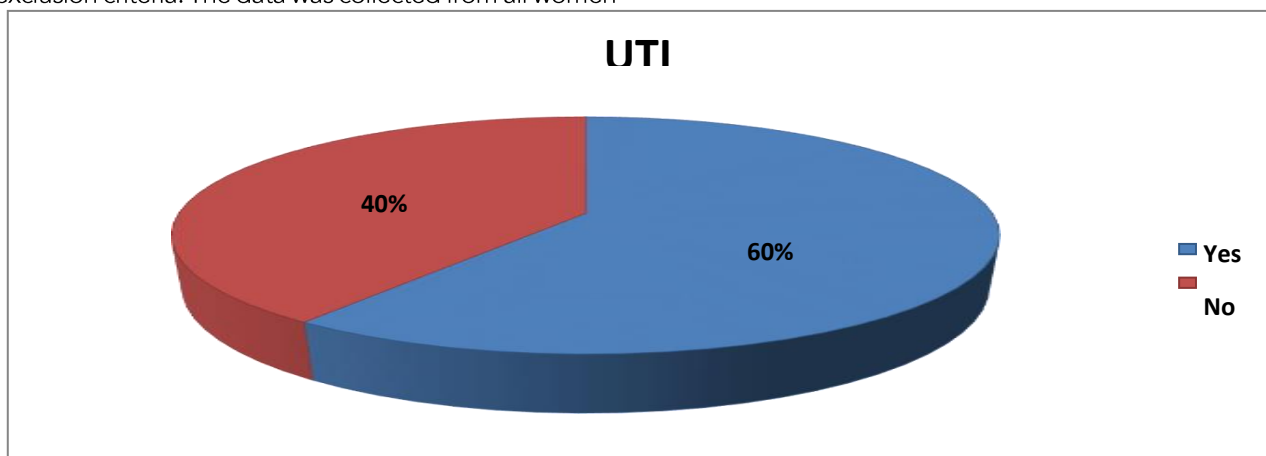


Figure 1: UTI prevalence of pregnant women with PROM.

The mean age of the studied group was 28±6.2, in which around 52.9% of PROM with UTI belongs to age group 20-29 years and around 20.6 % of

pregnant women with PROM but NO UTI belongs to age group <20 years and the difference was statically of No significance.

Table 1: Distribution of age in studied cases.

Variable	All		UTI		P	
	No.	%	Yes	%	No	
			No.		No.	%
Age mean±SD (28±6.2 years)						0.7*NS
<20 years	20	23.5	13	25.5	7	20.6
20-29 years	48	56.5	27	52.9	21	61.8
30-39 years	17	20.0	11	21.6	6	17.6

\* Chi square test, NS=Not significant.

Table 2: show that 58.8% of pregnant women with PROM and UTI being Primi-gravida and and no significant history Previously of miscarriage and

71.4% delivered vaginally and 76.5% was term when compared with pregnant women with PROM and NO UTI and the difference was not significant.

Table 2: Distribution of gestational characteristics according to UTI prevalence.						
Variable	All		UTI		P	
	No.	%	No.	%	No.	%
<b>Gravidity</b>						0.78*NS
Primi-gravidity	49	57.6	30	58.8	19	55.9
Multi-gravidity	36	42.4	21	41.2	15	44.1
<b>Parity</b>						0.8*NS
Nulli-parity	51	60.0	31	60.8	20	58.8
Multi-parity	34	40.0	20	39.2	14	41.2
<b>Miscarriage</b>						0.89**NS
Yes	12	14.1	7	13.7	5	14.7
No	73	85.9	44	86.3	29	85.3
<b>Previous mode of delivery</b>						0.7**NS
Vaginal	27	75.0	15	71.4	12	80.0
Cesarean	9	25.0	6	28.6	3	20.0
<b>Gestational age</b>						0.5*NS
Preterm	22	25.9	12	23.5	10	29.4
Term	63	74.1	39	76.5	24	70.6

\*Chi-square test, \*\*Fishers exact test, NS=Not significant.

The PROM pregnant women with UTI were significantly related to symptomatic presentation ( $p < 0.01$ ). The significant clinical features of UTI

among pregnant women with PROM were frequency, dysuria, loin pain and fever ( $p < 0.001$ ). (Table 3)

Table 3: The clinical features of patient with PROM and UTI.						
Variable	All		UTI		P	
	No.	%	No.	%	No.	%
<b>Clinical features</b>						<0.001* <sup>S</sup>
Asymptomatic	6	11.8	34	100.0	-	-
Symptomatic	45	88.2	0	-	-	-
<b>Frequency</b>						<0.001* <sup>S</sup>
Yes	6	11.8	35	100.0	-	-
No	45	88.2	0	-	-	-
<b>Dysuria</b>						<0.001* <sup>S</sup>
Yes	6	11.8	25	100.0	-	-
No	45	88.2	0	-	-	-
<b>Loin pain</b>						<0.001* <sup>S</sup>
Yes	6	11.8	27	100.0	-	-
No	45	88.2	0	-	-	-
<b>Fever</b>						<0.001* <sup>S</sup>
Yes	6	11.8	12	100.0	-	-
No	45	88.2	0	-	-	-

\*Fishers exact test, S=Significant

Table 4: shows that 23.6% of pregnant with PROM and UTI had low birth weight and around 49% had Cesarean section in comparison with non UTI and

PROM and the difference was statically significant. And in fig 2.

Table 4: Distribution of fetal outcome in studied patient.						
Variable	All		UTI		P	
	No.	%	No.	%	No.	%
<b>Birth weight</b>						0.01* <sup>S</sup>
Normal	72	84.7	39	76.4	33	79.0
Low	13	15.3	12	23.6	1	21.0
<b>Mode of delivery</b>						<0.001* <sup>S</sup>
Vaginal delivery	59	69.4	26	51.0	33	97.1
Cesarean section	26	30.6	25	49.0	1	2.9

\*Chi-square test, \*\*Fishers exact test, NS=Not significant, S=Significant.

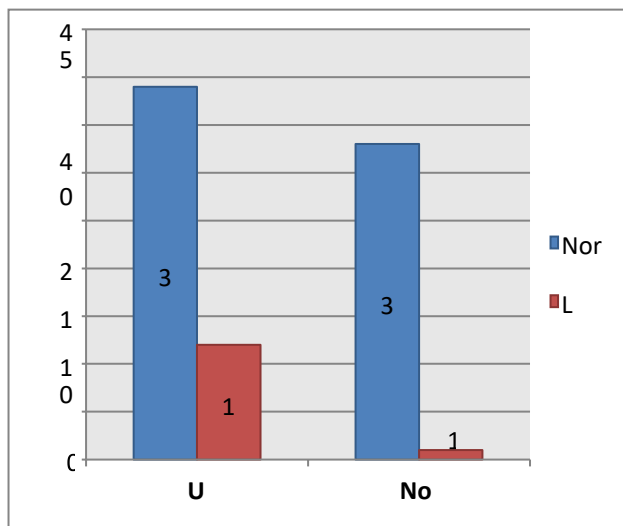


Figure 2: Distribution of birth weight in studied group.

## Discussion

UTIs are the most frequent bacterial infection during pregnancy, causing maternal and newborn co-morbidities. Assessing the link between urinary tract infection and premature membrane rupture helps establish preventative and therapeutic strategies<sup>15</sup>. 60% of pregnant women with PROM had a urinary tract infection. This conclusion is similar to Rahman et al. retrospective analyses of 100 pregnant women with PROM/PPROM in Indonesia, which reported 55.17% had urinary tract infections<sup>6</sup>. Our study's prevalence of UTI in pregnant women with PROM is greater than Addisu et al. finding of 26.7%<sup>16</sup>. This variation in UTI prevalence among pregnant women with PROM may be due to sociocultural variables, PROM risk factor predominance, study technique, and sample size discrepancies. 62% of pregnant women with preterm labour had urinary tract infections, according to a research in Basrah, Iraq. Different Iraqi studies, such as Nahab et al in Samawa city/Iraq, reported that 61.3% of pregnant women attending prenatal care unit had urinary tract infection<sup>17</sup>. In the research, 57.6% of PROM pregnant women were primi-gravid. This matches Gahwagi et al. research in Libya found that primi-gravidity increases PROM risk. 60% of pregnant women were nulliparous<sup>18</sup>. In Egypt, Ali et al. found a link between nulliparity and PROM. 41% of PROM pregnant women had a miscarriage history<sup>19</sup>. This data is consistent with Assefa et al. discovery that obstetric history, specifically recent miscarriage, is a risk factor for PROM<sup>7</sup>. In our study, 25% of PROM pregnant women had a prior C-section. This data is similar to Jiang et al., who found a prior C-section in 22.4% of PROM pregnant women<sup>20</sup>. In our research, 25.9% of women had PPROM, whereas 74.1% had PROM. Al-Joborae et al. found that 30% of pregnant women had PPROM and 70% had TPROM<sup>21</sup>. In this study, PROM pregnant women with UTI had symptomatic manifestation ( $p=0.01$ ). This conclusion is similar to Kamgang et al., who observed pregnant women with symptomatic UTIs had greater incidence of preterm membrane rupture<sup>22</sup>. Jain et al. found

that asymptomatic bacteriuria in pregnant women is linked to preterm premature membrane rupture<sup>23</sup>. Our investigation found a correlation between PROM pregnant women with UTI and symptom frequency ( $p=0.001$ ). Caughey et al. found that urine frequency is a frequent clinical characteristic of pregnant women with PROM, especially if accompanied by UTI<sup>24</sup>. Our investigation found a link between PROM pregnant women with UTI and dysuria ( $p=0.001$ ). This data is congruent with Alsmarai et al. study in Iraq, which said pregnant dysuria increases the risk of premature delivery and PROM<sup>25</sup>. In our research, PROM pregnant women with UTI had loin discomfort ( $p=0.001$ ). This matches Kamgang et al.<sup>22</sup>. Our investigation demonstrated a link between PROM pregnant women with UTI and fever ( $p=0.001$ ). This discovery is similar to Liang et al., who found that fever often accompanies preterm membrane rupture in pregnant women<sup>26</sup>. Low birth weight was seen in 15.3% of pregnant women with PROM and was associated with UTI ( $p=0.01$ ). This conclusion is comparable to Egbe et al<sup>27</sup>, who found that maternal UTIs are linked to increased birth weight. Hanke et al<sup>28</sup> found that pregnant women with PPROM have low birth weight babies. PROM and UTI together caused decreased birth weight in newborns<sup>27,28</sup>. Our analysis demonstrated a strong link between caesarean section and PROM UTI ( $p=0.001$ ). This data is comparable to that of Beksac et al<sup>29</sup>, who found that 65.2% of PROM pregnant women with urinary tract infections had caesarean sections.

## Conclusion

Pregnant women who have preterm rupture of membranes have an increased risk of contracting a urinary tract infection. Symptoms of a urinary tract infection in pregnant women include frequency, dysuria, loin pain, and fever. This infection is most commonly linked to preterm labor. Premature membrane rupture and urinary tract infections are associated with a high risk of having a baby with a low birth weight. Pregnant women who experience preterm rupture of membranes and urinary tract infection typically have their babies delivered via caesarean surgery.

## References

1. Idrisa A, Pius S, Bukar M. Maternal and neonatal outcomes in premature rupture of membranes at University of Maiduguri Teaching Hospital, Maiduguri, North-Eastern, Nigeria. *Trop J Obstet Gynaecol* 2019; 36:15-20.
2. Eleje GU, Ezebialu IU, Umeobika JC, Eke AC, Ezeama CO, Okechukwu ZC. Pre-labour rupture of membranes at term: A review of management in a health care institution. *Afrimed J* 2012; 1:10-14.
3. Qasim IK, Salman IA. Prevalence and Determinants of unfavorable Maternal and Neonatal Outcome in Term Premature Rupture of Membrane. *Indian J Med Forensic Med Toxicol* 2020; 14: 1530- 1531.

4. Darine SD, Nabil SN, Hamouda BH. Association between genital tract infection and premature rupture of membranes: A retrospective case control study in Tunisia, North Africa. *Afr J Reprod Health* 2021; 25(2): 131-137.
5. 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.
6. Rahman MN, Liligoly RD, Pangastuti N. Urinary tract infection in premature rupture of membrane (PROM): an academic hospital based study. *J Med Sci*, 2019; 51 (1): 31-35.
7. Assefa NE, Berhe H, Girma F, Berhe K, Berhe YZ, Gebreheat G, et al. Risk factors of premature rupture of membranes in public hospitals at Mekele city, Tigray, a case control study. *BMC Pregnancy Childbirth* 2018; 18(1):386.
8. Omneya MO, Mohammed E. Can vaginal washing fluid, creatinine and qualitative  $\beta$ -hcG diagnose suspected premature rupture of membranes? *Open J Obstet Gynaecol* 2014; 967-972.
9. Fortner KB, Grotegut CA, Ransom CE, Bentley RC, Feng L, Lan L, et al. Bacteria localization and chorion thinning among preterm premature rupture of membranes 2014;9:1-10. Available from: [www.poisone.org](http://www.poisone.org).
10. Qasim IK, Salman IA. Prevalence and Determinants of unfavorable Maternal and Neonatal Outcome in Term Premature Rupture of Membrane. *Indian Journal of Forensic Medicine & Toxicology* 2020; 14 (4): 1530-1537.
11. Sujatha R, Nawani M. Prevalence of asymptomatic bacteriuria and its antibacterial susceptibility pattern among pregnant women attending the antenatal clinic at kanpur, India. *J Clin Diagn Res* 2014; 8(4):DC01-3.
12. Dutta EH, Behnia F, Boldogh I. Oxidative stress damage- associated molecular signaling pathways differentiate spontaneous preterm birth and preterm premature rupture of the membranes. *Mol Hum Reprod* 2016; 22: 143-157.
13. Baldwin EA, Walther-Antonio M, MacLean AM. Persistent microbial dysbiosis in preterm premature rupture of membranes from onset until delivery. *PeerJ* 2015; 3: e1398.
14. Maki Y, Fujisaki M, Sato Y. Candida chorioamnionitis leads to preterm birth and adverse fetal-neonatal outcome. *Infect Dis Obstet Gynecol* 2017; 2017: 9060138.
15. World Health Organization. WHO recommendations for prevention and treatment of maternal peripartum infections. NLM classification: WQ 256, Geneva. WHO 2015. Available from: <https://apps.who.int/iris/bitstream/10665/186171/1/9789241549363>
16. Addisu D, Melkie A, Biru S. Prevalence of Preterm Premature Rupture of Membrane and Its Associated Factors among Pregnant Women Admitted in Debre Tabor General Hospital, North West Ethiopia: Institutional-Based Cross-Sectional Study. *Obstet Gynecol Int* 2020; 2020:4034680.
17. Nahab HM, Akeel Hamed Al-Oebady M, Aqeel Abdul Munem H. Bacteriological Study of Urinary Tract Infections among Pregnant Women in Al Samawa City of Iraq. *Arch Razi Inst* 2022; 77(1):117-122.
18. Gahwagi M, Busarira M, Atia M. Premature Rupture of Membranes Characteristics, Determinants, and Outcomes of in Benghazi, Libya. *Open Journal of Obstetrics and Gynecology* 2015; 5: 494-504.
19. Ali AES, Nossair WS, Abdel Maaboud RMR, Ibrahim SA. Incidence Rate, Risk Factors and Outcome of Premature Rupture of Membranes (PROM) at Zagazig University Hospitals. *The Egyptian Journal of Hospital Medicine* 2021; 85 (1): 2744-2750.
20. Jiang H, Lu C, Zhou J, Zhang W. Cesarean section and pregnancy outcomes of preterm premature rupture of membranes under different fertility policies in China. *Transl Pediatr* 2021; 10(4):973- 983.
21. Farhood Al-Joborae SF, Alwan FW. Sociodemographic and medical factors of preterm delivery according to the clinical subtypes of prematurity. *Medical Journal of Babylon* 2018; 15(4):341-348.
22. Kamgang F, Maise H, Moodley J. Pregnant women admitted with urinary tract infections to a public sector hospital in South Africa: Are there lessons to learn? *Southern African Journal of Infectious Diseases* 2016; 31(3): 79-83.
23. Jain V, Das V, Agarwal A, Pandey A. Asymptomatic bacteriuria & obstetric outcome following treatment in early versus late pregnancy in north Indian women. *Indian J Med Res* 2013; 137(4):753-758.
24. Caughey AB, Robinson JN, Norwitz ER. Contemporary diagnosis and management of preterm premature rupture of membranes. *Rev Obstet Gynecol* 2008; 1(1):11-22.
25. Alsamarai AM, Khorshed SA, Ali H. Urinary tract infection in female in Kirkuk city, Iraq: Association between risk factors and bacterial type. *Our Dermatol Online* 2017; 8(3):242-249.
26. Liang H, Xie Z, Liu B, Song X, Zhao G. A routine urine test has partial predictive value in premature rupture of the membranes. *J Int Med Res* 2019; 47(6):2361-2370.
27. Egbe T, Omarine N, Henri E, Francine W, Egbe D, Enow-Orock G. Uropathogens of Urinary Tract Infection in Pregnancy and Maternal-Fetal Outcomes at the Douala Referral Hospital, Cameroon: A Case-Control Study. *Open Journal of Obstetrics and Gynecology* 2020; 10: 914-929.
28. Hanke K, Hartz A, Manz M, Bendiks M, Heitmann F, Orlikowsky T, et al; German Neonatal Network (GNN). Preterm prelabor rupture of membranes and outcome of very-low-birth-weight infants in the German Neonatal Network. *PLoS One* 2015; 10(4):e0122564.
29. Beksac AT, Orgul G, Tanacan A, Uckan H, Sancak B, Portakal O, et al. Uropathogens and Gestational Outcomes of Urinary Tract Infections in Pregnancies that Necessitate Hospitalization. *Curr Urol* 2019; 13:70-73.