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The relationship between urinary tract infections and preterm labor for pregnant women in Syria

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Abstract: Objective: The aim of this study is to determine the prevalence of urinary tract infection (UTI) in pregnant women with preterm labor. In addition to, estimating the association between UTI and occurrence of preterm labor.

Patients and Methods: Descriptive Case- Control Study conducted for the period one year (June 2020 –June 2021) at Tishreen University Hospital in Lattakia- Syria. The study included 125 pregnant women without risk factors for preterm labor who were divided into case group (70): with preterm labor, and control group (55) with full term labor. Investigations for presence of UTI were performed in two groups.

Results: The mean age was 25.5±5.3 years in the case group and 26.2±4.89 years in control group without significant difference. Previous history of preterm labor was more frequently in case group (17.5% vs.2.7%, p: 0.03). E.COLI was more frequently in the two groups. It was found that 16 patients (22.8%) in the case group and 4 patients (7.3%) in the control group had UTI with significant difference ($p<0.05$). In the multivariate regression model, UTI was significantly associated with preterm labor (OR: 3.7[1.18- 12.05], P: 0.02.

Conclusion: UTI is associated with the risk of preterm labor. Therefore, early detection and treatment of the infection can reduce effectively the risk of preterm labor.

Keywords: Preterm labor, urinary tract infection

العلاقة بين التهاب المسالك البولية والمخاض الباكر للنساء الحوامل في سوريا

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المستخلص: هدفت الدراسة إلى تحديد نسبة انتشار التهاب المسالك البولية في حالة المخاض الباكر، وكذلك تقييم العلاقة بين التهاب المسالك البولية وحدوث المخاض الباكر.

طريقة البحث: كانت هذه دراسة وصفية (حالة- شاهد) أجريت في مشفى تشرين الجامعي في اللاذقية- سوريا خلال الفترة الممتدة ما بين حزيران 2020- حزيران 2021. شملت الدراسة 125 حاملا من دون وجود عوامل خطر لحدوث المخاض الباكر وتم تقسيمهن إلى مجموعتين: مجموعة الحالات: شملت 70 حاملاً مع مخاض باكر، ومجموعة الشواهد: شملت 55 حاملاً مع حدوث المخاض عند تمام الحمل. تم إجراء الاستقصاء عن وجود التهاب المسالك البولية في كلا المجموعتين.

النتائج: بلغ متوسط العمر 5.3±25.5 في مجموعة الحالات و4.89±26.2 في مجموعة الشواهد من دون وجود اختلافات ذات أهمية إحصائية. أثبتت الدراسة أن التاريخ المرضي لبدء مخاض باكر كان أكثر انتشاراً لدى مجموعة الحالات (17.5% مقابل 2.7%)، وإن أكثر العوامل الممرضة المعزولة هي العصيات القولونية في كلتا المجموعتين. تم تحديد وجود التهاب المسالك البولية عند 16 مريض (22.8%) في مجموعة الحالات و4 مرضى (7.3%) في مجموعة الشواهد. أظهر التحليل المتعدد أن التهاب المسالك البولية يزيد خطر حدوث المخاض الباكر وبنسبة أرجحية 3.7.

الاستنتاج: يترافق التهاب المسالك البولية مع خطر حدوث المخاض الباكر، لذلك فإن التشخيص الباكر وعلاج الالتهابات قد يقلل بشكل فعال خطر الحدوث.

الكلمات المفتاحية: المخاض الباكر، انتان السبيل البولي.

Introduction.

Preterm labor is defined as occurring regular uterine contractions at least once every 10 minutes resulting in cervical dilatation before the end of 37 weeks' gestation [1, 2].

It is an obstetric complication occurring in 15% to 20% of all pregnancies. Many factors are increasing the risk of incidence including maternal and fetal factors [3]. These factors include maternal demographic and socioeconomic characteristics, behavioral factors, and obstetric history [4].

The pathophysiology involves the following pathogenic processes: premature activation of the maternal or fetal hypothalamic- pituitary adrenal axis, pathological uterine distention, inflammation, and infection [5].

The preterm labor contribution to adverse outcomes is largely related to pregnancy age at delivery. There isn't a single effective method for satisfactory prognosis of preterm labor and prevention of preterm birth exists [6].

Urinary tract infections (UTI) are common during pregnancy. UTI may present with symptoms of acute cystitis or pyelonephritis, or may be insidious in women with asymptomatic bacteriuria [7]. Asymptomatic bacteriuria defined as isolation of bacterial strain in quantitative counts of $\geq 10^5$ cfu/mL or a catheterized urine specimen with bacterial isolation in a quantitative count of $\geq 10^2$ cfu/mL without urinary symptoms [8].

Acute cystitis is characterized by inflammation of the bladder. Signs and symptoms include hematuria, dysuria, suprapubic discomfort, urgency and nocturia, and confirmed by bacterial growth on urine culture [8].

Acute pyelonephritis is characterized by fever, flank pain, and tenderness, and confirmed by bacterial growth on urine culture [8].

In pregnant women, anatomical and physiological changes in urinary tract, as well as immune system changes during pregnancy increase the risk of bacteriuria, and it may cause a symptomatic infection [9].

Preterm labor has a considerable health impact as it is the most common reason for antenatal hospitalization of pregnant women and possess a unique pressure on obstetricians. Many studies

demonstrated a significant correlation between UTI and maternal morbidity and adverse birth outcomes such as preterm labor [10]. Therefore, the objectives of this study which is conducted in Syria for the first time is to: examine the relationship between UTI during pregnancy and preterm labor and determine the incidence of UTI in preterm labor.

Materials and Methods.

This is a descriptive (Case – Control) Study of 125 pregnant women aged (18- 35) years who attended the department of Obstetrics and Gynecology at Tishreen University Hospital in Lattakia- Syria for one year (June 2020- June 2021). The exclusion criteria were: Presence of placenta previa, pregnant women with pre- existing diabetes mellitus, chronic hypertension and heart disease, women with multiple pregnancies, polyhydramnios and congenital malformation, Intrauterine growth restriction (IUGR), presence of cervicitis and vaginal infection, previous cervical cerclage, preeclampsia and gestational hypertension.

The following workup included: history and physical examination, performing ultrasonographic examination, laboratory investigations including complete urine analysis procedure for clean –catch midstream specimen, and culture on appropriate media and viable bacterial cell count was done was done by utilizing the micro calibrated loop (1µ) method. Patients were divided into case group: women with preterm labor and control group: with full term labor.

Ethical consideration: A complete and clear informed consent was obtained from all participators after discussion about the study. This study was performed by following the Declaration of Helsinki.

Statistical Analysis:

Statistical analysis was performed by using IBM SPSS version 20. Basic Descriptive statistics included means, standard deviations (SD), Frequency and percentages. To examine the relationships and comparisons between the two groups chi- square test were used. Multivariate logistic regression was used to determine the association between UTI and outcome using odds ratio (OR) and 95% confidence interval (CI). All the tests were considered significant at a 5% type I error rate ($p<0.05$), β: 20%, and power of the study: 80%.

Results.

As shown in Table (1), the mean age was 25.5±5.3 in case group and 26.2±4.89 in control group, p: 0.44. The highest frequency of patients was in the age group <25 years in the two groups without significant differences (p; 0.86). There was a significant difference between the two groups regarding presence of previous history of preterm labor which was more frequent in the case group (17.5 vs.2.7%, p;0.03). The mean gestational age was 33.2±4 in the case group vs. 38.8±1.1 in control group, p;0.0001.

Table (1) Demographic characteristics of the study population by comparison of the two groups

Variables	Case group1	Control group	p value
Maternal age (years)	25.5±5.3	26.2±4.89	0.44
Age group (years) <25 25- 35 >35	 39 (55.7%) 21 (30%) 10 (14.3%)	 28 (51%) 18 (32.7%) 9 (16.3%)	0.86
Obstetric history nulliparous multiparous	 30 (42.9%) 40 (57.1%)	 19 (34.5%) 36 (65.5%)	0.13
Previous preterm labor Present Absent	 7 (17.5%) 33 (82.5%)	 1 (2.7%) 35 (97.3%)	0.03
Previous preterm abortion Present Absent	 6 (11.5%) 50 (88.5%)	 3 (5.8%) 49 (94.2%)	0.3
Gestational age (weeks)	33.2±4	38.8±1.1	0.0001

The predominant micro- organisms were more frequent in Case group (62.5%) and Control group (50%).UTI was positive in the case group in 22.8% vs. 7.3% in control group, p: 0.01. Asymptomatic bacteriuria was the most frequent urinary infection in case group (10%) (Table: 2).

Table (2) Results of urine culture and different micro- organisms isolated from study population samples

Variable	Case group	Control group	P value
Viable colony count CFU/ml $<10^3$ 10^3- 10^4 10^4- 10^5 $>10^5$	 54 (77.2%) 4 (5.7%) 5 (7.1%) 7 (10)	 51 (92.7%) 1 (1.8%) 1 (1.8%) 2 (2.6%)	0.1
Organism isolated E Coli Streptococcus group B Klebsiella Enterococcus fecalis	 10 (62.5%) 3 (18.7%) 2 (12.5%) 1 (6.3%)	 2 (50%) 1 (25%) 1 (25%) 0 (0%)	 0.6 0.7 0.5 0.6

Variable	Case group	Control group	P value
UTI			
Positive	16 (22.8%)	4 (7.3%)	0.01
Negative	54 (77.2%)	51 (92.7%)	
Diagnosis			
Acute pyelonephritis	3 (4.2%)	0 (0%)	
Acute cystitis	6 (8.6%)	2 (3.6%)	0.09
Asymptomatic bacteriuria	7 (10%)	2 (3.6%)	
UTI (negative)	54 (77.2%)	51 (92.7%)	

UTI was a significant independent risk factor for preterm labor occurrence OR: 3.7[1.18- 12.05], p: 0.02.

Table (3) Distribution of urinary infection between groups

Variable	Case group	Control group	OR	P value
Urinary infection				
Present	54 (51.4%)	51 (48.6%)	3.7[1.18- 12.05]	0.02
Absent	16 (80%)	4 (20%)		

Discussion.

Spontaneous preterm labor accounts for 40% to 50% of all preterm deliveries, which is associated with considerable health impact as is one of the leading causes of perinatal morbidity and several chronic diseases in the long term [11].

The current study of 125 pregnant women demonstrated the prevalence of UTI in the group with preterm labor was 22.8% with statistical significant differences with full term labor group ($p<0.05$). Asymptomatic bacteriuria was the most frequent infection in case group. UTI significantly increase the incidence of preterm labor in pregnant women, which increase the chance of its occurrence by 3.7 times. These results are comparable to the findings reported by previous studies.

Several proposed mechanisms linking UTI to preterm labor including: elevated levels of cytokines such as IL- 1β promote synthesis of IL- 6, IL- 8 which then triggers the production of prostaglandins E2, F2a which stimulate uterine contractions. Colonization of amniotic fluid by uropathogenic originated from UTI, and these bacteria produce phospholipases A and C that act as precursors of pro- contractile prostaglandins E2, F2a[11].

Paulo *et al.*, (2012) showed that UTI was more frequent in preterm labor group compared to the full- term labor group without significant differences (36.7% vs.22.2%, p: 0.1) [12].

Indu *et al.*, (2014) demonstrated that UTI was more frequent in pregnant women with preterm labor (13.4% vs.1.92%, $p<0.05$), and the most frequent isolated pathogens were E. COLI in both groups[13].

Kamel *et al.*, (2018) demonstrated that asymptomatic bacteriuria was present in 5% in preterm group vs.2.5% in full- term group without significant differences ($p>0.05$). E.COLI was the most common pathogen [14].

Vrishali *et al.*, (2017) showed that UTI was present in 22% of pregnant with preterm labor vs. 6% in full- term labor ($p<0.05$) [15].

Similar to previous studies, our findings support the conclusion that urinary tract infection increases the risk of preterm labor.

Conclusion:

Screening and treatment of urinary tract infection in pregnancy will reduce the incidence of preterm labor and improve perinatal outcome.

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