The Association between Meconium-Stained Amniotic Fluid and Chorioamnionitis or Endometritis

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Objective: *Assess the association between meconium-stained amniotic fluid and chorioamnionitis or endometritis in term pregnant women.*
Material and Method: *A five-year retrospective study was undertaken between January 1, 1999 and December 31, 2003. One thousand seventy-nine pregnant women who delivered at the Department of Obstetrics & Gynecology, Phramongkutklao Hospital were included in the present study.*
Results: *Five hundred and fifty-three pregnant women (51.25%) had meconium-stained amniotic fluid (group 1) and 526 (48.75%) pregnant women were clear of amniotic fluid (group 2). Two pregnant woman in group 1 (0.36%) and eight pregnant women in group 2 (1.52%) were found to have chorioamnionitis (OR = 0.235). Postpartum endometritis was detected in only one (0.18%) pregnant women in group 1 and nine (1.71%) pregnant women in group 2 (OR = 0.104).*
Conclusion: *No association was found between meconium-stained amniotic fluids and chorioamnionitis or endometritis.*

Keywords: *Meconium-stained amniotic fluid, Chorioamnionitis, Endometritis*

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Meconium-stained amniotic fluid is a common finding in term and post-term pregnancy. The incidence of meconium-stained amniotic fluid is commonly found in 9-20% of deliveries[1]. The incidence of meconium-stained amniotic fluid in preterm pregnancy is less than 5%[2]. The pathophysiology of the meconium passage may arise from different causes such as response of fetal hypoxia, increased vagal activity *in utero* from stress, normal physiologic function or a combination of different causes[1]. Fetal defecation will cause meconium staining of the amniotic fluid, placenta umbilical cord, and body of the fetus[3]. The neonatal outcome is meconium aspiration syndrome, 0.13-1%, and neonatal death, 20%[4]. Meconium-stained amniotic fluid represents a fetal response to stress and is associated with non-reassuring fetal heart sound[5]. The operative obstetrics rate is higher in deliveries complicated by meconium-stained amniotic fluid. The rate of maternal complication and mortality are higher in women with meconium-stained amniotic fluid[6]. Previous studies reported that meconium-stained amniotic fluid is a risk factor of infection where Ureaplasma urealyticum and *Mycoplasma* spp. were the most common organisms isolated from the amniotic fluid. The maternal lower genital tract is the source for these bacteria[7,8]. Pregnant women who had meconium-stained amniotic fluid had increased risk for peripartum and postpartum infection[9-11]. The objective of the present study was to assess the association between meconium stained amniotic fluid and chorioamnionitis or endometritis.

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Material and Method

A five-year retrospective study was completed

between January 1, 1999 and December 31, 2003. One thousand and seventy nine pregnant women who delivered at the Department of Obstetrics & Gynecology, Phramongkutklao Hospital were included in the present study. Pregnant women were defined as women with a single fetus, cephalic presentation, gestational age at delivery $\geq$ 37 weeks and birth weight $\geq$ 2500g. The exclusion criteria were high risk pregnancy, time of rupture of membranes $\geq$ 18 hours, dead fetus *in utero*, fetal anomaly, maternal medical diseases and prophylactic antibiotic given before, during and after delivery. The primary objective was to look for the association between meconium-staining of amniotic fluid and chorioamnionitis or endometritis. The quality of meconium-stained amniotic fluid was assessed clinically by the physician who provided care at the time of rupture of the membranes and was categorized as "mild", "moderate," and "thick." Pregnant women without meconium-stained amniotic fluid were categorized as "clear" amniotic fluid. Chorioamnionitis was defined when the body temperature was > 37.8 C, plus any two of the following; maternal tachycardia > 100 beats per minute, fetal tachycardia > 160 beats per minute, uterine tenderness, foul smelling amniotic fluid, or white blood cell > 15000/mm^3[10]. Postpartum endometritis was diagnosed as having a temperature more than 38 C (taken twice at least 4 hours apart), plus uterine tenderness, foul smell lochia or white blood cell count more than 15000/mm^3[10]. Maternal, demographic data, route, and outcome of delivery were abstracted from the medical records by a single investigator using standardized definitions. Factors associated with peripartum and postpartum infections were analyzed including duration of ruptured membrane, maternal age, parity, and personnel-medical birth attendants in delivery. This present research was approved by the Ethics Committee, Royal Thai Army Medical Department.

Statistical analysis

Mean $\pm$ Standard Deviation (SD) and frequency (%) were used to describe the patients characteristics. Student's t-test was performed to assess the difference between two mean. Chi-square test was used to compare categorical variables. Univariate and multivariate analysis of risk factors (odds ratio) associated with quality of meconium-stained amniotic fluid and maternal factors were analyzed with 95% confidence interval (95% CI). A two-tailed p-value less than 0.05 was considered statistically significant.

Results

One thousand seventy nine 1079 pregnant women were studied. Table 1 shows the demographic data; age, gestational age, number of ANC, gestational age at first ANC, parity, duration of rupture of mem-

Table 1. Demographic data of 1079 pregnant women

Characters	Meconium-stained Amniotic Fluid (n = 553)	Clear Amniotic Fluid (n = 526)	p-value
Age	27.35 $\pm$ 5.80	26.69 $\pm$ 5.34	0.053
Gestational age (week)	38.81 $\pm$ 2.50	38.71 $\pm$ 1.27	0.408
Number of ANC	7.57 $\pm$ 3.29	7.70 $\pm$ 3.17	0.533
Gestational age at first ANC (weeks)	17.45 $\pm$ 7.62	17.20 $\pm$ 7.37	0.586
Parity	1.63 $\pm$ 0.85	1.59 $\pm$ 0.74	0.558
Duration of ruptured of membrane (hours)	10.98 $\pm$ 3.43	9.92 $\pm$ 3.33	<0.001*
Birthweight (gm)	3196.05 $\pm$ 421.09	3165.86 $\pm$ 356.25	0.205
Route of delivery (percent)			
Normal delivery	485 (49.9)	487 (50.1)	0.001*
Cesarean section	27 (50.9)	26 (49.1)	
Operative vaginal delivery	41 (75.9)	13 (24.1)	
Delivery personnel (percent)			
Staff	44 (34.9)	82 (65.1)	<0.001*
Medical students	144 (43.0)	168 (45.4)	
Nurses and student nurses	202 (54.6)	191 (57.0)	
Residents	163 (66.0)	84 (34.0)	

* = Statistically significant

brane, birth weight, route of delivery, and delivery personnel with mean and standard deviation. Statistically significant difference between the two groups included duration of ruptured membranes, the route of delivery, and delivery personnel (p-value < 0.05). The prevalence of meconium-stained amniotic fluid in the study group was 51.25%, as shown in Table 2. The overall chorioamnionitis rate was 0.93%. Patients with clear amniotic fluid had a 1.52% chorioamnionitis rate; patients with any degree of meconium had an overall rate of 0.36%. It was found that patients with meconium-stained amniotic fluid was associated with a decrease in chorioamnionitis (OR, 0.235; 95%CI, 0.05-1.112) this finding was not statistically significant. A similar trend was observed with endometritis, for which the overall rate was 0.93%; the patients with clear amniotic fluid had a 1.71% endometritis rate, and the patients with any degree of meconium had an overall rate of 0.18%. The patients with meconium-stained were significantly associated with a decrease in endometritis (OR, 0.104; 95%CI, 0.013-0.824), as shown in Table 3. In univariate model (Table 4), with

Table 2. Prevalence of meconium-stained amniotic fluid

Amniotic fluid	Number	Percent
Clear	526	48.75
Mild meconium-stained	373	34.57
Moderate meconium-stained	118	10.94
Thick meconium-stained	62	5.74
Total	1079	100.00

Table 3. Infection rates by quality of meconium-stained amniotic fluid

Amniotic Fluid	Chorioamnionitis (n = 10)	OR	95%CI	Endometritis (n = 10)	OR	95%CI
Meconium-Stained (n = 553)	2 (0.36)	0.235	0.05-1.112	1 (0.18)	0.104	0.013-0.824
Clear (n = 526)	8 (1.52)	1		9 (1.71)	1	

Table 4. Association of maternal factors and quality of meconium-stained amniotic fluid

	Meconium-stained	Clear	Crude OR	95% (CI)	p-value
Age					
< 35	503 (50.2)	499 (49.8)	1		
≥ 35	49 (64.5)	27 (35.5)	1.80	1.10-2.92	0.018*
Route of delivery (percent)					
Normal delivery	485 (49.9)	487 (50.1)	1		
Cesarean section	27 (50.9)	26 (49.1)	1.043	0.60-1.81	0.882
Operative vaginal delivery	41 (75.9)	13 (24.1)	3.167	1.67-5.98	<0.001*
Delivery personnel (percent)					
Staff	44 (34.9)	82 (65.1)	1		
Medical students	202 (54.6)	168 (45.4)	2.241	1.47-3.40	<0.001*
Nurses and student nurses	144 (43.0)	191 (57.0)	1.405	0.91-2.15	0.117
Residents	163 (66.0)	84 (34.0)	3.616	2.30-5.67	<0.001*
Gestational age					
36-40	499 (50.6)	487 (49.4)	1		
≥ 40	49 (58.3)	35 (41.7)	1.366	0.87-2.14	0.211
ANC					
> 4	113 (57.4)	84 (42.6)	1		
≤ 4	440 (49.9)	442 (50.1)	1.351	0.98-1.84	0.059
Duration of rupture of membranes (hours)					
≥ 18	1 (50.0)	1 (50.0)	1		
< 18	552 (51.3)	524 (48.7)	1.053	0.06-16.88	1.000

* = Statistically significant

Table 5. Multivariate analysis of risk factors associated with quality of meconium-stained amniotic fluid

	Meconium-stained	Clear	Crude OR	95% (CI)	p-value
Age					
< 35	503 (50.2)	499 (49.8)	1		
≥ 35	49 (64.5)	27 (35.5)	1.762	1.05-2.95	0.032*
Route of delivery (percent)					
Normal delivery	485 (49.9)	487 (50.1)	1		
Cesarean section	27 (50.9)	26 (49.1)	0.872	0.47-1.61	0.661
Operative vaginal delivery	41 (75.9)	13 (24.1)	2.850	1.43-5.67	0.003*
Delivery personnel (percent)					
Staff	44 (34.9)	82 (65.1)	1		
Medical students	202 (54.6)	168 (45.4)	2.694	1.72-4.21	<0.001*
Nurses and student nurses	144 (43.0)	191 (57.0)	1.728	1.09-2.72	0.018*
Residents	163 (66.0)	84 (34.0)	3.902	2.44-6.21	<0.001*
Gestational age					
36-40	499 (50.6)	487 (49.4)			
≥ 40	49 (58.3)	35 (41.7)			
ANC					
> 4	113 (57.4)	84 (42.6)			
≤ 4	440 (49.9)	442 (50.1)			
Duration of ruptured membranes (hours)					
≥ 18	1 (50.0)	1 (50.0)			
< 18	552 (51.3)	524 (48.7)			

* = Statistically significant

the use of the associated, dichotomize, risk factors as a predictor for meconium-stained, the authors found that maternal age, route of delivery, and delivery personal to be statistically significant (p-value < 0.05). In multivariate model (Table 5), with the use of the dichotomize associated risk factors as a predictor for meconium-stained, the authors found that maternal age and route of delivery statistically significant (OR, 1.646, 1.642; 95%CI, 1.51-2.69, 1.08-2.49, respectively).

Discussion

The present study reports the results from a retrospective study of meconium-stained amniotic fluid and intrapartum chorioamnionitis or postpartum endometritis in Phramongkutklao Hospital, Bangkok, Thailand. However, previous studies reported that an association between meconium-stained amniotic fluid and infection existed. Piper JM et al[4] concluded the meconium-stained amniotic fluid is associated with increased peripartum infection and Tran SH et al[9] reported that chorioamnionitis and endomyometritis are associated with meconium-stained amniotic fluid. However, they are a limitation in antibiotic prophylaxis for Group B streptococcus. Other studies were observation in preterm pregnancy and *in vitro*. They have provided evidence to strengthen this potential association. The present study was controlled by multiple confounding factors that included length of labor, gestational age, parity, birth weight, route of delivery, pregnant women, and prior antibiotic prophylaxis. In Phramongkutklao Hospital, the prevalence of meconium-stained amniotic fluid (51.25%) was higher than other studies. It might be because of the subjective degree of judgment, clinician or birth attendant, assessing the degree of meconium-stained. There is no clear definition of the diagnosis. With regard to the diagnosis of infection, clinical criteria were used because amniotic fluid culture is not performed routinely at the study institution. Therefore, the rate of chorioamnionitis and endometritis in the present study is lower than other studies. Furthermore, meconium-stained was associated with older age group, route of delivery, and delivery personnel (p-value < 0.05). In the present study, the clear amniotic fluid group had a higher infection rate than the meconium-stain group. The reason for this may be associated with contamination and unsterile technique used in the nurse student teaching programs. The limitations of the present study were due to the retrospective nature, the degree of meconium staining, and the fact that the diagnosis

of chorioamnionitis and endometritis were based on the judgment of the clinician providing care, not from culture-proven infection. Therefore, this study cannot be used to detect subclinical infection.

Further prospective controlled trial studies of this kind may be beneficial.

Conclusion

There was no association between meconium-stained amniotic fluid or chorioamnionitis and endometritis.

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ความสัมพันธ์ระหว่างการถ่ายขี้เทาของทารกในครรภ์และการติดเชื้อของเยื่อถุงน้ำคร่ำ หรือ การอักเสบของเยื่อบุมดลูกที่โรงพยาบาลพระมงกุฎเกล้า

สุธี พานิชกุล, กุณฑรี บุญประเสริฐ, สยมพร โกมลพิศ, ปริศนา พานิชกุล, สุภัค แซ่โง้ว

วัตถุประสงค์: *เพื่อศึกษาความสัมพันธ์ระหว่างการถ่ายขี้เทาของทารกในครรภ์และการติดเชื้อของเยื่อถุงน้ำคร่ำ หรือ การอักเสบของเยื่อบุมดลูกในสตรีตั้งครรภ์*

วัสดุและวิธีการ: *ทำการศึกษาแฟ้มประวัติการคลอดย้อนหลัง 5 ปีในสตรีตั้งครรภ์ที่มาคลอดที่โรงพยาบาลพระมงกุฎเกล้า จำนวน 1079 ราย ระหว่างเดือนมกราคม พ.ศ. 2542 ถึงเดือนธันวาคม พ.ศ. 2546 โดยดูความสัมพันธ์ระหว่างการถ่ายขี้เทาของทารกในครรภ์และภาวะการติดเชื้อของเยื่อถุงน้ำคร่ำ หรือ การอักเสบของเยื่อบุมดลูกภายหลังการคลอดของสตรีที่มาคลอดบุตร*

ผลการศึกษา: *จากสตรีที่มาคลอดบุตรที่โรงพยาบาลพระมงกุฎเกล้าทั้งสิ้น 1079 ราย พบว่ามีภาวะการถ่ายขี้เทาของทารก ในครรภ์ ร้อยละ 51.25 พบภาวะการติดเชื้อของเยื่อถุงน้ำคร่ำในการที่ทารกในครรภ์มีการถ่ายขี้เทาและไม่มีขี้เทาร้อยละ 0.36 และ 1.52 ตามลำดับ พบภาวะการติดเชื้อของเยื่อบุมดลูกหลังคลอดในการที่ทารกในครรภ์มีการถ่ายขี้เทา และไม่มีขี้เทาร้อยละ 0.18 และ 1.71 ตามลำดับ*

สรุป: *ไม่พบว่าการถ่ายขี้เทาของทารกในครรภ์จะสัมพันธ์กับการติดเชื้อของเยื่อถุงน้ำคร่ำหรือการอักเสบของเยื่อบุมดลูกในสตรีตั้งครรภ์ ซึ่งต้องการการศึกษาเพิ่มเติมต่อไป*