A Comparison of the Rate of Premature Rupture of Membranes between Twin versus Singleton Pregnancy

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Objective: *To compare the rate of pregnancy complicated with premature rupture of membranes (PROM) and obstetric outcomes of twin pregnancies and singleton pregnancies.*

Material and Method: *A retrospective cohort study was conducted on twin and singleton pregnancies that delivered at Rajavithi Hospital, Tertiary public hospital, Bangkok, Thailand between January 1, 2008 and July 31, 2012. Singleton pregnancies as a control group were matched with twin pregnancies based on date of delivery, with a ratio of 1:1. The main outcome of measure was the prevalence of preterm rupture of membranes.*

Results: *The prevalence of PROM among twin pregnancies had a tendency to be lower than that in singleton pregnancies, 5.4% vs. 9%, but the difference was not statistically significant (p = 0.053). The mean gestational age at delivery for twin pregnancies was significantly lower than singleton, 34.8±3.1 weeks vs. 38.1±2.1 weeks (p<0.001). The rates of cesarean delivery, low birth weight baby, and APGAR scores less than 7 at 5 minutes were also significantly higher in twin pregnancies.*

Conclusion: *The prevalence of PROM in twin pregnancies had a tendency to be lower than that in singleton, but not statistically significant. The reason may be associated with a high rate of pre-labor cesarean section due to other obstetric complications.*

Keywords: *Twin pregnancy, Premature rupture of membranes, Obstetrics outcome*

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Over the past 20 to 30 years, the prevalence of twin pregnancy has increased in many countries[1-3]. Most of twin pregnancies were associated with newly technology of in vitro fertilization but race might be a factor that causes the difference in incidence in each country.

Twin pregnancy significantly affects on adaptation of maternal physiology. Physiologic adaptations occur in the mother in response to the demands of pregnancy. This demand includes support of the fetuses, protection of the fetuses, and preparation of the mother for delivery[4]. Twin pregnancy is one of the common obstetric complications. Many complications are more often encountered during twin pregnancy such as maternal anemia, preeclampsia, preterm birth, premature rupture of membrane, and postpartum hemorrhage[5]. As a consequence, twin pregnancies are associated with higher rates of maternal and perinatal morbidity and mortality. Fetal mortality is increased in all gestational weeks because of prematurity and very low birth weight baby[6].

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Premature rupture of membrane (PROM) is defined as rupture of the amniotic membranes before the onset of labor[5]. PROM might be more prevalent in twin pregnancy and could be a cause of other complications, such as cord prolapse, preterm birth, low birth weight, chorioamnionitis, and postpartum hemorrhage[7,8]. The frequency of PROM increases with increasing plurality of gestation[9]. There have been few studies of association between twin pregnancy and premature rupture of membrane as well as to compare with singleton, especially in Thailand.

The primary objective of the present study was to compare the prevalence of premature rupture of membrane (PROM) in twin pregnancies and singleton pregnancies. Additionally, pregnancy outcomes between twin and singleton pregnancies were also compared. The results may be beneficial for the baseline data, evaluation of the quality of obstetric care, and guide to develop the management guideline in the future.

Material and Method

The present study was ethically approved by the Institute Review Boards of Rajavithi Hospital, Bangkok, Thailand. The study design is retrospective cohort study comparing the prevalence of PROM

between twin and singleton gestations. The null hypothesis was that there was no difference in the prevalence of PROM in twin pregnancy and singleton pregnancy.

Consecutive cases of twin pregnancy delivered at Rajavithi Hospital between January 1, 2008 and July 31, 2012 were recruited as a study group and were matched with singleton pregnancies based on delivery date with a ratio of 1:1 by computer randomization. The cases were identified through a search of the hospital computer database. Maternal charts, labor records and delivery notes were reviewed to identify maternal characteristics, clinical complications and neonatal outcomes, including pregnancy-induced hypertension, placenta previa, placental abruption, postpartum hemorrhage, comorbid diseases e.g. diabetes or chronic hypertension etc., route of delivery as well as indications, gestational age at delivery, birth weight, and Apgar scores at 1 and 5 minutes. The diagnosis of ruptured of membranes was made by clinical history and examination include pooling of amniotic fluid, positive nitrazine test and oligohydramnios documented by ultrasound. Gestational age was estimated by last menstrual period and dating by early ultrasound. The main outcome of measure was the prevalence of PROM in the two groups.

Statistical analysis

The statistical analysis was performed using IBM SPSS version 21.0 (IBM SPSS Statistics for Windows, Released 2012. Armonk, NY: IBM Corp). Comparisons of baseline characteristics and the outcomes between the two groups were performed, using Student's t -tests for continuous variables and Chi-square or Fisher's exact tests for categorical variables. A p-value <0.05 was considered statistically significant. The present study needed a sample size of at least 283 cases per group to gain 80% power of test at 95% confidence interval, based on the prevalence of PROM among singleton and twins pregnancy of 12.2 and 17.3%, respectively, as reported by Mizrahi et al[10].

Results

Of 26,387 deliveries during the study period, 402 were twin pregnancies, given an incidence of 1.5%. Among these 402 twin deliveries, only 391 cases were included in the study. The remainders were excluded because of incomplete data.

Three hundred ninety one singleton pregnancies were matched as a control group. However, two cases were subsequently excluded because of incomplete data. Therefore, 389 singleton pregnancies were finally available for analysis. All of them met the criteria and delivered at Rajavithi Hospital between January 1, 2008 and July 31, 2012. Maternal baseline characteristics were presented in Table 1.

The mean maternal age of twin pregnancy was slightly higher than that of singleton (28.2±6.4 vs. 27.3±6.5, p-value = 0.045). Most of pregnant women were nulliparous and had antenatal care at Rajavithi Hospital, which were similar in both groups. There was statistical significant difference between two groups in maternal affected with hypertensive disorder (p-value <0.001). Notably, 43 of 50 cases in twin group were affected by severe preeclampsia while none in the singleton group was affected by severe preeclampsia.

The prevalence of PROM in the twin group was lower than that in the singleton group but not statistically significant, 5.4% compared to 9.0%, p-value = 0.053, as presented in Table 2. In subgroup analysis, the prevalence of PROM >24 was significantly higher in the singleton group (4.1% vs. 1.3%, p-value = 0.021). In the twin group, prevalence of PROM in the monochorionic twins and in dichorionic twins subgroup were not significantly different; 17/301 (5.6%) vs. 3/83 (3.6%); (p-value = 0.460), respectively.

Table 1. Maternal baseline characteristics

Characteristic	Single (n = 389)	Twin (n = 391)	p-value
Age (years)	27.3±6.5	28.2±6.4	0.045
Nulliparous	212 (54.5%)	204 (52.2%)	0.281
Parity			
1	127 (32.6%)	140 (35.8%)	0.197
2	36 (9.3%)	38 (9.7%)	0.461
>2	11 (2.8%)	6 (1.5%)	0.161
Place of ANC			
Rajavithi	272 (69.9%)	217 (55.5%)	<0.001
Other	117 (30.1%)	174 (44.5%)	
Maternal disease			
Hepatic	1 (0.003%)	1 (0.003%)	1.000
Respiratory	2 (0.005%)	2 (0.005%)	1.000
Hematologic	10 (0.026%)	7 (0.018%)	0.471
DM	16 (0.041%)	20 (0.051%)	0.782
Renal	1 (0.003%)	2 (0.005%)	0.721
Hypertension	15 (0.039%)	50 (0.128%)	<0.001
Heart disease	1 (0.003%)	2 (0.005%)	0.908
Infection	4 (0.010%)	4 (0.010%)	1.000
Myoma	1 (0.003%)	1 (0.003%)	0.749

ANC = antenatal care; DM = diabetes mellitus

Table 2. Perinatal outcomes among the two groups

Outcome	Single group (n = 389)	Twin group (n = 391)	RR (95% CI)	*p*-value
PROM	35 (9.0%)	21 (5.4%)	0.60 (0.35-1.01)	0.053
PROM >24 hours	16 (4.1%)	5 (1.3%)	0.31 (0.12-0.84)	0.021
PROM <24 hours	19 (4.9%)	16 (4.1%)	0.84 (0.44-1.60)	0.594
PROM before 37 weeks	5/39 (12.8%)	18/237 (7.6%)	0.59 (0.23-1.50)	0.270
GA at delivery	38.13±2.107	34.84±3.136		<0.001
Cesarean delivery	136 (35.0%)	290 (74.2%)	2.12 (1.83-2.46)	<0.0001
EFW (gm)	2,998.6±487.1	2,078.4±599.0		<0.001
LBW	45 (11.5%)	591 (76.0%)	6.58 (4.99-8.69)	<0.0001
APGAR <7 at 5 min	5 (1.3%)	69 (8.9%)	6.92 (2.81-17.01)	<0.0001

RR = relative risk; PROM = premature rupture of membrane; GA = gestational age; EFW = estimate fetal weight; LBW = low birth weight

As expected, the mean gestational age at delivery for twins and singleton deliveries were significant difference, 34.8±3.1 weeks and 38.1±2.1 weeks respectively (*p*-value <0.001). The mean birth weights for twins and singleton deliveries were 2,078.4±599.0 gm and 2,998.6±487.1 gm (*p*-value <0.001). The rate of cesarean delivery, low birth weight baby, and APGAR scores less than 7 at 5 minutes were significantly higher in the twin group.

Discussion

The incidence of twin pregnancy has been rising and varies widely throughout the world[11-13]. The highest incidence has been reported in Africans whereas the rate among Asians is the lowest. In our hospital, the rate of twin pregnancy was slightly increased during the five years of study. The use of assisted reproductive techniques (ARTs) is one of the explanations.

Increasing maternal age has been found to be associated with increased incidence of twin pregnancy[13,14]. Most studies have found that the incidence of twins increase with maternal age up to 37 years after which the rate decline[5,15]. The finding of the present study was consistent with that observation. The mean maternal age in twin group was slightly higher but significant, 28.2±6.4 years compared to 27.3±6.5 years in the singleton group. The result of the present study is similar to the finding of other studies[13,16].

Compared to singleton pregnancy, twin gestation has less congenital malformations. However, twin gestations has statistically lower rates of preterm premature rupture of membranes (12.2% vs. 17.3%), severe pregnancy induced hypertension (2.5% vs. 6.3%), oligohydramnios (2.3% vs. 4.7%), placenta previa (0.9% vs. 2.9%), placental abruption (1.8% vs. 5%) and clinical chorioamnionitis (1.8% vs. 5.2%)[10]. In contrast to the present study, there is a significant higher rate of hypertensive disorders of pregnancy include severe pregnancy induced hypertension in twin group. Most studies have found that the incidence of hypertensive disorders of pregnancy was significant higher in twin pregnancies and increase with higher-order multifetal gestations[4,5].

In contrast to other study, the rate of premature rupture of membrane among twin pregnancies in the present study was relatively low, though not significant, when compared to that in the singleton controls, whereas most studies have found that PROM occurred more frequently in twin pregnancy[5,9]. Although subgroup analysis among twin pregnancies showed a slightly higher rate of PROM in monochorionic twins, the difference was not statistically significant. Therefore, the chorioamionicity was probably not associated with the rate of PROM. The reason of lower rate of PROM in the present study might be affected from a very higher rate of cesarean delivery in the twin group, as high as 74.2% compared to only 35% in the singleton group. Several cases of twin pregnancies ended up with pre-labor cesarean section due to several unique indications such as pregnancy-induced hypertension, non-vertex presentation in the first twins. Certainly, such cases had less chance of PROM. Therefore, the subtly increased rate of PROM in twin pregnancies could not express in the setting of very high rate of cesarean delivery in twin pregnancies.

The higher rate of cesarean section among twin pregnancies may be associated with increased incidence of other obstetric indications for cesarean

deliveries such as maternal hypertensive disorders, mal-presentation, and premature rupture of membranes. Most of them delivered within 24 hours after PROM. However, PROM has been a factor that can precipitate preterm birth. The risks of preterm birth and low birth weight were higher in twin. In the present study, the mean gestational age at delivery was significantly lower in twin pregnancy compared to singleton and the rate of low birth weight was significantly higher in twin pregnancy too.

Surprisingly, the prevalence of PROM among twin pregnancies in the present study was not higher, even relatively lower, than that in singleton pregnancies, contrary to the finding in previous reports. It is possible that the very high rate pre-labor cesarean section in twin pregnancies responsible for such low rate of PROM. For example, twin pregnancies with non-vertex presentation in the first twin had a tendency to be delivered by cesarean section. Additionally why the prevalence of prolonged PROM was significantly lower in twin pregnancies may be explained by the fact that once PROM occurred in twin pregnancies they were very soon performed cesarean section. Unlike in singleton pregnancies in which PROM was not an indication for cesarean section but the physicians had tend to perform cesarean section in twins with PROM and didn't wait until prolonged PROM was diagnosed.

The complications associated with preterm birth, especially with PROM, are not limited to respiratory distress syndrome, pulmonary hypoplasia, intraventricular hemorrhage, and neonatal sepsis[9]. In fact, infants who born following PROM had the highest risk of neonatal death compared with births attributed to the other subtypes of prematurity[17]. The limitations of the present study included 1) possible selection bias because of retrospective nature and 2) the intervention in particular early cesarean section could confound the outcome of measure.

In summary, the prevalence of PROM among twin pregnancies was not increased as expected. On the contrary, prolonged PROM was significantly lower in twin pregnancies. Nevertheless, such an observation was likely to be associated with a very high rate of cesarean section in the present study. Though several obstetric outcomes such as pregnancy-induced hypertension, preterm birth, low-birth weight, low Apgar Scores were significantly higher in twin pregnancies as seen in other reports, the rate of PROM may not be a significant problem in such pregnancies in a setting of very high cesarean rate of twin pregnancies.

What is already known on this topic?

Twin pregnancy usually has higher rate of premature rupture of membranes than singleton pregnancy.

What this study adds?

The high rate of pre-labor cesarean section due to other obstetrics complication may be a reason that makes the lower prevalence of PROM in twin pregnancies than in singleton.

Potential conflicts of interest

None.

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ภาวะน้ำเดินก่อนเจ็บครรภ์คลอดในสตรีตั้งครรภ์แฝดเปรียบเทียบกับสตรีครรภ์เดี่ยว

จิตติมา รุจิเวชพงศธร

วัตถุประสงค์: *เพื่อเปรียบเทียบความชุกและผลลัพธ์ของภาวะน้ำเดินก่อนเจ็บครรภ์คลอดในสตรีตั้งครรภ์แฝดเปรียบเทียบกับสตรีครรภ์เดี่ยว*

วัสดุและวิธีการ: *เป็นการศึกษาเชิงวิเคราะห์ไปข้างหน้าโดยเก็บข้อมูลย้อนหลังในสตรีครรภ์แฝดและครรภ์เดี่ยวที่คลอดในโรงพยาบาลราชวิถีระหว่าง วันที่ 1 มกราคม พ.ศ. 2551 ถึง 31 กรกฎาคม พ.ศ. 2555 โดยจับคู่หากลุ่มควบคุมที่เป็นครรภ์เดี่ยวด้วยอัตราส่วน 1:1 ผลลัพธ์การศึกษาที่ต้องการวัดคือความชุกของภาวะน้ำเดินก่อนเจ็บครรภ์คลอด*

ผลการศึกษา: *ความชุกของภาวะน้ำเดินก่อนเจ็บครรภ์คลอดในสตรีครรภ์แฝดมีแนวโน้มต่ำกว่าสตรีครรภ์เดี่ยว, 5.4% และ 9% แต่ไม่มีนัยสำคัญทางสถิติ ($p = 0.0529$) อายุครรภ์เฉลี่ยในครรภ์แฝดต่ำกว่าครรภ์เดี่ยวอย่างมีนัยสำคัญทางสถิติ, 34.8±3.1 สัปดาห์ และ 38.1±2.1 สัปดาห์ ตามลำดับ ($p<0.001$) อัตราการผ่าตัดคลอด ทารกน้ำหนักตัวน้อย และคะแนน APGAR น้อยกว่า 7 ที่เวลา 5 นาที ในครรภ์แฝดสูงกว่าครรภ์เดี่ยวอย่างมีนัยสำคัญ*

สรุป: *ความชุกของภาวะน้ำเดินก่อนเจ็บครรภ์คลอดในสตรีครรภ์แฝดมีแนวโน้มต่ำกว่าสตรีครรภ์เดี่ยวแต่ไม่มีนัยสำคัญ ซึ่งอาจจะมีสาเหตุมาจากอัตราการผ่าตัดคลอดก่อนเจ็บครรภ์ในครรภ์แฝดสูงมากจนทำให้คลอดเสียก่อนที่จะมีปัญหาน้ำเดิน*