OBSTETRICS

The Incidence and Risk Factors for Preterm Delivery in Northeast Thailand

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ABSTRACT

Objectives: To identify incidence and risk factors of preterm delivery among women who delivered in northeastern of Thailand.

Materials and Methods: A descriptive study was conducted at Srinagarind Hospital, the tertiary care hospital in the northeastern of Thailand. Medical records of 1,108 women who had delivery from January 2017 to December 2018 were reviewed. The incidence rate of preterm birth and the risk factors were identified and preterm birth was classified into spontaneous preterm and indicated preterm cases in subgroup analysis. To analyze the data, chi-square test and multiple logistic regression models were used to identify odds ratios with 95% confidence interval and p value of < 0.05 was considered statistically significant.

Results: The incidence of preterm birth was estimated as 10.83%. The spontaneous preterm birth was the largest category, at 67% of preterm birth. The risk factors were associated with preterm birth included the number of time to antenatal care < 4, multifetal pregnancy, placenta previa and hypertensive disorders in both univariate and multivariate analyses. After subgroup analysis, inter-pregnancy interval between 6-12 months, multifetal pregnancy and fetal growth restriction were statistically significantly associated with spontaneous preterm birth group even after adjusting for confounding factors. The maternal cardiac disease was associated with increased risk of all preterm subtypes.

Conclusion: Inadequate antenatal care, multifetal pregnancy, placenta previa and hypertensive disorders were strongly associated risk factor for preterm delivery in northeastern of Thailand. Additionally, subgroup analysis showed inter-pregnancy interval between 6-12 months, multifetal pregnancy and fetal growth restriction were statistically significantly associated with spontaneous preterm birth. The northeastern of Thailand pregnancy women should be routinely screened for these risk factors and prevented to decrease preterm birth.

Keywords: incidence, northeastern Thailand, preterm birth, risk factors.

อุบัติการณ์และปัจจัยเสี่ยงที่มีผลต่อการคลอดก่อนกำหนดในประเทศไทย

กรวลัย กลิ่นพูล, สุกัญญา ไชยราช

บทคัดย่อ

วัตถุประสงค์:   เพื่อศึกษาอุบัติการณ์และปัจจัยเสี่ยงของการคลอดก่อนกำหนดในสตรีตั้งครรภ์แถบภาคตะวันออกเฉียง เหนือของประเทศไทย

วัสดุและวิธีการ: การศึกษาเชิงพรรณนาโดยการสืบค้นเวชระเบียนของสตรีตั้งครรภ์ 1,108 คนที่มีการคลอดตั้งแต่มกราคม 2560 ถึงธันวาคม 2561ที่โรงพยาบาลศรีนครินทร์ โรงพยาบาลระดับตติยภูมิในภาคตะวันออกเฉียงเหนือของประเทศไทย โดยนำข้อมูลที่ได้มาหาอุบัติการณ์และปัจจัยเสี่ยงของการคลอดก่อนกำหนดและมีการศึกษาแบบกลุ่มย่อยสำหรับการ คลอดก่อนกำหนด โดยแบ่งเป็น 2 กลุ่ม คือ กลุ่มที่คลอดก่อนกำหนดแบบเกิดขึ้นเองกับกลุ่มที่คลอดก่อนกำหนดโดยการ ทำให้เกิดขึ้นโดยใช้ *chi-square test* และ *multiple logistic regression models* ในการคำนวณหา *odds ratios* และ *95% confidence interval* โดย *p value < 0.05* ถือว่ามีนัยสำคัญทางสถิติ

ผลการศึกษา: อุบัติการณ์ของการคลอดก่อนกำหนดมีค่าร้อยละ 10.83 ซึ่งส่วนใหญ่เป็นกลุ่มที่คลอดก่อนกำหนดแบบเกิด ขึ้นเองถึงร้อยละ 67 โดยปัจจัยเสี่ยงที่มีความสัมพันธ์กับการคลอดก่อนกำหนดได้แก่ การฝากครรภ์น้อยกว่า 4 ครั้ง การตั้ง ครรภ์แฝด รกเกาะต่ำและความดันโลหิตสูง ซึ่งเมื่อทำการศึกษาแบบกลุ่มย่อยของการคลอดก่อนกำหนดแล้วพบว่า การเว้น ระยะห่างระหว่างตั้งครรภ์อยู่ในช่วง 6 -12 เดือน การตั้งครรภ์แฝดและภาวะทารกในครรภ์เจริญเติบโตช้าเป็นปัจจัยเสี่ยงที่ มีความสัมพันธ์กับการคลอดก่อนกำหนดแบบเกิดขึ้นเองอย่างมีนัยสำคัญ และภาวะโรคหัวใจในสตรีตั้งครรภ์เป็นปัจจัยที่ มีความสัมพันธ์กับการคลอดก่อนกำหนดทั้งในกลุ่มที่คลอดก่อนกำหนดแบบเกิดขึ้นเองและกลุ่มที่คลอดก่อนกำหนดโดย การทำให้เกิดขึ้น

สรุป: การฝากครรภ์ที่น้อยกว่า 4 ครั้ง การตั้งครรภ์แฝด รกเกาะต่ำและความดันโลหิตสูงเป็นปัจจัยเสี่ยงที่สำคัญอย่าง ยิ่งต่อการคลอดก่อนกำหนดในภาคตะวันออกเฉียงเหนือของประเทศไทย และจากการศึกษาแบบกลุ่มย่อยพบว่า การเว้น ระยะห่างระหว่างตั้งครรภ์อยู่ในช่วง 6 -12 เดือน การตั้งครรภ์แฝดและภาวะทารกในครรภ์เจริญเติบโตช้าเป็นปัจจัยเสี่ยง ที่มีความสัมพันธ์กับการคลอดก่อนกำหนดแบบเกิดขึ้นเองอย่างมีนัยสำคัญ สตรีตั้งครรภ์ในภาคตะวันออกเฉียงเหนือของ ประเทศไทยควรได้รับการตรวจคัดกรองปัจจัยเสี่ยงเหล่านี้เป็นประจำและควรได้รับคำแนะนำในการป้องกันไม่ให้เกิดการ คลอดก่อนกำหนด

คำสำคัญ: อุบัติการณ์, ภาคตะวันออกเฉียงเหนือของประเทศไทย, การคลอดก่อนกำหนด, ปัจจัยเสี่ยง

Introduction

Preterm birth is defined by World Health Organization (WHO) as delivery before 37 weeks of gestational age. It is the most common cause of neonatal morbidity and mortality[1]. A quarter of causes of perinatal mortality is preterm delivery[2]. Furthermore, It can cause long term adverse outcomes such as the respiratory diseases, higher rates of cerebral palsy, visual disorders, hearing disorders and learning disorders than term children[1], especially the children that was born before 32 weeks of gestational age have the higher risk for attention deficit hyperactivity disorder (ADHD) and cardiovascular diseases[3].

Preterm birth is one of the important public health problems in the world because of the increasing rate of preterm delivery. It is estimated that 15 million children or 11% of all live births in the world is preterm birth per year and more than a half of that preterm birth occurred in sub-Saharan Africa and South Asia[4]. The causes for preterm births include: 1.) Spontaneous preterm labor with intact membranes, 2.) Idiopathic preterm premature rupture of the membranes (PPROM), 3.) Delivery due to maternal or fetal indications, 4.) Twins and higher-order multifetal pregnancy[5].

Although there are a lot of study about preterm birth, but an exact mechanism of preterm birth have not yet been determined[5]. There are many risk factors for preterm delivery such as maternal age, pre-pregnancy weight, urinary tract infection, placental abruption, polyhydramnios, race, maternal education, socioeconomic status, history of previous preterm birth, gender of infant, maternal nutritional status, inter-pregnancy interval, In – vitro Fertilization/ Intra Cytoplasmic Sperm Injection (IVF/ICSI), smoking, hypertensive disorder, diabetes mellitus, uterine leiomyoma, number of times to antenatal care, maternal height[6–24].

The study of incidence and risk factor is valuable for follow the trend of incidence and find out the others prevention method. Although there are many studies of preterm delivery, but no study reported about the preterm birth rate and risk factor in northeastern of Thailand. The aims of this study were to identify incidence and risk factors for preterm delivery among women who delivered in northeastern of Thailand.

Materials and methods

Study setting and participants

The study design was a descriptive study that conducted at Srinagarind Hospital, the tertiary care hospital in the northeastern of Thailand. The study was approved by the Khon Kaen University Ethics Committee in Human Research (HE621011). All women who delivered at Srinagarind Hospital during January 2017 to December 2018 were included. Women who had a gestational age at delivery, calculated based on the first day of the last menstrual period (LMP) or first transabdominal or first transvaginal ultrasonography less than 24 weeks or estimated fetal weight form transabdominal ultrasonography at delivery less than 500 grams or had antepartum death or was stillbirth or had incomplete medical records were excluded. The primary and secondary outcomes were incidence and risk factors for preterm delivery, respectively.

The sample size was calculated based on the incidence of preterm birth from a previous study which was 13.3%[6]. According to confidence interval was 95% and allowable error in estimating incidence was 0.02, a minimum of 1,108 medical records were needed.

Data collection and variable of interest

Medical records were obtained from Praxticol which was a program, used in Srinagarind Hospital to keep medical records in electronic documents. The definition of preterm birth was delivery before completed 37 weeks of gestation. Gestational age was calculated based on the first day of the LMP in women with regular menstrual cycle without the effect of exogenous hormone at least 3 months and the gestational age was confirmed by transabdominal ultrasonography at 13-16 weeks of gestational age. If the difference exceeded 10 days, gestational age

by ultrasonography was used. The preterm birth was categorized into indicated preterm birth and spontaneous preterm birth. The definition of spontaneous preterm birth was defined as delivery that had been preceded by spontaneous labor with or without PPROM and excluded preterm births due to induction of labor or cesarean section for fetal and maternal indications.

The variable of interest in this study included maternal age, maternal occupation and education, number of previous abortion, previous stillbirth, previous preterm birth, previous caesarean section and previous uterine curettage, the inter-pregnancy interval that was defined as the time between the delivery of a women's previous child and the first day of the LMP of the next pregnancy[21], history of IVF/ICSI, number of time to antenatal care, pre-pregnancy BMI, maternal height, history of amniocentesis/villocentesis, Patient Health Questionnaire-2 (PHQ-2) that was used to screen for depression in a first-step approach and asked about the frequency of anhedonia and depressed mood over the past two weeks[22], maternal anemia status, single or multiple pregnancies, neonatal sex, obstetric and medical characteristics: included presence of placenta previa, placental abruption, PPROM, hypertensive disorders, preexisting diabetes mellitus, gestational diabetes mellitus, cardiac disease, myoma uteri, urinary tract infection and fetal growth restriction (FGR). All data were collected by the investigator and recorded with EpiData software ver.3.1.

Statistical analysis

Data were analyzed with Stata version 10. Continuous data were analyzed with descriptive statistics and presented with mean or median depend on distribution of data. The incidence of preterm birth was calculated by proportion of the number of deliveries before 37 weeks of gestation to the total number of deliveries with 95% confidence intervals (CI). The associated risk factors of preterm birth were analyzed with chi square test. According to 95%CI, the multivariate logistic regression model was used to identify odds ratios (OR) with p value of < 0.05 was considered statistically significant.

Results

The incidence of preterm birth in Srinagarind Hospital for the period from January 2017 to December 2018 of 1,108 women was estimated as 10.83% that was slightly higher in late preterm which was delivery at 34-36 weeks, at 7.58 % of all births or 70% of preterm. The spontaneous preterm birth was the largest category, at 67% of preterm birth (Table 1).

Table 1. The incidence of preterm birth in Srinagarind Hospital, Khon Kaen, Thailand.

Gestational age	number	Percent
Term birth (≥ 37 weeks)	988	89.17
Preterm birth (< 37 weeks)	120	10.83
Subgroup by gestational age		
< 28 weeks	3	0.27
28-31^{+6} weeks	12	1.08
32-33^{+6} weeks	21	1.9
34-36^{+6} weeks	84	7.58
Subgroup by determining factor		
Spontaneous preterm	80	66.67
Indicated preterm	40	33.33

The maternal characteristic of term birth and preterm birth showed that the mean age for term birth and preterm births were 29.5 ± 5.4 and 28.6 ± 5.7 years, respectively. Furthermore, maternal age, occupation and level of education were not significantly different between the two groups (Table 2).

Table 2. Maternal characteristics of preterm birth compared with term birth.

Characteristics	Total (N=1108)	Term delivery (N=988)	preterm delivery (N=120)	OR (95% CI)	p value
Maternal age (years)	29.4 ± 5.4	29.5 ± 5.4	28.6 ± 5.7		
Maternal age group (years)					0.28
15-19	46	38 (3.9)	8 (6.7)	1.72(0.78-3.79)	
20-34	851	758 (76.7)	93 (77.5)	1.0	
≥ 35	211	192 (19.4)	19 (15.8)	0.81 (0.48-1.35)	
Occupation					0.26
House wife	278	243 (24.6)	35 (29.2)	1.0	
Farmer	31	24 (2.4)	7 (5.8)	2.03 (0.81-5.05)	
Business woman	134	119 (12)	15 (12.5)	0.88 (0.46-1.67)	
Government employee	599	548 (55.5)	51 (42.5)	0.65 (0.41-1.02)	
Others	66	54 (5.5)	12 (10)	1.54 (0.75-3.17)	
Level of education					0.6
College	755	674 (68.2)	81 (67.5)	1.0	
Secondary school	316	283 (28.7)	33 (27.5)	0.97 (0.63-1.49)	
≥ Primary school	37	31 (3.1)	6 (5)	1.61 (0.65-3.98)	

Data presented as mean ± SD or n (%)
OR: odds ratio, CI: confidence interval

The maternal obstetrics and medical factors that were associated with increased risk of preterm birth included history of previous preterm birth (OR 3.73, 95%CI: 1.80-7.77), history of previous stillbirth (OR 3.86, 95%CI: 1.31-11.31), inter-pregnancy interval of 6-12 months (OR 2.75, 95%CI: 1.44-5.24), number of times to antenatal care < 4 (OR 6.06, 95%CI: 2.26-16.23), multifetal pregnancy (OR 16.84, 95%CI: 8.22-34.47), placenta previa (OR 6.59, 95%CI: 2.72-16), PPROM (OR 243.5, 95%CI: 41.48-Inf), hypertensive disorders (OR 5.64, 95%CI: 2.38-13.33), maternal cardiac disease (OR 5.04, 95%CI: 1.19-21.37), urinary tract infection (OR 6.31, 95%CI: 1.39-28.53) and fetal growth restriction (OR 10.70, 95%CI: 2.83-40.40). Other risk factors included advanced maternal age, teenage pregnancy, low education, previous preterm birth, previous abortion, previous uterine curettage, maternal height, low pre-pregnancy BMI, Patient Health Questionnaire-2, maternal anemia, IVF/ICSI, preexisting diabetes or gestational diabetes were not significantly associated with increased risk of preterm birth (Table 3).

Table 3. Maternal obstetrics and medical factors associated with preterm birth.

Characteristics	Term delivery (N=988)	preterm delivery (N=120)	OR (95% CI)	p value
History of previous preterm birth				< 0.005
Yes	26 (2.6)	11 (9.2)	3.73 (1.80-7.77)	
No	962 (97.4)	109 (90.8)	1.0	
History of stillbirth				0.02
Yes	11 (1.1)	5 (4.2)	3.86 (1.31-11.31)	
No	977 (98.9)	115 (95.8)	1.0	
Inter-pregnancy interval				0.03
Primigravida	454 (45.9)	59 (49.2)		
Multipara				
< 6 months	7 (0.7)	1 (0.8)	1.49 (0.18-12.40)	
6-12 months	57 (5.8)	15 (12.5)	2.75 (1.44-5.24)	
> 12 months	470 (47.6)	45 (37.5)	1.0	
Number of times to antenatal care				< 0.005
< 4	10 (1.0)	7 (5.8)	6.06 (2.26-16.23)	
≥ 4	978 (99)	113 (94.2)	1.0	
Gestation				< 0.005
Singleton	975 (98.7)	98 (81.7)	1.0	
Multiple	13 (1.3)	22 (18.3)	16.84 (8.22-34.47)	
Placenta previa				< 0.005
Yes	12 (1.2)	9 (7.5)	6.59 (2.72-16)	
No	976 (98.8)	111 (92.5)	1.0	
PPROM				< 0.005
Yes	0 (0)	18 (15)	243.5 (41.48-Inf)	
No	988 (100)	102 (85)	1.0	
Hypertensive disorders				
Yes	14 (1.4)	9 (7.5)	5.64 (2.38-13.33)	< 0.005
No	974 (98.6)	111 (92.5)	1.0	
Cardiac disease				0.047
Yes	5 (0.5)	3 (2.5)	5.04 (1.19-21.37)	
No	983 (99.5)	117 (97.5)	1.0	
Urinary tract infection				0.03
Yes	4 (0.4)	3 (2.5)	6.31 (1.39-28.53)	
No	984 (99.6)	117 (97.5)	1.0	
Fetal growth restriction				< 0.005
Yes	4 (0.4)	5 (4.2)	10.70 (2.83-40.40)	
No	984 (99.6)	115 (95.8)	1.0	

OR: odds ratios, CI: confidence intervals, PPROM: preterm premature rupture of the membranes

From multivariate analysis that used to adjust risk factors for some possible confounders showed that the number of times to antenatal care < 4 (adjusted OR 5.46, 95%CI: 1.35-22.05), multifetal pregnancy (adjusted OR 17.08, 95%CI: 6.77-43.10), placenta previa (adjusted OR 7.74, 95%CI: 2.75-21.77) and hypertensive disorders (adjusted OR 10.29, 95%CI: 3.32-31.92) remained significantly associated with increased risk of preterm birth (Table 4).

Table 4. Adjusted risk factors associated with preterm birth.

Characteristics	Adjusted OR (95% CI)	p value
History of previous preterm birth	2.45 (0.78-7.71)	0.13
Inter-pregnancy interval 6-12 months	1.60 (0.54-4.82)	0.4
Antenatal care < 4	5.46 (1.35-22.05)	0.02
Multifetal pregnancy	17.08 (6.77-43.10)	< 0.005
Placenta previa	7.74 (2.75-21.77)	< 0.005
Hypertensive disorders	10.29 (3.32-31.92)	< 0.005
Maternal cardiac disease	3.47 (0.34-35.81)	0.30
Urinary tract infection	0.87 (0.06-11.88)	0.92
Fetal growth restriction	6.12 (0.90-41.72)	0.06

OR: odds ratios, CI: confidence intervals

When subgroup analysis of preterm birth was considered, multifetal pregnancy and fetal growth restriction were associated with increased risk of all preterm birth subtypes. In addition, risk factors related only to the spontaneous preterm births were history of previous preterm birth (OR 5.69, 95%CI: 1.51-8.57), history of stillbirth (OR 4.67, 95%CI: 1.45-15.03), inter-pregnancy interval between 6-12 months (OR 2.56, 95%CI: 1.27-5.19). IVF/ICSI in current pregnancy was the only risk factor that was not associated preterm births, but was associated with spontaneous preterm birth in subgroup analysis. Risk factors related only to the indicated preterm births were antenatal care < 4 (OR 13.97, 95%CI: 4.53-43.04), placenta previa (OR 20.33, 95%CI: 7.77-53.18), hypertensive disorders (OR 20.20, 95%CI: 8.13-50.21), maternal cardiac disease (OR 10.35, 95%CI: 1.94-55.05), preexisting diabetes (OR 25.31, 95%CI: 1.55-412.12) and urinary tract infection (OR 12.95, 95%CI: 2.30-72.89) (Table 5).

Result from multivariate logistic regression models for subgroup analysis of preterm birth found that maternal cardiac disease was associated with increased risk of both spontaneous preterm birth (adjusted OR 14.04, 95%CI: 1.15-170.75) and indicated preterm birth (adjusted OR 67.90, 95%CI: 4.3-1072.1). In addition, inter-pregnancy interval between 6-12 months (adjusted OR 2.73, 95%CI: 1.05-7.08), multifetal pregnancy (adjusted OR 47, 95%CI: 13.43-164.52) and fetal growth restriction (adjusted OR 13.87, 95%CI: 1.94-99.22) were statistically significantly associated with only spontaneous preterm birth group. Conversely, placenta previa (adjusted OR 43.96, 95%CI: 10.56-183.02) and hypertensive disorders (adjusted OR 26.70, 95%CI: 4.37-162.99) were statistically significantly associated with indicated preterm birth (Table 6 and 7).

Table 5. Adjusted risk factors associated with spontaneous preterm births and indicated preterm births as compared to term births.

Characteristics	Spontaneous preterm			Indicated preterm		
	N	OR (95% CI)	p value	N	OR (95% CI)	p value
History of previous preterm birth	8	5.69 (1.51-8.57)	< 0.005	3	3.01 (0.87-10.36)	0.08
History of stillbirth	4	4.67 (1.45-15.03)	0.01	1	2.28 (0.28-18.08)	0.44
Inter-pregnancy interval 6-12 months	12	2.56 (1.27-5.19)	0.009	3	1.13 (0.33-3.90)	0.50
IVF/ICSI	5	4.63 (1.62-13.20)	< 0.005	0	-	-
Number of times to antenatal care	2	2.51 (0.54-11.65)	0.25	5	13.97 (4.53-43.04)	< 0.005
Multifetal pregnancy	17	20.24 (9.41-43.52)	< 0.005	5	10.71 (3.62-31.71)	< 0.005
Placenta previa	1	1.03 (0.13-8.02)	0.98	8	20.33 (7.77-53.18)	< 0.005
Hypertensive disorders	0	-	-	9	20.20 (8.13-50.21)	< 0.005
Maternal cardiac disease	1	2.49 (0.29-21.56)	0.41	2	10.35 (1.94-55.05)	0.006
Preexisting diabetes	0	-	-	1	25.31 (1.55-412.12)	0.02
Urinary tract infection	1	3.11 (0.34-28.19)	0.31	2	12.95 (2.30-72.89)	< 0.005
Fetal growth restriction	2	6.31 (1.14-34.98)	0.03	3	19.95 (4.31-92.35)	< 0.005

OR: odds ratios, CI: confidence intervals, IVF/ICSI: in – vitro fertilization/ intra cytoplasmic sperm injection.

Table 6. Adjusted risk factors associated with spontaneous preterm births as compared to term births.

Characteristics	Adjusted OR (95% CI)	p value
History of previous preterm birth	2.25 (0.49-10.40)	0.30
History of stillbirth	3.43 (0.58-20.34)	0.18
Inter-pregnancy interval 6-12 months	2.73 (1.05-7.08)	0.04
IVF/ICSI	1.17 (0.09-14.24)	0.90
Multifetal pregnancy	47 (13.43-164.52)	< 0.005
Placenta previa	1.27 (0.10-15.36)	0.85
Maternal cardiac disease	14.04 (1.15-170.75)	0.04
Fetal growth restriction	13.87 (1.94-99.22)	0.009

OR: odds ratios, CI: confidence intervals, IVF/ICSI: in – vitro fertilization/ intra cytoplasmic sperm injection.

Table 7. Adjusted risk factors associated with indicated preterm births as compared to term births.

Characteristics	Adjusted OR (95% CI)	p value
History of previous preterm birth	4.92 (0.79-30.80)	0.09
History of stillbirth	2.40 (0.19-31.08)	0.50
Inter-pregnancy interval 6-12 months	0.52 (0.11-2.52)	0.43
Number of times to antenatal care	6.58 (0.92-46.98)	0.06
Placenta previa	43.96 (10.56-183.02)	< 0.005
Hypertensive disorders	26.70 (4.37-162.99)	< 0.005
Maternal cardiac disease	67.90 (4.3-1072.1)	< 0.005
Fetal growth restriction	11.99 (0.60-238.10)	0.10

OR: odds ratios, CI: confidence intervals

Discussion

The incidence of preterm birth in this study was 10.83% that was similar to the incidence of worldwide and Vietnam, estimated at 11% and 11.8%, respectively, but lower than incidence in Southern Asia which was 13.3%[4, 23]. The different incidence may explained by the different quality of treatment in each country, setting of the study that was conducted in tertiary care hospital, referral center in northeastern of Thailand and the facility of tertiary care hospital that can close monitoring of patients with continuation of pregnancy in some high risk case such as medical condition which may extend time of gestational age to term pregnancy.

The majority of preterm births were spontaneous preterm birth; estimated at 67% and 33% were indicated preterm birth. This result was similar to previous study in Ethiopia that spontaneous preterm birth and indicated preterm birth were 66% and 34%, respectively[25].

This study found that inadequate antenatal care, multifetal pregnancy, placenta previa and hypertensive disorder were strongly associated risk factors for preterm delivery in both univariate and multivariate analyses. But after categorized preterm birth into spontaneous preterm birth and indicated preterm birth due to the 2 groups were different in its causes, risks and prevention method for each group. And in recent years, spontaneous preterm birth was a challenging problem in preterm delivery because it accounted for up to two-thirds of preterm birth and was focused on preventive method. We found that maternal cardiac disease was associated with increased risk of all preterm subtypes. In this study, inter-pregnancy interval between 6-12 months, multifetal pregnancy and fetal growth restriction were statistically significantly associated with spontaneous preterm birth group after multivariate analysis of all risk factors. This was in contrast with previous studies in Ethiopia and Italy, which reported that previous preterm birth had an increased risk 5 folds for spontaneous preterm birth[25, 26].

Multifetal pregnancy was strongly associated with preterm birth and especially with the spontaneous preterm birth after subgroup analysis even after adjusting for confounding factors in this study. Women with multifetal pregnancy had increased risk of preterm birth more than 17 folds, which was similar to previous studies in Brazil that had increased risk 16 folds[19]. Multiple pregnancies may be able to cause overdistension of uterus that may lead to preterm labor.

From the result of previous study in Tanzania, inadequate antenatal care (ANC), defined as ANC

less than 4 times, increased risk for preterm birth more than 3 folds[13]. This result was similar to our study that had increased risk 5 folds even after adjusting for confounding factors and probably due to a few times of ANC may obscure clinicians to find out and prevent the risk factors of preterm birth.

Placenta previa was strongly associated risk factor of preterm birth in this study even after adjusting for confounding factors. Women who had placenta previa were nearly 8 times more likely to have preterm birth. Placenta previa causes heavy vaginal bleeding which lead to termination of pregnancy immediately even in premature birth. This agreed with previous studies in Canada and Tanzania that had increased risk in the same results as 7 times[13, 14].

Pregnancy induced hypertension causes adverse outcome to maternal and fetal such as preeclampsia with severe feature or fetal growth restriction due to uteroplacental insufficiency that cause preterm delivery. We found that women who had hypertensive disorders were 10 times more likely to have preterm birth compared with normotensive women even after adjusting for confounding factors. That was compatible with previous studies in Canada that had increased risk 2 times[13].

Women who have the history of previous preterm birth, had increased risk 4 times for preterm delivery and the spontaneous preterm group in univariate analyses, but it was not associated risk factor after adjusting for confounding. Compared with previous studies Italy and Korea that had increased risk in the same results as 3 times[20, 24].

We found mother who had urinary tract infection, were 6 times more likely to have preterm birth and indicated preterm in univariate analyses, but it was not associated risk factor of preterm birth in this study after adjusting for confounding. Urinary tract infection was associated with preterm birth in previous studies in Songkhla, Thailand that had increased risk 8 times[17].

In previous other studies showed that teenage pregnancy and advanced maternal age were associated with increased risk of preterm birth[12, 13, 16], but were not associated with preterm birth in our study. That may be explained by the antenatal care plan in our setting that was considered and grouped these women as high risk patients.

Additionally, the inter-pregnancy interval between 6-12 months, as compared with more than 12 months, had increased in risk of both preterm and spontaneous preterm group in univariate analyses. Therefore, contraceptive counseling should have performed to women who had other risk factors of preterm birth.

The strength of this study was recently studying about incidence and risk factors of preterm birth within at least 5 years in Thailand and was a new data of the northeast of Thailand. There were many participants not only for calculate the incidence, but also for determine the statistical significance of risk factors. But in some risk factors such as maternal cardiac disease or fetal growth restriction, the sample size may be inadequate due to the confidence interval was wide. So, it should be carefully interpreted. Because of the differentiation of risk factor and prevention method in each group, the study was classified to spontaneous preterm and indicated preterm. Additionally, we focused on the spontaneous preterm group that it was the main public health problem in Thailand and it might be preventable. However, the limitation of this study was a retrospective study which some investigated were not done in all cases such as urinary tract infection or gestational diabetes. So, the results could be biased.

Conclusion

The incidence and risk factors of preterm birth northeastern area was 10.83%. Inadequate antenatal care (ANC), multifetal pregnancy, placenta previa and hypertensive were strongly associated risk factor for preterm delivery. Additionally, subgroup analysis showed inter-pregnancy interval between 6-12 months, multifetal pregnancy and fetal growth restriction were statistically significantly associated with spontaneous preterm birth. Northeastern pregnancy women should be routinely screened for

these risk factors and prevented to decrease preterm birth.

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Potential conflicts of interest

The authors declare no conflict of interest.

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