OBSTETRICS

Assessment of routine risk screening for predicting preterm birth at a public hospital in Thailand

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ABSTRACT

Objective: To assess the predictive value of the risk factors for preterm birth in public hospital.

Materials and methods: Data of pregnant women who delivered in Lampang Regional Hospital from July 1, 2008 - June 30, 2010; were analyzed. Risk factors including history of preterm labor, uterine abnormality, hypertension, pregnant women who aged <20 years old, multifetal pregnancy and antepartum hemorrhage were evaluated. The diagnostic performance of establishment of at least one of six factors was calculated.

Result: Among 7,435 pregnant women, 6.7% delivered preterm infants. Most of them were at GA 35-36 weeks of gestation (57.1%). Thirty one percent of these women had at least 1 of the 6 risk factors. The Odds ratio of preterm birth for was 2.41 (95% CI 1.96-2.95). Diagnostic performance showed sensitivity of 30.7%, specificity of 84.4%, positive predictive value of 12.5%, negative predictive value of 94.4%, likelihood ratio for positive test 1.98 and likelihood ratio for negative test of 0.82.

Conclusion: Six factors of routine risk screening used in public hospital in Thailand had low screening performance and showed minimal benefit in clinical practices

Keywords: preterm birth, risk factor, prediction

Introduction

Preterm birth is one of major problems confronting obstetricians for decades. It causes both neonatal morbidity and mortality. Studies have shown that mortality rate is higher in infants with gestational age (GA) less than 32 weeks[1]. The common morbidities are respiratory distress syndrome, necrotizing enterocolitis, perinatal infection, intraventricular hemorrhage, retinopathy of prematurity, pulmonary hypertension and even hypoglycemia[2]. These morbidities require longer hospitalization and more health care resources while outcomes may not always be appreciated.

There are various measures that have been implemented so far to decrease the incidence of preterm birth, however the gold standard of care is not yet established. One of the remedies generally accepted is identification of pregnant women at risk, namely life style factors, bacterial vaginosis, prior preterm birth, too short or too long birth spacing, birth defect, periodontal status, race and even threatened abortion[1,3-9]. In addition, risk scoring index was

reported, nevertheless, it failed to help with the management[10-13].

Risk factors for preterm birth in Thail rural area are still not clear. More attention should be given to women with risk factors. History of previous preterm birth, uterine abnormality, hypertension, maternal age less than 20 years old, multifetal pregnancy, antepartum hemorrhage, history of spontaneous abortion and high workload/ exercise are routinely used as risk factors for preterm birth in Lampang Hospital. There were some reports about diagnostic power of some risk factors of preterm birth such as cervical length and fetal fibronectin[14,15,16]. No study determining the diagnostic performance of these routine risk factors. The benefit of this routine risk screening is questionable. The objective of this study was to assess the predictive performance of routine risk screening in predicting preterm birth.

Material and method

This cross-sectional study was conducted in Lampang Hospital using data of pregnant women who delivered in labor room of Lampang Hospital from July 1, 2008 to June 30, 2010. All women who delivered alive new borns at gestational age of 28 weeks or more were enrolled. Preterm birth was defined as gestation age of less than 37 completed weeks. Risk factors for preterm birth were

1. History of preterm labor in previous pregnancy
2. Uterine abnormality e.g. myoma uteri, uterine didelphys
3. Chronic hypertension, gestational hypertension or preeclampsia
4. Maternal age < 20 years old
5. Multifetal pregnancy
6. Antepartum hemorrhage e.g. placenta previa, abruptio placenta

Two risk factors that are routinely used for screening at antenatal clinic but were not used in this study are history of spontaneous abortion and workload/ exercise in pregnancy. The reason for not including both factors was unreliable information. Diagnostic performance of routine risk screening was analysed and described as sensitivity, specificity, positive predictive value, negative predictive value and likelihood ratio of positive and negative test. This study collected electronic records of hospital retrospectively under approval of authorized director. Anonymous and confidentiality were applied. Consent form was unavailable.

Results

In the study period, there were 7,435 deliveries and 6.7% of them were preterm birth. Maternal age, gravida, and history of abortion were similar between preterm and non-preterm group. Mean birthweight and gestational age (GA) of both groups are shown in Table 1. Most of the preterm infants found in this study were at GA 35-36 weeks (57.1%) while 23.5% and 19.4% were in GA 28-32 weeks and 33-34 weeks, respectively.

This study found that 30.7% of preterm births had at least 1 of the 6 risk factors while it was 15.6% in non-preterm births. The odds ratio of preterm birth for having risk factor was 2.41 (1.96-2.95) (Table 2).

Table 3 presents the diagnostic performance of the routine risk screening for predicting preterm birth.

Table 1: Parameters of pregnant women with preterm birth and non preterm birth

Factor	Preterm birth (N = 501)		Non-preterm birth (N = 6934)		p-value
	N	%	N	%	
Gravida					
G 1	226	45.1	3,207	46.2	0.126
G 2	172	34.3	2,565	37.0	
G 3	73	14.6	864	12.5	
G ≥ 4	30	6.0	298	4.3	
History of abortion					
No abortion	394	78.6	5,587	80.5	0.850
1 abortion	87	17.4	1,135	16.4	
2 abortion	19	3.8	159	2.3	
≥ 3 abortion	1	0.2	53	0.8	
Gestational age (wks)					
28-32	118	23.5	0	0	-
33-34	97	19.4	0	0	-
35-36	286	57.1	0	0	-
37-40	0	0	6,271	90.4	-
>40	0	0	663	9.6	-
	Mean	SD	Mean	SD	
Gestational age (wks)	34.0	2.4	38.8	1.2	-
Birthweight (gms)	2117.2	507.9	3098.4	417.7	-
Maternal age (yrs)	26.9	7.3	27.2	6.3	0.358

Table 2: Risk calculation of preterm birth for having risk factor

Gestational age	Preterm birth (N = 501)		Non-preterm birth (N = 6,934)		OR (95%CI)
	N	%	N	%	
Risk	154	30.7	1079	15.6	2.41 (1.96-2.95)
No risk	347	69.3	5855	84.4	

Table 3: Diagnostic performance of risk factor to predict preterm birth

	Diagnostic parameter (95% CI)	
Sensitivity	30.7%	(26.7 – 35.0)
Specificity	84.4%	(83.6 – 85.3)
Positive predictive value	12.5%	(10.7 – 14.5)
Negative predictive value	94.4%	(93.8 – 95.0)
Likelihood ratio (+)	1.98	(1.71 – 2.28)
Likelihood ratio (-)	0.82	(0.77 – 0.87)

Discussion

Six factors such as history of preterm birth, uterine abnormality, hypertensive disorders, teenage pregnancy, multifetal gestation and antepartum hemorrhage, routinely used for predicting preterm birth in Thai public hospitals had low diagnostic performance. Women who had one or more factors a higher odds ratio of preterm birth in 2.4 compared to women who had no risk factor.

Periodontal disease and positive vaginal Gram stain showed stronger risk with OR of 4.2-5.2[17,18]. Risk factors such as fetal fibronectin and shortening of cervical length seen by ultrasound, could have OR of 4.5-17.9 when combined with history of previous preterm delivery.

When we analyzed diagnostic performance of these 6 clinical risk factors, it has sensitivity of 30%. This means that only 30% of women with preterm birth to have at least one risk factor. Likewise, more than two-thirds of women with preterm birth did not have any risk factor.

At least one of six factors in this study was able to predict preterm birth with the likelihood ratio of 1.98. The prevalence (pretest probability) of preterm birth in this study was 6.7% without any test used. If this routine screening was applied, the posttest probability was 12.7%.

According to general acceptance for diagnostic test, excellent strength of LR+ should be about 10, very good strength is about 6 and fair strength is about 2[19].

When comparing these diagnostic parameters with of other risk factors, these clinical risk factors seem to be weak. Fetal fibronectin could predict preterm delivery with sensitivity, specificity, PPV and NPV of 67%, 92%, 30% and 98% respectively[14]. Cervical length ≤ 3.0 cm at 28 weeks had a sensitivity of 57.1% and specificity of 81.8%[15]. A combination of a history of spontaneous preterm birth and cervical length as measured by transvaginal ultrasonography <3.0 cm had sensitivity, specificity, PPV and NPV of 63.6%, 77.2%, 28.0% and 93.8%, respectively[16]. Fetal adrenal gland volume also showed sensitivity of 92%, specificity of 99%, PPV of 93.5 and NPV of 0.08, which is very impressive comparing to clinical risk factors in this study[20].

The heterogeneous findings were due to multi-factorial causes. Goldenberg RL mentioned that, of preterm births, 30 to 35% are indicated, 40 to 45% are spontaneous preterm labor, and 30 to 35% follow preterm rupture of membranes[8]. So, it is difficult to predict all preterm births only just by using risk factors. The limitation of this study are indicated preterm birth or preterm birth that follows premature rupture of membranes were included. The data obtained from retrospective electronic records may be underreporting of risk factors. Lastly, the accuracy of findings depends on the recording system.

The solution drawn from this study was, the policy of using routine risk screening for predicting preterm birth should be reconsidered. If it is used for the reason to warn health-care providers to close observe then the non-risk group cannot be neglected either. Both groups should be given the same advice and care regarding prevention of preterm birth. Policy makers should

empower obstetric personnel in general and regional hospitals to set up more predictive and feasible investigation clinical screening. An accurate, reliable and feasible screening method should be concerned in a country level. This could help identifying the real women at risk and cost effective measures could be implemented to prevent preterm birth.

Conclusion

Six factors of routine risk screening used in public hospital in Thailand had low screening performance and showed minimal benefit in clinical practices. Effective guidelines of practice for preterm births were further discussed and planned in national policy.

Acknowledgement

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ความสามารถในการทำนายของปัจจัยเสี่ยงการคลอดก่อนกำหนดที่ใช้ในโรงพยาบาลรัฐในประเทศไทย

ประเทือง เหลี่ยมพงศาพุทธิ, รายิน อโรร่า

วัตถุประสงค์ : เพื่อตรวจสอบความสามารถในการทำนายของปัจจัยเสี่ยงสำหรับการคลอดก่อนกำหนดในโรงพยาบาลรัฐ

วัสดุและวิธีการ : งานวิจัยนี้เป็นการศึกษาแบบตัดขวาง โดยได้ข้อมูลจากหญิงตั้งครรภ์ที่มาคลอดในโรงพยาบาลลำปาง ตั้งแต่ 1 กรกฎาคม พ.ศ. 2551 – 30 มิถุนายน พ.ศ. 2553 นำมาวิเคราะห์ปัจจัยเสี่ยงดังนี้ ประวัติเคยคลอดก่อนกำหนด การผิดปกติของมดลูก ความดันโลหิตสูง หญิงตั้งครรภ์อายุน้อยกว่า 20 ปี การตั้งครรภ์แฝด และการตกเลือดก่อนคลอด โดยกลุ่มศึกษามีปัจจัยเสี่ยงอย่างน้อยข้อใดข้อหนึ่ง มาคำนวณ diagnostic test

ผลการศึกษา : จากหญิงตั้งครรภ์ที่คลอดทารกมีชีพ 7435 ราย พบว่าเป็นการคลอดก่อนกำหนดร้อยละ 6.7 โดยส่วนใหญ่หรือร้อยละ 57.1 คลอดที่อายุครรภ์ 35-36 สัปดาห์ ร้อยละ 30.7 ของกลุ่มคลอดก่อนกำหนด พบว่ามีปัจจัยเสี่ยงอย่างน้อย 1 อย่าง และมี odds ratio ของการมีปัจจัยเสี่ยงเท่ากับ 2.41 (95% CI 1.96-2.95) จากการวิเคราะห์แบบ diagnostic test พบว่ามี sensitivity 30.7% specificity 84.4% positive predictive value 12.5% negative predictive value 94.4% likelihood ratio for positive test 1.98 และ likelihood ratio for negative test 0.82

สรุป : ปัจจัยเสี่ยงต่อการคลอดก่อนกำหนด 6 ข้อที่ใช้ในการคัดกรองในโรงพยาบาลของรัฐในประเทศไทยมีความสามารถในการทำนายต่ำ และมีประโยชน์น้อยในทางเวชปฏิบัติ