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Effect of Unfulfilled Standard Antenatal Care on Pregnancy Outcomes

Palin Pooltananan, M.D.*,
Somnimit Luengratsameerung, M.D.*

** Department of Obstetrics and Gynecology, Faculty of Medicine Vajira Hospital Navamindradhiraj University, 681 Samsen Road, Dusit district, Bangkok 10300, Thailand*

ABSTRACT

Objectives: To compare pregnancy outcomes between women who received unfulfilled standard versus fulfilled standard antenatal care (ANC) according to the Ministry of Public Health of Thailand (MOPH) guideline as the following; 1st visit as soon as possible but gestational age (GA) not later than 12 weeks of gestation, 2nd visit: GA between 16 - 20 weeks, 3rd visit: GA between 24 – 28 weeks, 4th visit: GA between 30 – 34 weeks and 5th visit: GA between 36 – 40 weeks.

Materials and Methods: A retrospective cohort study was conducted by recruiting medical records of all singleton pregnant women who delivered at the Department of Obstetrics and Gynecology, Faculty of Medicine, Vajira Hospital, Bangkok, Thailand from June 2015 to May 2016. All recruited pregnant women had singleton pregnancies, complete medical data record, certain GA by their last menstrual period or by early ultrasound before GA 28 weeks and GA at delivery equal to 28 weeks or more. Exclusion criteria were women with pre-existing medical conditions and fetal anomalies. Study outcomes were the rates of low neonatal birth weight (< 2,500 g), preterm delivery, low Apgar scores at 1 and 5 minute (< 7), neonatal intensive-care unit (NICU) admission, preeclampsia and postpartum hemorrhage.

Results: From 1,237 pregnant women who met to the eligible criteria, there were 1,170 cases included into the study. Six hundreds and three cases received fulfilled standard ANC and 567 cases received unfulfilled standard ANC. No statistical difference was found in the rates of low neonatal birth weight, preterm delivery, low Apgar scores, NICU admission, preeclampsia and postpartum hemorrhage between both groups. In addition, there were significantly higher rates of previous abortion, advanced maternal age, pre-pregnancy overweight and obesity and lower rates of teenage pregnancy, pre-pregnancy underweight in women who received fulfilled standard ANC.

Conclusions: There was no significant adverse pregnancy outcome in unfulfilled standard compared with fulfilled standard ANC group.

Keywords: antenatal care, pregnancy outcomes, low birth weight

Correspondence to: *Somnimit Luengratsameerung, M.D., Department of Obstetrics and Gynecology, Faculty of Medicine Vajira Hospital Navamindradhiraj University, 681 Samsen Road, Dusit district, Bangkok 10300, Thailand, Tel: +66 2244 3414, +66 89613 3987 Fax: +66 2243 7907, E-mail address: lsomnimit@yahoo.com*

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ผลของการฝากครรภ์ที่ไม่เป็นไปตามมาตรฐานต่อผลลัพธ์ของการตั้งครรภ์

ปาลิน พูลธนะนันท์, สมนิมิตร เหลืองรัศมีรุ่ง

บทคัดย่อ

วัตถุประสงค์: *เพื่อศึกษาเปรียบเทียบผลลัพธ์ของการตั้งครรภ์ระหว่างสตรีตั้งครรภ์ที่เข้ารับการฝากครรภ์ครบและไม่ครบตามเกณฑ์ของกระทรวงสาธารณสุขไทย โดยการฝากครรภ์ครบตามเกณฑ์ 5 ครั้ง ของกระทรวงสาธารณสุขไทยมีดังนี้ : ครั้งที่ 1 ฝากครรภ์เร็วที่สุดเมื่อทราบว่าตั้งครรภ์ แต่อายุครรภ์ต้องไม่เกิน 12 สัปดาห์, ครั้งที่ 2 เมื่ออายุครรภ์ระหว่าง 16 – 20 สัปดาห์, ครั้งที่ 3 เมื่ออายุครรภ์ระหว่าง 24 – 28 สัปดาห์, ครั้งที่ 4 เมื่ออายุครรภ์ระหว่าง 30 – 34 สัปดาห์, ครั้งที่ 5 เมื่ออายุครรภ์ระหว่าง 36 – 40 สัปดาห์*

วัสดุและวิธีการ: *การศึกษาย้อนหลังจากข้อมูลในเวชระเบียนของหญิงตั้งครรภ์เดี่ยวทุกรายที่มีการเก็บข้อมูลครบถ้วน, อายุครรภ์แม่นยำ และคลอดที่อายุครรภ์มากกว่าหรือเท่ากับ 28 สัปดาห์ ที่คลอดในโรงพยาบาลวชิรพยาบาล ประเทศไทย ตั้งแต่มิถุนายน 2558 ถึง พฤษภาคม 2559 เกณฑ์การคัดออก ได้แก่ มีโรคประจำตัวที่ส่งผลกระทบต่อผลลัพธ์ของการตั้งครรภ์หรือทารกในครรภ์มีความพิการ ผลลัพธ์ของการตั้งครรภ์ที่ต้องการศึกษา ได้แก่ ความชุกของทารกแรกเกิดน้ำหนักตัวน้อย (< 2,500 กรัม), การคลอดก่อนกำหนด (< 37 สัปดาห์), คะแนนแอปการ์น้อยกว่า 7 คะแนน ที่นาทีที่ 1 และ 5 หลังคลอด, การส่งตัวทารกไปรักษาต่อในหอผู้ป่วยทารกแรกเกิดวิกฤต, ภาวะครรภ์เป็นพิษ และการตกเลือดหลังคลอด*

ผลการศึกษา: *จากผู้คลอดครรภ์เดี่ยวทั้งหมด 1,237 ราย เข้าเกณฑ์การวิจัยทั้งหมด 1,170 ราย จัดอยู่ในกลุ่มฝากครรภ์ครบตามเกณฑ์กระทรวงสาธารณสุขไทย 603 ราย และไม่ครบตามเกณฑ์กระทรวงสาธารณสุขไทย 567 ราย พบว่า ความชุกของทารกแรกเกิดน้ำหนักตัวน้อย, การคลอดก่อนกำหนด, คะแนนแอปการ์น้อยกว่า 7 คะแนน ที่นาทีที่ 1 และ 5 หลังคลอด, การส่งตัวทารกไปรักษาต่อในหอผู้ป่วยทารกแรกเกิดวิกฤต, ภาวะครรภ์เป็นพิษ และการตกเลือดหลังคลอด ไม่แตกต่างกันในสองกลุ่มอย่างมีนัยสำคัญทางสถิติ ในกลุ่มสตรีตั้งครรภ์ที่ฝากครบตามเกณฑ์ของกระทรวงสาธารณสุขไทยมีความชุกของประวัติการแท้งในครรภ์ก่อน, มารดาอายุมากกว่า 35 ปี และมีค่าดัชนีมวลกายก่อนตั้งครรภ์มากกว่ามาตรฐาน สูงกว่าอย่างมีนัยสำคัญทางสถิติ รวมทั้งมีความชุกของสตรีตั้งครรภ์วัยรุ่น และมีค่าดัชนีมวลกายก่อนตั้งครรภ์น้อยกว่ามาตรฐาน ต่ำกว่าอย่างมีนัยสำคัญทางสถิติ*

สรุป: *ไม่พบความความแตกต่างของผลลัพธ์ของการตั้งครรภ์ระหว่างสตรีตั้งครรภ์ที่เข้ารับการฝากครรภ์ครบและไม่ครบตามเกณฑ์ของกระทรวงสาธารณสุขไทย*

คำสำคัญ: *การฝากครรภ์, ผลลัพธ์ของการตั้งครรภ์, ทารกแรกเกิดน้ำหนักตัวน้อย*

Introduction

Antenatal care (ANC) is an important strategy that can help preventing adverse pregnancy outcomes which can occur with any mothers or any newborns. This includes many measures such as history taking, physical examination, fetal heart sound monitoring, laboratory investigation and ultrasonography in order to identify a pregnant woman or a fetus at risk that can lead to adverse pregnancy outcomes. Early detection of a pregnant woman at risk is useful for planning of treatment program. Closed monitoring, counseling pregnant woman and her husband, timing of delivery, planning route of delivery should be performed intensively and continuously. It is necessary for pregnant women to receive antenatal care as soon as possible and it must be continuous[1].

For low risk pregnancy, we have used Dame Janet Campbell's fixed pattern of antenatal visits since 1920, i.e. after first ANC visit patient will be appointed to ANC every 4 weeks until 28th week of gestation, then every 2 weeks until 36th week of gestation, then every week until delivery. If the patients are at risk, the doctor may follow up more frequently[1].

In 2002, the World Health Organization (WHO) has suggested pregnant women to have at least four visits referring to the gestational age (GA) range as the following; 1st visit as soon as possible but not later than 12 weeks of gestation, 2nd visit during 24 – 28 weeks, 3rd visit during 30 – 34 weeks and 4th visit during 36 – 40 weeks[2].

In 2013, Ministry of Public Health of Thailand (MOPH) adjusted the WHO guideline to be appropriate for Thai women by adding the visit at 16 - 20 weeks of GA, therefore suggestion for standard ANC in Thailand is as the following; 1st visit as soon as possible but not later than 12 weeks of gestation, 2nd visit between 16 - 20 weeks, 3rd visit between 24 – 28 weeks, 4th visit between 30 – 34 weeks and 5th visit between 36 – 40 weeks[3].

According to recent data, it was found that 57-64% of pregnant women in Thailand started first ANC after 12 weeks of gestation3 even MOPH has recommended to have ANC as soon as possible. From previous retrospective cohort studies, it was found that the more numbers of antenatal visits resulted in decreasing rate of low birth weight (LBW), NICU admission and neonatal death[4]. On the other hand, fewer ANC visits could result in late risk evaluation leading to late treatment, which eventually increases adverse pregnancy outcomes, e.g. low neonatal birth weight (< 2,500 g), birth asphyxia, neonatal endotracheal intubation, neonatal intensive-care unit (NICU) admission, neonatal death, postpartum hemorrhage, preeclampsia or gestational diabetes[4].

However another randomized controlled trial found that there were no differences in rates of NICU admission, low 1-minute Apgar scores (< 7), umbilical cord pH less than 7.0 and LBW between women who received ANC 10 or more and less than 10 visits 5. Villar and colleagues conducted multicenter randomized controlled trial between fixed pattern model and new model ANC according to WHO guideline 2002. They found no significant difference in rates of LBW and preeclampsia between both groups[6]. After their study had published, WHO guideline was widely used in state of fixed pattern model. In 2013, Vogel and colleagues reconsidered exploratory analysis using the same population in the study of Villar and colleagues. They found that there was significantly higher rate of fetal death between 32nd and 36th weeks of gestation (adjusted RR 2.24; 95% CI 1.42, 3.53) which could be related to reduced number of visits[7].

Until now, there is still no clear-cut information about pregnancy outcomes relating to the ANC guideline of MOPH. Therefore we conduct the present study in Thai pregnant women to investigate if there is any different result between women who receive fulfilled standard and unfulfilled standard ANC.

Materials and Methods

This retrospective cohort study was conducted

by recruiting medical records of all singleton pregnant women who delivered at the Department of Obstetrics and Gynecology, Faculty of Medicine, Vajira Hospital, Navamindradhiraj University, Thailand from June 2015 to May 2016. This study was approved by the Vajira Institutional Review Board.

Inclusion criteria were singleton pregnancy, complete data record, certain GA by their last menstrual period or by early ultrasound before GA 28 weeks, and GA at birth equal to 28 weeks or more. Exclusion criteria were women who had medical disorders or any conditions which may affect pregnancy outcomes (e.g. pre-existing diabetes, chronic hypertension, autoimmune diseases, renal disease, HIV infection and syphilis infection), severe fetal congenital anomalies or chromosomal abnormalities.

According to MOPH guideline, we divided population into two groups, i.e. the women who received fulfilled standard and unfulfilled standard ANC as the following; 1st visit as soon as possible but not later than 12 weeks of gestation, 2nd visit between 16 - 20 weeks, 3rd visit between 24 – 28 weeks, 4th visit between 30 – 34 weeks and 5th visit between 36 – 40 weeks[3].

Based on the data collected from the medical records, characteristic data were age, GA at first ANC visit, number of visits, parity, history of LBW delivery, history of abortion, ethnicity, pre-pregnancy body mass index (BMI), history of alcoholic drinking and smoking during pregnancy, and medical disorders. The primary objective was to study rate of low birth weight delivery defined as neonatal weight less than 2,500 g. The secondary objectives were the rates of preterm birth defined as delivery before 37 complete weeks, birth asphyxia by considering Apgar sores at 1 and 5 minute less than 7, NICU admission, preeclampsia diagnosed by blood pressure of 140/90 mmHg or more measuring apart for at least 6 hours together with urine protein more than 300 mg per 24 hours[8] and postpartum hemorrhage defined as blood loss 500 ml or more in vaginal delivery and 1,000 ml or more in cesarean delivery[1].

Sample size was calculated based on our pilot study with 5% chance of making a type I error and 20% of type II error. Number needed was 558 for each group. The data were analyzed by SPSS version 22.0 (IBM). Chi-square test and Fisher's exact test were used for comparing categorical data and study t-test was used for comparing continuous data. For multivariate analysis, the possible factors identified with univariate analysis were further entered into the logistic regression analysis to determine independent predictors of patient and presented as odds ratio (adjusted OR) and 95% confidence interval (CI). A p value of less than 0.05 was considered statistically significant.

Results

From all 1,512 pregnant women delivered in the studied period, 1,237 women were included in this study. After recruitment, 67 pregnant women were excluded, 9 of which due to fetal anomalies and 58 due to maternal previous medical conditions that could affect pregnancy outcomes. Therefore 1,170 pregnant women were enrolled to the study, 603 and 567 cases of which were classified in fulfilled standard and unfulfilled standard ANC group, respectively. Process of studied enrollment is shown in Fig 1.

Demographic data and antenatal characteristics of pregnant women were presented in Table 1. There were significant differences in maternal age, GA at first visit ANC, number of visits, history of abortion and pre-pregnancy BMI between fulfilled standard and unfulfilled standard ANC group. There were no differences in parity, history of LBW delivery, ethnicity and history of alcoholic drinking and smoking during pregnancy between both groups.

For the studied pregnancy outcomes, the results were no significant difference in rates of LBW delivery, preterm birth, low 1- and 5-minute Apgar scores, NICU admission, preeclampsia and postpartum hemorrhage (Table 2).

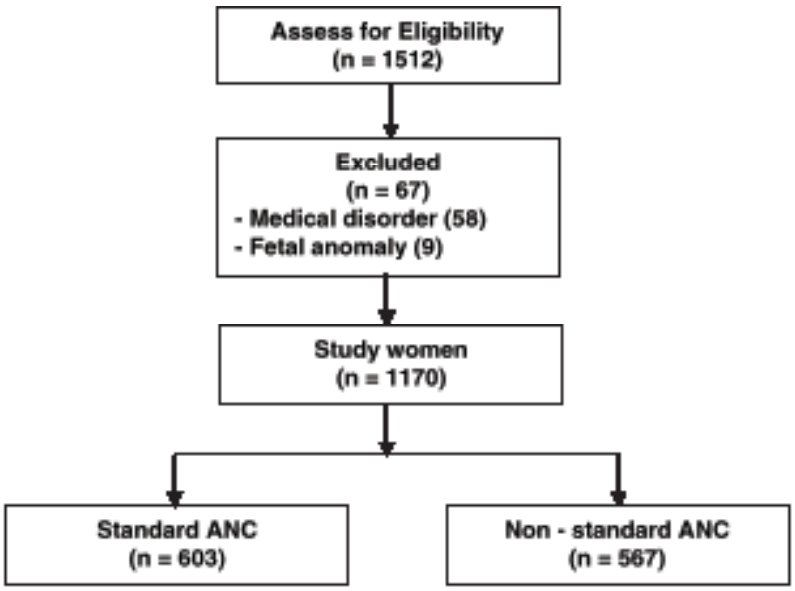

Fig. 1. Process of studied enrollment.

Table 1. Maternal demographic characteristics of fulfilled and unfulfilled antenatal care groups.

Characteristics	Fulfilled standard ANC	(n = 603)	Unfulfilled ANC standard	(n = 567)	p value
GA at 1st ANC (Median, IQR)	9	(7-11)	17	(15-21)	< 0.001
Number of visits (Median, IQR)	11	(10-13)	9	(7-10)	< 0.001
Maternal age, yrs (n, %)					< 0.001
Age < 20 years	49	(8.1)	104	(18.3)	
Age 20 - 34 years	418	(69.3)	379	(66.8)	
Age ≥ 35 years	136	(22.6)	84	(14.8)	
Nulliparous (n, %)	293	(48.6)	249	(43.9)	0.109
Previous LBW (n, %)	18	(3.0)	17	(3.0)	0.989
Previous abortion (n, %)	156	(25.9)	107	(18.9)	0.004
Thai ethnic (n, %)	565	(93.7)	514	(90.7)	0.052
Pre-pregnancy BMI (n, %)					<0.001
< 18.50	89	(14.8)	144	(25.4)	
18.50 - 24.99	345	(57.2)	316	(55.7)	
25.00 - 29.99	122	(20.2)	85	(15.0)	
≥ 30	47	(7.8)	22	(3.9)	
Alcohol (n, %)	1	(0.2)	2	(0.4)	0.528
Smoking (n, %)	2	(0.3)	7	(1.2)	0.077

IQR: interquartile range, ANC: antenatal care, LBW: low birth weight, BMI: body mass index

Table 2. Pregnancy outcomes of fulfilled and unfulfilled standard antenatal care groups.

Outcomes	Fulfilled standard ANC	(n = 603)	Unfulfilled ANC standard	(n = 567)	p value
LBW (n, %)	40	(6.6)	40	(7.1)	0.775
Preterm birth (n, %)	34	(5.6)	37	(6.5)	0.525
Low 1-min APGAR (n, %)	21	(3.5)	20	(3.5)	0.967
Low 5-min APGAR (n, %)	2	(0.3)	4	(0.7)	0.371
NICU admission (n, %)	10	(1.7)	8	(1.4)	0.731
Preeclampsia (n, %)	18	(3.0)	21	(3.7)	0.494
PPH (n, %)	14	(2.3)	12	(2.1)	0.812

ANC: antenatal care, LBW: low birth weight, NICU: neonatal care unit, PPH: postpartum hemorrhage

When multivariate analysis was used to adjust for maternal age, BMI and history of abortion, to exclude confounding factors that may affect pregnancy outcome, the outcomes were still not significantly different between the two groups (Table 3).

Table 3. Pregnancy outcomes of fulfilled and unfulfilled antenatal care groups adjust for maternal age, BMI and history of abortion.

Outcomes	Fulfilled standard ANC	(n = 603)	Unfulfilled ANC standard	(n = 567)	Unadjusted Odds ratio	(95% CI)	Adjusted Odds ratioa	(95% CI)
LBW	40	(6.6)	40	(7.1)	0.94	(0.59-1.47)	0.93	(0.59-1.47)
Preterm birth	34	(5.6)	37	(6.5)	1.17	(0.72-1.89)	1.22	(0.75-1.98)
Low 1-min Apgar	21	(3.5)	20	(3.5)	1.01	(0.54-1.89)	1.05	(0.56-1.97)
Low 5-min Apgar	2	(0.3)	4	(0.7)	2.14	(0.39-11.70)	2.28	(0.41-12.71)
NICU admission	10	(1.7)	8	(1.4)	1.18	(0.46-3.01)	1.18	(0.46-3.04)
Preeclampsia	18	(3.0)	21	(3.7)	0.80	(0.42-1.52)	0.71	(0.37-1.36)
PPH	14	(2.3)	12	(2.1)	1.10	(0.50-2.40)	1.07	(0.4912.35)

Data presented as n, %

ANC: antenatal care, LBW: low birth weight, NICU: neonatal care unit, PPH: postpartum hemorrhage

[a] Adjusted for maternal age, BMI and history of abortion

Discussion

There were significantly higher rates of teenage pregnancy and pre-pregnancy underweight BMI in unfulfilled standard ANC group. These can reflect that the patients in this group have lower concern on health of themselves. Vice versa, the patients in fulfilled standard ANC group had significantly higher history of abortion, rate of advanced maternal age, overweight and obesity which might cause them to concern more than patients who did not have and result in early visit for ANC.

There might be other factors that effected

pregnancy outcome. Previous study by Triped O. found that maternal risk factors of low birth weight were low pre-pregnancy BMI, prior LBW delivery, number of ANC vists[9] and study by Sattayaruk S. found that there was significant relationship between less number of ANC visits and low 1-minute APGAR score[10]. Therefore we used multivariate analysis to adjust for maternal age, pre-pregnancy BMI and history of abortion to exclude confounding factors that may affect pregnancy outcomes. The outcomes were still not significantly different between the two groups.

In our study there were no differences in rates of LBW, APGAR score at 1 and 5 minute less than 7, and NICU admission which is correlated with previous study by Carter EB. in 2016 which compared between ANC more or equal to 10 visits and less than 10 visits in low risk pregnancy. As implied to our study it seems to be no difference in number of visits in both groups (9 vs. 11) from Carter EB.6 study cut point. These can result in no differences in pregnancy outcomes.

Although majority of pregnant women had regular and continuous ANC visits, they were assigned to unfulfilled standard ANC group due to first visit was late than 12 weeks of gestational age. We considered that the number of visits and continuance should be more concerned as an important predictor of pregnancy outcomes than gestational age at first visit.

This study might have some limitations. Firstly, there are selection biases, i.e. the inclusion criteria was GA at birth more than 28 weeks causing loss data on population who delivered at GA 24-28 weeks. It may result in lower rate of LBW than it should be in unfulfilled ANC group. Secondly, pregnant women who had history of abortion that could be from congenital or chromosomal anomalies tended to come to visit ANC earlier and then are enrolled in fulfilled standard rather than unfulfilled standard ANC group (25.9 vs 18.9%, P = 0.004). So, the result of fulfilled standard ANC group might be worse than it should be. Third, this study was a retrospective study, the result might not represent the effects of fulfilled standard versus unfulfilled standard ANC according to the MOPH guideline as good as randomized control trial.

Further study should be more concerned about GA at first visit cut point and continuance to achieve more accurate outcomes and to exclude pregnant woman who have history of abortion and non-Thai ethnicity in order to eliminate the selection bias. And new ANC guidelines should be adjusted by concern more about number of visits and GA at first visit to be as soon as possible. In case of late 1st ANC visit, the physician should encourage pregnant woman to take ANC as soon as possible and adequate amount.

Conclusion

There was no significant adverse pregnancy outcome in unfulfilled standard compared with fulfilled standard ANC group

Potential conflicts of interest

The authors declare no conflict of interest.

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