ผลของการใช้กระเป๋าพกพาแบบบันทึกนับลูกดิ้นเปรียบเทียบกับแบบบันทึกแบบดั้งเดิมต่อความสม่ำเสมอในการนับลูกดิ้น
Effects of Portable Pocket Diary for Recording Fetal Movement Counts Compared with the Usual Counting Diary on Consistency of the Counting

นิพนธ์ต้นฉบับ

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วารสารไทยเภสัชศาสตร์และวิทยาการสุขภาพ 2562;14(4):182-190.

Original Article

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Thai Pharmaceutical and Health Science Journal 2019;14(4):182-190.

บทคัดย่อ

วัตถุประสงค์: เพื่อเปรียบเทียบความสม่ำเสมอของการนับลูกดิ้นระหว่างหญิงตั้งครรภ์ที่ใช้เครื่องกระเป๋าพกพาแบบบันทึกนับลูกดิ้นและที่ใช้แบบบันทึกนับลูกดิ้นตามปกติ **วิธีการศึกษา:** ในการวิจัยแบบกึ่งทดลองนี้ มีกลุ่มตัวอย่าง คือ หญิงตั้งครรภ์เดี่ยวที่ฝากครรภ์และคลอดที่โรงพยาบาลนพรัตน์ราชธานี กรุงเทพมหานคร ระหว่างสิงหาคม 2560 – กรกฎาคม 2561 มีคุณสมบัติตามเกณฑ์คัดเข้า คือ มีอายุครรภ์ตั้งแต่ 28 สัปดาห์ขึ้นไป แบ่งเป็นกลุ่มทดลองใช้กระเป๋าพกพาแบบบันทึกนับลูกดิ้นจำนวน 43 ราย และกลุ่มควบคุมใช้แบบบันทึกนับลูกดิ้นตามปกติจำนวน 48 ราย ติดตามรวบรวมข้อมูลทุกครั้งที่มาตรวจครรภ์จนกระทั่งคลอด วิเคราะห์ข้อมูลด้วย chi-squared และ Fisher's exact test **ผลการศึกษา:** หญิงตั้งครรภ์เดี่ยวกลุ่มทดลองที่ใช้กระเป๋าพกพาแบบบันทึกนับลูกดิ้นมีความสม่ำเสมอในการนับลูกดิ้นมากกว่ากลุ่มควบคุมที่ใช้แบบบันทึกนับลูกดิ้นตามปกติ (*P*-value < 0.001) **สรุป:** การใช้กระเป๋าพกพาแบบบันทึกลูกดิ้นเป็นทางเลือกหนึ่งของหญิงตั้งครรภ์ เป็นสัญลักษณ์เตือนความจำให้หญิงตั้งครรภ์ตระหนักและเห็นความสำคัญว่าการนับลูกดิ้นแสดงถึงการมีสุขภาพดีของทารกในครรภ์ ส่งเสริมให้มีการนับลูกดิ้นอย่างสม่ำเสมอ

คำสำคัญ: แบบบันทึกนับลูกดิ้น, ความสม่ำเสมอ, การตรวจสุขภาพทารกในครรภ์

Abstract

Objective: To compare consistency in counting fetal movement by pregnant women using portable pocket diary and the usual counting diary. **Method:** In this quasi- experimental research, sample was women with single pregnancy who had antennal care (ANC) and delivered at Nopparatrajathanee Hospital, Bangkok, between August 2017 and July 2018. Their pregnancy had to be 28 weeks or greater. They were divided into two groups, 43 in the experimental group (portable pocket diary) and 48 in the control group (usual diary). Participants were followed up at each ANC visit till delivery to collect for demographic, ANC status, and pregnancy outcome data. Data were analyzed using chi-square and Fisher's exact tests. **Results:** Pregnant women in the experimental group had more consistency in counting fetal movement than those in the control group (*P*- value < 0. 001) . **Conclusion:** The portable pocket diary to record fetal movement counts could be an alternative method for pregnant women. It could help remind pregnant women to realize that counting fetal movement could ensure fetus well-being and should be done on a regular basis.

Keyword: fetal movement count record diary, consistency, fetal well-being assessment

Editorial note
Manuscript received in original form on June 13, 2019;
revised August 8, 2019;
and accepted in final form on September 29, 2019

Journal website: http://ejournals.swu.ac.th/index.php/pharm/index

Introduction

Fetal movement counting is a primary screening method to identify the impaired placenta function which could reduced placental perfusion, and consequently fetal hypoxia. [1,2] Impaired placenta function was associated with adverse events including retarted fetal growth, pre-term labor, perinatal death, and a low APGAR score in the newborn. [3-5] Fetal movement counting could then be used to prevent adverse outcomes in the fetus.

Pregnant women usually could feel the fetal movement since 18 to 20 weeks for the first pregnancy and as early as 16 to 20 weeks for the later ones. Studies from the last four decades suggest that self- monitored daily fetal movement counting could help assess fetal well-being.[6,7] However, there have been no definite evidences that fetal movememt counting could help reduce fetal morbidity and mortality.

It has been known that countinuous daily fetal movement by the mother could help screen the problem and relieve the mother anxiety. No fetal movement could be an alarm sign of life-threatening placental abnormality. Self-monitoring on fetus health by the mother should be encouraged to be able to detect an early decrease of fetal movement, and seek medical care in a timely fashion. Healthcare providers should emphasize the importance of monitoring the fetal movement to prevent perinatal mortality,[8] which is a challenge in obstetrics.

Fetal movement counting known as "kick out" or a more well-known term of "count-to-ten" has been used for mother-monitoring on fetus health.[9] The method has been used for a long time and cost-free compared with other methods[10] Less or no movement is a warning or early sign of dead fetus in utero or fetal death. A study showed that 4 – 16% of fetuses with less movement were found in unplanned pregnancy and those not under the supervision of scheduled ante-natal care (ANC), especially in the third trimester.[11] Continuous daily monitoring of fetal movement in the third trimester has been proved to prevent dead fetus in utero.[4,10,12]

Among various factors contributing to the ineffectiveness of fetal movement, a lack of maternal concern, maternal socioeconomic problems, and healthcare providers's lack of consultation skills have been prominently evident.[2,13,14] Since immediate and readily available ANC contact could be provided for the pregnant women, nurses should realize benefits of fetal movement counting. Nurses should advise pregnant women on how to count and record fetal movement, and waring signs for pregnant women to seek urgent medical care before the scheduled follow-up visit. Fetal movement counting should be done within a specific duration of the day for each individual and recorded in a diary to avaoid forgetting the counts. The most effective method should be easy and convenient for a daily practice.[9,15]

Among various methods of fetal movement counting, the method of Heazell and Froen is based on the basis that if the movement was less than 10 counts within 2 hours, the fetus is in danger.[16] It is recommended that at least three movements must be detected within one hour because most pregnant women usually could feel three movements within several minutes.[17] The longer the duration to count, the more likely the error in counting.[18] In the method of Sadovsky and Polishuk, the women should count fetus movement three time daily after meal each for a duration of an hour.[19] A count of less than 3 times per hour is considered abnormal. For a further counting upon additional 6 – 12 hours per day, the count is called the daily fetal movement record (DFMR). A DFMR of less than 10 counts is considered abnormal suggesting a high risk of dead fetus in utero. The fetus heart beats heard 12 hours before fetal death are called the movement alarm signal (MAS).

A few studies on reliability of self-monitoring fetus movement counting have found that about 82 – 88% of pregnant women were willing to perform an hour-long counting at least three times a day.[20,21] However, Pearson and Weaver found that the acceptance declined to 50% if the counting was continued for 12 non-stop hours.[22] Therefore, the most effective way to count the fetus movement should be done three times a day, with less than an hour each time.

The concept of surviving newborn and safe mother is the basis for maternal and newborn care issued by the Ministry of Public Health. The care aims to reduce the newborn's mortality and morbidity. Perinatal mortality rate is an index of the effectiveness of maternal and newborn health from pregnancy to seven days after labor to demonstrate the national health problem. Based on the statistics by the Office of Policy and Strategies of Thailand, fetal mortality and perinatal mortality were 6.6 and 2.8 per 1,000 live births, respectively, in 2011, and decreased to 6.2 and 2.3 per 1,000 live births, respectively, in 2015.[23] The data from Nopparatrajathanee Hospital showed that fetal mortality rate was 10.0 per 1,000 live births in 2011, and decreased to 7.82 per 1,000 live births in 2014 with the majority of fetal death before the labor.[24]

A major factor of dead fetus in utero is placental hypoxia. It is crucial that healthcare providers should be able to recognize or even diagnose fetal hypoxia as early as possible to avert the incidence and plan a safe labor successfully. Various methods to measure fetal hypoxia have been developed. Fetal movement is an easy, safe and cheap physical examination. Fetal movement examination is practical regardless of places or settings, even out of the hospital since no hospital-based electronic devices are needed.

Based on the investigators' experiences, among pregnant women receiving care at the ANC clinic of Nopparatrajathanee Hospital, about 50% of them did not perform and record fetal movement counting in the diary provided. Most of these women judge the movement, more or less, by the feeling from the touch. Many women did not understand how to count since the advice given was varied based on the providers giving the advice. The confusion cold cause poor decision to make a timely visit to the hospital for urgent care as reported in the study of Phoodaangau.[2] The problem has been a challenge in obstetric care to prevent adverse outcomes previously described. The investigators developed a portable pocket diary diary to record fetal movement counts. The pocket contained a diary and manual to remind warning signs for hospital emergency visit. It allowed for a convenient carrying,

timely recording of the fetal movement counts, and timely prompting the women for emergency visit.

Our portable pocket diary diary was different from the common one of Sadovsky and Polishuk.[19] The well-known diary of Sadovsky and Polishuk is not portable, therefore the counts happening when out of reach of the diary could be forgot. It also needs a good recall to record in the diary a the later time. In addition, the women could not completely decide whether the sign they experience could prompt the urgent hospiatl visit. On the other hand, our portable pocket diary diary is readily portable, which could allow for a timely and continuous count recording requiring no recall. In addition, the pocket allows for clear and precise reminders of signs that could prompt the women for an urgent hospital visit.

Based on literature review and our own experiences in the ANC clinic, we expected that pregnant women could conveniently carry the portable pocket diary diary for fetal movement counting bundled with a manual for adverse events reminder. This could possibly be an obstetric nursing care innovation by simply modifying materials from a regular daily living.[25] The portable pocket diary itself could remind and encourage the women to realize that it is only their goodwill toward the unborn that drives the recording of timely and precise counts of fetal movement. Reminder of warning signs to prompt urgent hospital visit was for the safety of both the mother and fetus. Ultimately, it could promote self-care to the women and the care from the unborn. The findings could be useful in implementing the innovation for fetal movement counting in pregnant women receiving ANC care Nopparatrajathanee Hospital.

Specifically, this study aimed to compare consistency of countin Fetal movement counting is a primary screening method to identify the impaired placenta function which could reduced placental perfusion, and consequently fetal hypoxia.[1,2] Impaired placenta function was associated with adverse events including retarted fetal growth, pre-term labor, perinatal death, and a low APGAR score in the newborn.[3-5] Fetal movement counting could then be used to prevent adverse outcomes in the fetus.

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Specifically, this study aimed to compare consistency of counting, measured as the recording, on fetal movement between women using the newly developed portable pocket diary and those using the usual counting record. We

hypothesized that consistency in recording the fetal movement between the use portable pocket diary and the usual method was different. between women using the newly developed portable pocket diary and those using the usual counting record. We hypothesized that consistency in recording the fetal movement between the use portable pocket diary and the usual method was different.

Methods

In this quasi-experimental study, pregnant women in the experimental group used portable pocket diary for fetal movement counting while those in the control group received the usual fetal counting diary. Study population was women with single pregnancy with a gestational age of at least 28 weeks or higher, receiving care at the ANC clinic of Nopparatrajathanee Hospital, in Khan Na Yao District, Bangkok. Study sample was those meeting inclusion criteria and willing to participate in the study. Pregnant women with non-Thai nationality, not having the newborn delivered at Nopparatrajathanee Hospital, having twin pregnancy, or being unable to communicate in Thai were excluded.

Sample size was estimated with a type I error of 5% and a power of 80% using STATA software program. A sample of 84 participants (42 in each group) was needed. To compensate for a loss due to those not delivering newborn at Nopparatrajathanee Hospital, a total of 92 participants (46 in each group) were required for 10% attrition rate.

Instruments

The instruments consisted of (A) the fetal movement counting records, portable pocket diary for the experimental group and the usual diary for the control group, and (B) data collection form for (1) demographic information such as age, height, education level, and occupation, (2) history of pregnancy and labor such as number of pregnancy, history of dead fetus in utero, pregnancy complications, warning signs for hospitalization or emergency visit, duration from the start of warning sign to arrival at labor room, number of ANC visits, and consistency of fetal movement counting, and (3) pregnancy outcomes such as type of labor, type of newborn, an APGAR score at 1 and 5 minutes.

In this study, consistency in fetal movement counting was defined as having fetal movement counting recorded three times a day after meal every day with a full one-hour counting each time. On the other hand, inconsistency was referred to having fetal movement counting recorded three times a day after meal every day but not with a full one-hour counting each time, or less than three times of counting, or no counting at all. It was implied that recording reflect the counting of fetal movement.

Data collection procedure

Data of pregnancy women were collected from August 2017 to July 2018. Once eligibility was confirmed, participants were allocated to each of the two groups based on the participant's preference on the method. The researcher advised the participants on how to detect and record fetal movement regarding the assigned method. The advice took about 10 minutes to complete. Participants were expected to submit the records to the researcher at each ANC visit which was 3 to 4 weeks apart. The researcher tally the records of fetal movement counting for each visit until labor.

Participant right protection

Study protocol was approved by the Ethics Committee for Human Study of Nopparatrajathanee Hospital (Approval number: 33/2560; approval date: July 7, 2017). Participation was voluntary. Information of participants were secured. Services at the ANC were not affected by the participant's answers. Participants could withdraw at any time with no need for reasons. Data of participants were presented as summary not individual's information.

Statistical analysis

Descriptive statistics were used to present participants' demographic and clinical characteristics. Comparisons of categorical variables were carried out using Chi-squared test or Fisher's exact test as appropriate. Significance of all statistical analysis was set at a type I error of 5% (or P-value < 0.05).

Results

There were 43 and 48 eligible participants in experimental and control groups, respectively (Table 1). The majority were in their 20 – 34 years of age with no statistical significance (72.10% and 68.75% in experimental and control groups, respectively). Most participants in the experimental group had senior high school education or primary vocational school

education (39.53%) while the majority of those in control group (45.84%) had junior high school education, with no statistical significance. For occupation, majority in both groups were general labors (60.47% and 56.25%, respectively) with no statistical significance.

In terms of history of pregnancy and labor, only number of scheduled ANC follow-up visits were found significantly different between the two groups (*P*-value = .006) where those in experimental group were more likely to have 2 visits (25.58%) compared with 8.33% in control group. All other characteristics were not different between the two groups. These included number of pregnancy, history of dead fetus in utero, pregnancy complications, warning sign for emergency hospital visit, and duration from the start of warning sign to the arrival at labor room.

For pregnancy outcomes, about two-thirds of participants in both groups had vaginal labor (65.12% and 66.67% in experimental and control groups, respectively). All newborns in both groups were alive. For Apgar score at 1 and 5 minute, all newborns in both groups had score in the range of 7 – 10 points. Therefore, the use of portable pocket diary for fetal movement counting and the usual counting diary resulted in similar pregnancy outcomes (Table 1).

For inconsistency in recording the fetal movement counting, 81.39% of participants using the portable pocket diary were consistent in recording the counting while only 43.75% of those using the usual counting diary did so with a statistical significance (P-value < 0.001) (Table 2).

Discussions and Conclusion

The study on the consistency in recording the fetal movement counting among pregnant women found that the portable pocket diary newly developed by the investigator team was significantly associated with a higher level of consistency of recording compared with the usual counting diary. This positive effect of the portable pocket diary for fetal movement counting could be attributable to its reminder attribute. It reminded the pregnant women to record the counting right away on the scheduled time so recall was not needed. Precise counts could also be obtained.

Table 1 Characteristics of participants in the two groups (n = 91).

Characteristics	Experimental group (n = 43)		Control group (n = 48)		*P*-value[#]
	N	%	N	%	
Demographic characteristics					
Age (yrs)					
< 20	6	13.95	5	10.42	0.641
20 – 34	31	72.10	33	68.75	
□ 35	6	13.95	10	20.83	
Education					
Primary school	6	13.95	6	12.50	0.279
Junior high school	15	34.88	22	45.84	
Senior high school / junior vocational school	17	39.53	19	39.58	
Bachelor's degree	5	11.64	1	2.08	
Occupation					
Housewife (no formal working)	15	34.88	21	43.75	0.253*
General labor for daily hiring	26	60.47	27	56.26	
Employee of government (enterprise)	2	4.65	0	0.00	
History of pregnancy / labor					
Number of pregnancy					
First	15	34.88	20	41.67	0.266*
Second	20	46.52	16	33.33	
Third	8	18.60	9	18.75	
Fourth	0	0	3	6.25	
History of dead fetus in utero					
No	43	100.00	47	97.92	0.341*
Yes	0	0	1	2.08	
Pregnancy complications					
No	40	93.01	46	95.83	0.557
Yes	3	6.99	2	4.17	
Warning sign for emergency hospital visit					
Less fetal movement	1	2.33	2	4.17	
Labor pain	32	74.42	37	77.08	0.355
Water breaking	2	4.65	6	12.50	
Headache, blurred vision, heartburn	5	11.63	2	4.17	
Regular scheduled visit	3	6.97	1	2.08	
Duration (hrs) from the start of warning sign to the arrival at labor room					
Mean (SD)	*2.61 (1.99)*		*3.09 (2.60)*		
Min. – Max.	*0 - 7.2*		*0 – 12*		
Number of participants with duration < mean	30	69.77	31	64.58	0.599
Number of participants with duration □ mean	13	30.23	17	35.42	
Number of scheduled follow-up ANC visit					
1	32	74.42	42	87.50	0.006*
2	11	25.58	4	8.33	
3	0	0.00	2	4.17	
Mean number	*1.26*		*1.17*		
Pregnancy outcomes					
Type of labor					
Vaginal	28	65.12	32	66.67	0.876
Caesarean section	15	34.88	16	33.33	
Newborn status					
Alive	43	100.00	48	100.00	n/a[$]
Dead	0	0.00	0	0	
APGAR score at 1 minute (points)					
8 – 10	43	100.00	46	95.83	0.400*
≤ 7	0	0.00	2	4.17	
APGAR score at 5 minutes (points)					
8 - 10	43	100.00	48	100.00	n/a[$]

[#] Chi-squared test.

* Fisher's exact test.

[$] n/a = not applicable.

Table 2 Consistency in recording the fetal movement counting between the two groups (N = 91).

Consistency	N (%)		*P*-value[#]
	Experimental group (n = 43)	Control group (n = 48)	
Consistent	35 (81.39)	21 (43.75)	< 0.001
Inconsistent	8 (18.61)	27 (56.25)	

[#] Chi-squared test.

Regular fetal movement counting for pregnancy with gestational age of 28 weeks or greater could promote the women' s concern that the counting as prescribed and immediate recording was crucial for the fetus health and well-being. Any deviations from the criteria could raise the risk of the fetus health, for example, placental cord compression and placental abruption[13] and incidences at birth such stillbirth and low Apgar scores.[26,27] There have been no clear evidences showing that decreased fetal movement counts could lead could lead to adverse outcomes on the newborn, especially in pregnant women with no pregnancy complications.[10] However, counting fetal movement is rather useful for monitoring adverse outcomes to the fetus than predicting outcomes on the newborn. This was consistent with studies of Saastad and Frøen et al.[28,29]

Women using the portable pocket diary were more likely to have the second ANC visit than those using the usual counting diary. This could be because the portable pocket diary was a reminder of the focus on monitoring the fetus movement and not to forget to count and record the movement. Once the movement was changed or deviated from the criteria, along with the warning sign of adverse events, the women were alerted for emergency hospital visit. They expected to have the fetus checked with electronic non-stress test to determine if the fetal movement counting was related to the fetus health. It is also monitoring fetus health to ensure no fetal hypoxia.

Decreased fetal movement is a critical warning sign of fetus health. In this present study, we found no association between decreased fetal movement and the use of counting methods. This could be due to the fact that the warning signs in the manual book were mainly about complications and early signs of laboring. Self-monitoring fetal movement counting also emphasized on the fetus health, not the strength of the movement. Decreased fetal movement could happen at any time from 28th week of pregnancy till labor. During the counting, women might not be able to feel the difference in strength of the movement whiling also doing other activities. In addition, it is sometimes hard to tell the difference regarding the fetal living cycle.[4,12] For example, there is no fetal movement while fetus is sleeping, and more movement in the afternoon than morning, with the highest strength of movement in the evening. The fetus moves the most when the mother is laying down on the side, or after having meal especially dinner, and when exercising.[30] As the fetus ages, the fetus grows in size and the uterus space is reduced, hence less fetal movement.[31]

Our study found that all labors resulted in livebirths in both groups. Most newborns, except two in the control group, had Apgar scores at 1 minute of 8 – 10 points, and all of them had Apgar scores at 5 minutes of 8 – 10 points. Most newborns had Apgar scores of 9 points. No effect of counting on the Apgar score could be attributable to the fact that fetal movement counting was rather for preventing adverse events. With the decreased fetal movement, a placental perfusion could be decreased, and hence the hypoxia.[1] This hypoxia is related to dysfunctional placenta and adverse outcomes during pregnancy such as retarded fetus growth and perinatal death.[3-5] Recent studies showed that fetal movement counting was not directly related to pregnancy outcomes.[4,12] However, once decreased fetal movement is detected, additional investigations including Doppler ultrasound studies and computerized cardiotocography should be carried out.[32] However, some academicians asserted that fetal movement counting is related to the pregnant women's perception on the fetal movement such as number of labors, duration of perception and the women' s position.[33] The women' s perception could be the obstacle to the counting.[2] However, not many pregnant women were not concerned of counting and recording the fetal movement.[34] In this present study, we focused mainly on promoting counting the fetal movement during the scheduled of the day, and recording the timely and precise number of counts with the use of the portable pocket diary.

This study could not present a clear evidence of benefits of the portable pocket diary for fetal movement counting compared with other methods. This was because we compared only the portable pocket diary model with the usual diary, no other methods were tested. Since the counting of fetal movement was measured as the recorded number in the diary, the correct recording was relied heavily on honesty. A

more objective recording method could better the reliability of the findings. In addition, with a small sample size, the findings could be inconclusive. Hence, studies with a larger sample size are needed. Furthermore, more counting methods or models, such as newly developed smartphone applications, should be tested against this portable pocket diary to record fetal movement counts. Pregnant women with a gestational age of less than 28 weeks should also be studied.

In terms of practical applications, ANC clinics could implement the portable pocket diary for recording the fetal movement counts for their pregnant women. It could remind the women for regular counting and continuous care to prevent complications on their unborn child.

Acknowledgement

The investigators would like to thank pregnant women receiving care at the ANC clinic of Nopparatrajathanee Hospital for their kind contribution.

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