Satisfaction of Healthy Pregnant Women Receiving Short Message Service via Mobile Phone for Prenatal Support: A Randomized Controlled Trial

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Objective: *The main objective was to compare the satisfaction levels of antenatal care between healthy pregnant women who received short message service (SMS) via mobile phone for prenatal support, and those who did not. The second objective was to compare the confidence, anxiety levels and also pregnancy outcomes.*
Design: *A randomized controlled trial.*
Material and Method: *68 healthy pregnant women who attended the antenatal clinic and delivered at Siriraj Hospital, who met the inclusion criterias between May 2007 and October 2007, were enrolled and randomly allocated into two random groups. The study group received two SMS messages per week from 28 weeks of gestation until giving birth. The other group was pregnant women who did not receive SMS. Both groups had the same antenatal and perinatal care. The satisfaction, confidence and anxiety scores were evaluated using a questionnaire at the postpartum ward. The pregnancy outcomes were also compared in these two groups.*
Results: *The satisfaction levels of the women who received prenatal support in SMS messages, were significantly higher than those of who did not receive the messages both in the antenatal period (9.25 vs. 8.00, $p < 0.001$) and during labor (9.09 vs. 7.90, $p = 0.007$). In the SMS using group, the confidence level was higher (8.91 vs. 7.79, $p = 0.001$) and the anxiety level was lower (2.78 vs. 4.93, $p = 0.002$) than the control group in the antenatal period, however no difference in pregnancy outcomes were found.*
Conclusion: *The present study shows the higher satisfaction level of pregnant women who received SMS via mobile phone during their antenatal service when compared with the general antenatal care group. The study also show the higher confidence level and lower anxiety level in the antenatal period but no difference in pregnancy outcomes.*

Keywords: *SMS, Short message service, Antenatal care, prenatal support, Satisfaction*

J Med Assoc Thai 2008; 91 (4): 458-63
Full text. e-Journal: *http://www.medassocthai.org/journal*

All pregnant women worry about the safety of themselves and their babies. Effective antenatal care is necessary to give pregnant women confidence and decrease anxiety, allowing them to maintain their own health and deliver a healthy baby.

Normally, pregnant women have 10 to 15 minutes per visit with a doctor at the antenatal clinic, even in women who receive good antenatal care, or only the totals of a few hours throughout their forty weeks of gestation. This short period of time does not allow the women the opportunity to ask doctors all the questions they want and this may in turn, lead to stress and anxiety.

There are many factors affecting the patient's satisfaction of prenatal care received, including; women's attitudes towards health care professionals, delays in discovering their pregnancy, initial attitudes about being pregnant and perceptions of the importance

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of prenatal care[1]. From many studies, there were several examples of supportive care methods, which are used by obstetricians, to improve the quality of the routine antenatal care given and decrease perinatal morbidity and complications. David J et al[2] assessed changes in the satisfaction levels associated with a flexible choosing time of antenatal care schedules, offered to 609 women at a low obstetric risk. His studies, however, did not find differences between the study and the control group in terms of attitudes to pregnancy and motherhood.

Ann O et al[3] studied 509 women, with a history of giving birth to low-weight babies, who were randomly allocated to receive social support intervention (24-hour contact telephone numbers and a program of home visits). Babies born to the intervention group women had a higher mean birth weight than those born to the control group. The women's attitude to the social support intervention they received was also very positive, 80% of those who filled in the postnatal questionnaire signed out the fact that the midwife listened to them as important.

Robert L et al[4] tested the effect of a program of additional social support, consisting of antenatal home visits and telephone calls by midwives, on the occurrences of preterm births in 1970 pregnant women, with poor obstetric histories, at risk of preterm births. The results of this trial provide little evidence for the effectiveness of social support intervention in the prevention of preterm births in women with poor obstetric histories. Christine R et al's[5] study investigated a new conceptualization of the effectiveness of social support attempts called social support effectiveness. Results revealed that women who perceived themselves to have more effective partner support, reported less anxiety.

There have been some examples of the use of mobile phones for clinical care[6,7] including; help to control blood sugar levels in children with insulin dependent diabetes[8] and helping to improve calcium intake compliance in menopausal women with osteoporosis[9]. Telephone calls have also been used to improve neonatal care of postpartum mothers with social problems[10].

Nowadays, advancements in mobile phone technology have meant that the SMS (Short Message Service) messaging sent via mobile phones has become a very popular service, and is used for a variety of objectives such as communication and advertisement. Downer SR et al[11] evaluated the affect of appointment reminders sent by SMS and found that this type of service significantly improved patient attendance. Other studies found SMS use effective in improving immunization rates[12] and an easy way to allow patients to keep in touch[13].

In the authors' opinion SMS messaging can be applied for use in antenatal care. The SMS messaging can be used to give advice on how to take care of oneself during pregnancy and also prevent and warn of complications. Furthermore, the authors had not specifically studied the use of SMS in antenatal care providing the area of interest for the present study. If the study shows that the use of SMS messages provides better satisfaction levels than routine antenatal care then the authors can adopt its use with the routine antenatal care offered at Siriraj Hospital.

Material and Method

A randomized controlled trial was conducted on pregnant women who received antenatal care and planned to deliver at Siriraj Hospital, Bangkok, Thailand between May 2007 and October 2007. All pregnant women met the inclusion criteria. Age over 18 years old, no medical diseases or obstetrics complications, singleton pregnancy, and dating confirmed by ultrasound, gestational age less than 28 weeks when enrolled in the present study. All participants had their own mobile phone and could receive and understand SMS messages. Pregnant women who aborted before 28 weeks of gestation or changed to deliver at another hospital were excluded from the present study.

Sample size was calculated from a pilot study, in the postpartum ward, which was performed on 20 women who had attended the antenatal clinic and gave birth at Siriraj Hospital. The average satisfaction score of the Siriraj antenatal care was 7.70 out of 10 and standard deviation was 1.3. The difference of satisfaction score between the two groups was considered 1 or more points to gain statistical significance.The present study had a 95% confidence interval, 80% power and type l error was 0.05. Estimated follow up loss was 20 percent. Sample size should be more than 27 women in each group.

The pregnant women that participated were randomly allocated into two random groups using a table of random numbers. The study group received two SMS messages, via mobile phone, per week from the 28 weeks of gestation until delivery. Both groups got the same antenatal and perinatal care. The two SMS messages per week (one way communication) contained information and warnings relating to abnormal symptoms which, if the pregnant woman had, would require

that they consult the doctor. The SMS messages were appropriate to the women's gestational age. SMS messages were sent on Mondays and Thursdays during the daytime to avoid making a disturbance. The examples of SMS messages such as "dyspepsia can occur because of decreased motility of the stomach in pregnant women" was sent at 32 weeks of gestation, "fetal movement count is necessary, if it decreases you should go to the hospital" was sent at 36 weeks of gestation and "after giving birth, breast milk is the best food for your baby and can improve immunity" was sent at 40 weeks of gestation. All participants received phone calls at 32 weeks of gestation. The aims of phone call were to check both groups that they still contacted the Siriraj antenatal clinic and confirmed that the study group could receive and understanded SMS messages.

Satisfaction scores of antenatal and perinatal periods were evaluated by a tested questionnaires using visual analog scale, 1 to 10 points. Participants answered questionnaires themselves at the postpartum ward. Furthermore, the questionnaires also collected the confidence and anxiety scores from the antenatal and perinatal periods. The pregnancy outcomes such as gestational age at birth and fetal birth weight were collected from the obstetric records at the postpartum ward.

Statistical analysis

Analysis was performed with the statistical program SPSS 13.0 for Windows. A Chi-square or Fisher's exact test were used for the differences in the frequencies of events between pregnant women groups. The student t-test was used for comparison of the mean between patient groups. Data were presented as a mean $\pm$ standard deviation. A p-value of < 0.05 was considered to be statistically significant. The present study was approved by the Siriraj ethical committee.

Results

68 pregnant women met the criteria for inclusion into the present study. They were randomly allocated into two groups, the present study and the control group. In the study group 2 women (6.3%), changed to deliver at another hospital. In the control group 2 women (6.9%), changed to deliver at another hospital, 2 women (6.9%) were lost during the follow up and 1 woman (3.4%) had her pregnancy aborted before 28 weeks of gestation. The remaining women numbered 32 in the study group and 29 in the control group.

Maternal characteristics listed in Table 1, show no difference between the study and the control groups. There were no differences in the average maternal age, parity and education. The satisfaction, confidence and anxiety level are shown in Table 2. In summary, the present study found pregnant women who received the additional SMS messages had significantly higher levels of satisfaction in the antenatal and perinatal periods, and higher levels of confidence in the antenatal periods than those who did not receive the messages. The levels of confidence in the perinatal period were also higher in the study group than in the control group but there was no statistical significance ($p = 0.074$).

With respect to anxiety, the present study found that prenatal support via SMS messages decreased the level of anxiety in the antenatal and perinatal periods but only had statistical significance in the antenatal period.

The present study found no difference in pregnancy outcomes between both groups, including; gestational age at birth, infant birth weight, preterm delivery and route of delivery, as shown in Table 3.

Table 1. Characteristics of the 61 healthy pregnant women

	SMS n = 32	No SMS n = 29	p-value
Age	28.72 (4.9)	25.97 (6.1)	0.570
Parity			
Nulliparous	21 (65.6)	14 (48.4)	
Multiparous	11 (34.4)	15 (51.6)	0.267
Education:			
None/primary school	4 (12.5)	9 (31.0)	
Secondary school	18 (56.3)	17 (58.7)	
Bachelors degree	10 (31.2)	3 (10.3)	0.061

Data shown as mean [SD] or number (%)

Table 2. Comparison of satisfaction, confidence and anxiety levels between SMS and no SMS group

	SMS n = 32	No SMS n = 29	p-value
Satisfaction level:			
Antenatal period	9.25 (0.72)	8.00 (1.10)	<0.001*
Perinatal period	9.09 (0.93)	7.90 (2.08)	0.007*
Confidence level:			
Antenatal period	8.91 (0.86)	7.79 (1.45)	0.001*
Perinatal period	8.94 (0.95)	8.38 (1.43)	0.074
Anxiety level:			
Antenatal period	2.78 (2.06)	4.93 (2.89)	0.002*
Perinatal period	4.78 (2.45)	5.79 (2.60)	0.122

Value shown as mean (SD), * Statistically significant

Table 3. Pregnancy outcomes

	SMS n = 32	No SMS n = 29	p-value
Gestational age at delivery (wk)	38.7 (1.1)	38.6 (1.1)	0.34
Fetal birth weight (gm)	3051 (636)	3188 (456)	0.35
Preterm delivery	0 (0)	2 (6.9)	0.22
Route of delivery:			
Normal vaginal delivery	26 (81.3)	24 (82.8)	1.00
Cesarean section	6 (18.7)	5 (17.2)	

Data shown as mean (SD) or number (%)

Discussion

The most important outcome of childbirth is to have a healthy mother and baby. There have been many studies about social support to improve the effectiveness of antenatal care, such as giving pregnant women their own obstetric case notes, 24 hour telephone contact numbers and home visit programs. Most of the studies[3-5] found that a variety of social support can improve attitudes and the satisfaction levels of pregnant women, some can also improve obstetric outcomes[3,4]. Rapid technological development has meant that the mobile phone has become a common part of everyday life and from reviews and studies, as discussed in the introduction, SMS messaging has become a tool for clinical care; reminding patients of appointments and improving immunization rates. Prenatal support in antenatal care by using SMS presumed to effectively improve the quality of the antenatal care.

The present study showed that additional prenatal support through SMS messages via mobile phone could improve the satisfaction levels of pregnant women during both the antenatal and perinatal periods. Since SMS messages will clarify the physiology of maternal changes. Pregnant women felt that they were being well taking care of all the time. They felt supported all the time even though they were not attending the antenatal clinic. Moreover, there were significantly increased confidence and decreased anxiety levels during the antenatal period when compared with the control group.

On the contrary, the present study found no difference in confidence and anxiety levels in the perinatal period. This could be explained by the fact that during labor pregnant women face stress, pain and excitement. Even pregnant women that were very well prepared and educated by SMS in the antenatal period were still apprehensive about their labor outcomes before delivery. Other factors can also affect confidence and anxiety during the perinatal period such as attitudes and pregnancy background from previous labour in multiparous women or experiences of pain. This could also potentially lead to future research to look at means of resolving these problems.

No negative effects from the use of SMS messaging were discovered in the present study. SMS message receivers were not burdened by the calling sound because SMS messages, in the present study, were only sent during the daytime. These were different from SMS messages for advertising purposes as all the pregnant women in the present study chose to participate and had communicated and accepted the methods of the present study before signing consent forms. Moreover, all participants preferred to receive these types of SMS messages during any future pregnancies.

There was also no differences in the pregnancy outcomes between the two groups. Reasons for this could be that the present study was carried out on healthy pregnant women and the groups were too small in number. Most pregnant women, regardless of whether they receive antenatal care, usually have good pregnancy outcomes. Further studies into pregnancy outcomes in larger groups of pregnant women should be done.

However, the aim of the present study was to examine the satisfaction levels of pregnant women with the antenatal care they received. Although higher satisfaction levels in the study group than in the control group didn't mean clinical significance or better pregnancy outcomes but higher satisfaction levels indicated a happier pregnancy. The present study found that high satisfaction, confidence levels and low anxiety levels were created by using SMS for prenatal support. The authors, therefore, recommend the use of SMS messaging via mobile phone, as a new evolution in antenatal care.

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ความพึงพอใจของสตรีตั้งครรภ์ที่ได้รับบริการส่งข้อความผ่านโทรศัพท์มือถือเพื่อช่วยในการดูแลการตั้งครรภ์: วิธีวิจัยแบบสุ่ม ควบคุมกลุ่มตัวอย่าง

รสธรรม จารีธรรม, วิทยา ถิฐาพันธ์, จันทรา เทียนไทย, สมหมาย วิบูลย์ชาติ, ประคอง ชื่นวัฒนา, จิราวรรณ ฉัตรชัยนพคุณ

วัตถุประสงค์: *เพื่อศึกษาเปรียบเทียบความพึงพอใจ ความมั่นใจและความวิตกกังวลระหว่างสตรีตั้งครรภ์ที่ได้รับการดูแลครรภ์ตามปกติร่วมกับการได้รับบริการส่งข้อมูลผ่านโทรศัพท์มือถือกับสตรีตั้งครรภ์ที่ได้รับการดูแลครรภ์ตามปกติเพียงอย่างเดียวในโรงพยาบาลศิริราช โดยมีความพึงพอใจของบริการฝากครรภ์เป็นเป้าหมายหลักของการศึกษาและเปรียบเทียบความมั่นใจ ความวิตกกังวล และผลลัพธ์ของการตั้งครรภ์ร่วมด้วย*

ชนิดของการวิจัย: *การวิจัยแบบสุ่ม ควบคุมกลุ่มตัวอย่าง*

วัสดุและวิธีการ: *สตรีตั้งครรภ์ที่ได้รับการดูแลครรภ์และคลอดในโรงพยาบาลศิริราช ที่เข้าได้กับเกณฑ์การคัดเลือกประชากรระหว่างเดือนพฤษภาคม พ.ศ. 2550 ถึง ตุลาคม พ.ศ. 2550 จะได้รับการสุ่มแบ่งเป็น 2 กลุ่ม คือกลุ่มศึกษาที่ได้รับข้อความผ่านโทรศัพท์มือถือตั้งแต่อายุครรภ์ 28 สัปดาห์ จนกระทั่งคลอด และกลุ่มควบคุมที่จะไม่ได้รับข้อความผ่านโทรศัพท์มือถือ ทั้ง 2 กลุ่ม จะได้รับการดูแลฝากครรภ์ และการดูแลขณะคลอดที่เหมือนกัน ระดับความพึงพอใจ ความมั่นใจ และความวิตกกังวลจะถูกประเมิน โดยใช้แบบสอบถาม เมื่อสตรีตั้งครรภ์พักรักษา ในหอผู้ป่วยหลังคลอด และเก็บข้อมูลการคลอดเพื่อเปรียบเทียบระหว่างทั้ง 2 กลุ่มด้วย*

ผลการศึกษา: *ความพึงพอใจของสตรีตั้งครรภ์ ที่ได้รับบริการส่งข้อความผ่านโทรศัพท์มือถือ เพื่อช่วยในการดูแลครรภ์มีความพึงพอใจสูงกว่าในกลุ่มสตรีตั้งครรภ์ที่ไม่ได้รับข้อความอย่างมีนัยสำคัญ ทางสถิติทั้งในขณะรับบริการฝากครรภ์ (9.25 และ 8.00, p = 0.001) และการดูแลระหว่างคลอด (9.09 และ 7.90, p = 0.007) ในกลุ่มศึกษาที่ได้รับข้อความผ่านโทรศัพท์มือถือยังมีระดับความมั่นใจสูงกว่า (8.91 และ 7.79, p = 0.001) และระดับความวิตกกังวลน้อยกว่าในกลุ่มควบคุม (2.78 และ 4.93, p = 0.002) อย่างไรก็ตามการศึกษานี้ไม่พบความแตกต่างของผลลัพธ์ของการตั้งครรภ์ระหว่างทั้ง 2 กลุ่ม*

สรุป: *การศึกษานี้แสดงให้เห็นว่าสตรีตั้งครรภ์ ที่ได้รับการส่งข้อความผ่านโทรศัพท์มือถือ เพื่อช่วยในการดูแลครรภ์มีระดับความพึงพอใจสูงกว่าในกลุ่มสตรีที่ได้รับการฝากครรภ์ตามปกติ เพียงอย่างเดียวทั้งในขณะฝากครรภ์และขณะคลอด และการศึกษานี้ยังพบว่าในขณะฝากครรภ์ ระดับความมั่นใจของกลุ่มสตรีที่ได้รับข้อความผ่านโทรศัพท์มือถือสูงกว่าและระดับความวิตกกังวลน้อยกว่ากลุ่มที่ไม่ได้รับข้อความอีกด้วย*