Effect of Text Messages Intervention on Pregnancy Healthcare Practices in Pregnancy: A Three Group Non-Randomized Controlled Trial

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ABSTRACT

Objective: The purpose of this study was to investigate the effect of text messaging and group training on health care behaviors of pregnant women.

Methods: A three group non-randomized controlled design was used in this study. The study was conducted with pregnant women who applied to four family health centers in different regions of Istanbul between November 2016 and June 2017. The Health Practices in Pregnancy Scale (HPPS) was used to evaluate the health behaviors of pregnant. In total, 150 pregnant women were included in the study, which contained text messages group, education group, control group. The text message group received 105 messages in total, 4 text messages per week for 6 months. The education group attended three weeks of group sessions held for pregnant women. The control group received routine prenatal care in the family health center.

Results: The health practice of the text message and education group were significantly higher than that of the control group. In addition, the text message group health practice scores significantly increased posttest (p<0.05), whereas the education and control groups health practice scores did not significantly change (p>0.05).

Conclusion: Text messages could be an effective education method for improving the health practices of pregnant women.

Keywords: Education, health practice, health education, pregnancy, text message.

1. INTRODUCTION

Pregnancy, a limited and special period in a woman's life, is an individual experience influenced by sociocultural, behavioral and economic factors (1). During this period, health behaviors such as rest, healthy eating and exercise significantly affect the health of both mother and baby (2).

The main goal of antenatal care services is to eliminate or minimize maternal mortality. However, hundreds of women die due to preventable complications of pregnancy and childbirth each year. Antenatal care includes education, counseling, screening, and treatment to assure the best possible health for mother and fetus (3).

As an important component of antenatal care, particularly for women who are pregnant for the first time, education contributes to better obstetrical outcomes (4). Health education provides an important resource to promote the personalized and integral care of the needs of pregnant women. It allows pregnant women to expose their possible doubts and questions, aiming at reducing uncertainties through an orientation in health, making autonomy possible

(5). There have been many studies conducted that found that educated women have better pregnancy outcomes compared with uneducated women and that education during the antenatal period can reduce pregnancy and delivery complications. Considering the potential outcomes of health education for pregnant women, healthcare professionals must strive to execute and incorporate educational activities to prepare pregnant women for childbirth and the postpartum period (6).

In recent years, the use of mobile health (mHealth) applications that provide easier and lower cost access to healthcare has increased (7). mHealth is defined by the World Health Organization as the "medical and public health applications supported by mobile phones, patient follow-up monitors, electronic organizers or other wireless devices" (8). Mobile health has so far been used in many health promotion applications such as smoking cessation, weight management, healthy nutrition, exercise promotion, diabetes management, and health education (9). Text

messaging is a simple, cost-effective and widely available method that can be used in mobile healthcare applications (10). Due to its characteristic of ubiquity and the possibility of personalization, it is expected to be a powerful tool for patient-centered care.

Mobile health, which is widely used in health improvement applications around the world, has started to be used in antenatal care. Studies have shown that text messages regarding mobile health practices are effective in improving the health knowledge, attitudes and behaviors of pregnant women (11, 12). Mobile health practices provide significant opportunities to support medical and public healthcare practices for pregnant women (9).

There are no studies in Turkey on the education of pregnant women through text messages. Pregnant women receive routine antenatal care in family health centers or benefit from group training in pregnancy education programs in some hospitals. It has been reported that group training is useful for pregnant women, but there are problems involved, such as the limited number of pregnant women who have access to the service, the implementation of applications only in some hospitals, lack of a standard education model, and environmental limitations (13-15). It is feasible then that women can be provided with health information by means of new methods that are easily available and require no limits put on place or time. Text messages constitute one such method.

The purpose of this study was to investigate the effect of text messaging and group training on health care behaviors of pregnant women. Study tested to hypotheses; there will be increase in the health practices of the text message group than education and control group.

2. METHODS

2.1. Design

This study used a pre and posttest quasi-experimental design with two experimental groups and a control group (Figure 1).

2.2. Setting and Participants

This study was conducted at four family health centers in Istanbul, Turkey. Included participants were pregnant who (a) gestational week 1-15, (b) had never received any education on health practice, (c) healthy woman, (d) owned a smart phone. Consent forms were obtained from the pregnant who volunteered to participate. Participants were divided into three groups: text messages group (Experimental 1: TMG), education group (Experimental 2: EG), or Control group: (Con). The sample size was calculated with the Power and Sample Size Calculation Program. A 5% significance level and 90% power (mean difference=13 and standard deviation =12.91) required 66 pregnant women (22 pregnant women in each group) for sampling. However, 150 pregnant women (50 pregnant women in each group) were included in the study considering that there would be losses in the research process.
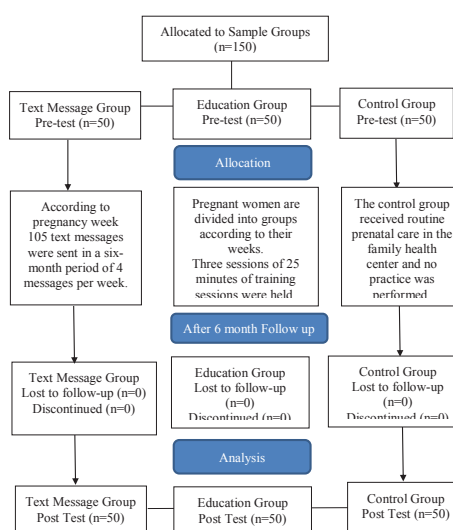

Figure 1. *Flow chart of the study*

2.3. Instruments

Data were collected using a sociodemographic form prepared by the researchers and the Health Practices in Pregnancy Scale (HPPS).

Sociodemographic Form

The sociodemographic form prepared by the researchers was based on existing literature. The form included ten questions determining the socio-demographic/obstetric characteristics of the pregnant women.

Health Practices in Pregnancy Scale

The Health Practices in Pregnancy Scale (HPPS) is a 34-item scale developed by Kelly Lindgreen to evaluate health practices related to pregnancy outcomes during pregnancy; its cronbach alpha coefficient is .81. The scale was adapted into Turkish by Er (2006). In this study, the scale had 33 items and the cronbach alpha coefficient was .74 (16). The scale measures the adequacy of the health practices of pregnant women in six areas; rest and exercise, safety, nutrition, avoidance of harmful substances, health care, and information. There is also an item describing all health practices in pregnancy. The lowest possible score to be obtained from the scale is 33; the highest score is 165. High scores indicate an increase of positive health behaviors.

2.4. Intervention Procedures

2.4.1. Creation of content and obtaining an expert opinion

Education and text messages content were prepared by the researchers using the relevant literature in a specific for each trimester (17-19). For the suitability of the contents of text messages were evaluated by seven obstetric nursing specialists (academics), an education specialist, two public health nursing specialists, and two midwives working in obstetrics clinics. The experts evaluated each text message,

checking for the range of inappropriate to very appropriate expressions (1 to 4 points). A high level of agreement was found between the scores rated by the experts (W= .27, p= .00). The text messages in the content are shown in Table 1.

Table 1. *Text messages and group education topics*

Text Messages Samples			Group Education Topics
Changes in Pregnancy	Drug Use	Smoking/Alcohol	Session 1: First Trimester
During the first 3 months of pregnancy, you may experience psychological ups and downs due to changes in your hormone balance. Do not worry.	Using medication in the first 3 months of pregnancy can harm the baby. Do not use the medication without consulting your doctor, even if it is pain relieving.	When you smoke, your baby is exposed to 7000 chemicals. Do not use alcohol during your pregnancy.	Changes in pregnancy Baby growth and development during pregnancy Oral health Smoking, alcohol, drug use Sexual life Hygiene during pregnancy
Oral Health	Sexual life	Hygiene	
Your gums bleed more often, use a soft brush. Always brush your teeth after each meal and before bedtime.	It is safe for you to continue having sex as long as your doctor allows.	You can make your bathroom as a standing shower or by sitting in the bathtub.	
Baby development	Diet	Exercise	Session 2: Second Trimester
At the end of the 12th week, your baby is approximately 12 cm tall and weighs around 23 grams.	Consume at least 5 servings of fruit and vegetables per day (1 apple = 1 por., 3 tbsp vegetables = 1 por.).	Walking is an easy exercise. Come on, take a 30-minute walk at a light tempo outdoors every day.	Baby growth and development healthy eating habits exercise Living a healthy lifestyle Safe travel during pregnancy Sleep
Safe travel	Sleep	Danger Signs	
If your trip will exceed 2 hours, you can take a break every 2 hours and walk.	Outside of sleeping during the night, take a 1-hour rest during the day	If you have complaints such as bleeding, dizziness, loss of consciousness, multiple vomiting, bad headache, contact your doctor immediately.	
Birth process	Birth Preparation	Breastfeeding	Session 3: Third Trimester
Think of beautiful things in the delivery room, imagine your baby and breastfeeding.	Get your hospital bag ready with a few personal items, such as a toothbrush and toothpaste, lip balm, deodorant, a brush and comb, makeup (if you're planning to use it), and hair ties or a headband	Give your baby your breast every time they get hungry and breastfeed every 2 hours at the latest.	What are the signs of danger in pregnancy Birth process Preparing a birth bag General principles of breastfeeding

2.4.2. Pilot Practice

The clarity of the text messages and training content, set up according to the expert opinions, were tested in ten pregnant women with a pilot application. The final form of the content was created after the pilot implementation.

2.4.3. Inclusion of pregnant women

Those who met the criteria for recruitment from among the pregnant women in the family health centers were identified. The pregnant women were divided into three groups; text messages group (TMG), education group (EG) and control group (CG).

2.5. Educational Intervention

The educational intervention consisted of physiological and psychological changes in pregnancy, what the mother should do, the growth and development of the baby, hygiene and general body care, eating, exercise, sleep, oral health, smoking, alcohol-substance-drug use, travel, sexual life, pregnancy danger signs, birth preparation, and breastfeeding.

The TMG received the education with text messages, a total of 105 text message were sent to the pregnant women at the same time every day (12:00 p.m.), a period of six months, at a rate of 4 messages per week.

The EG received the same education content with text messages gruop in three sessions on different days. Each session lasted about 25 minutes and was in the form of lectures, group discussion, and a question and answer session. The sessions were held at the family health centers taken into the study. The group sessions were attended by 3-4 pregnant women. The trainer was a nurse and PhD student.

The CG received routine prenatal care in the family health center and no intervention was performed.

2.6. Data Collected

Data were collected between November 2016 and June 2017. Participants completed the questionnaires just before study (pre-test) and six months after study (post-test).

2.7. Ethical considerations

Prior to the start of the study, approval was granted by Marmara University Institutional Review Board in Turkey (MIRB-2015-079). Pregnant were informed about all aspects of the study and were assured that there was no disadvantage for non-participation. After pregnant were informed, those who were willing to participate in this study signed a consent form.

2.8. Data Analysis

Data analyses were performed using SPSS version 21.0 (SPSS Inc., Chicago, IL, USA). Descriptive and inferential statistics were used to describe the demographic of participants and their scores on the questionnaire. The chi-square and one-way analysis of variance tests were used to compare the demographic data of the groups in the pre-test. Effect size was calculated using Cohen's d to estimate effect sizes between groups. The dependent sample t-test was used to determine the intra-group differences in each group, and one-way analysis of variance with Duncan post-hoc was used to test for differences in scores among the three groups. All results were evaluated at a 95% confidence interval and a significance level of $p \leq 05$. Normal distribution was evaluated with the Kolmogorov-Smirnov Z test.

3. RESULTS

3.1. Homogeneity test among the three groups' baseline variables

One hundred and fifty pregnant women participated. Participants were between 18 and 42 years (mean: 29.22 ± 4.47). There were no statistically significant differences among the three groups regarding typical characteristics (age, education, income status, before pregnancy, during pregnancy, gestational week number of pregnancy, smoking health education about pregnancy) or the score of health practices (Table 2). Therefore, the three groups were considered homogeneous.

3.2. Mean differences in health practices

There were statistically significant mean differences among the three groups health practices (F=2.88, p=.05) (Table 3). After the intervention, the post-hoc analysis showed that the health practice score was significantly higher for the two experimental groups (TMG and 2) than for the control group. Post hoc analysis of this interaction indicated that the pregnant women in the text messages group had significantly increased health practice scores (t=3.45, p=.01). There was no statistically significant difference between the mean pretest and posttest HPPS scores of the EG (p> .05). There was no statistically significant difference between the mean pretest and posttest HPPS scores of the CG (p> .05) (Table 3).

Table 2. Comparison of sociodemographic characteristics of groups (n=150)

Introductory features		TMG (n=50)		EG (n=50)		Con (n=50)		statistics
Variables		mean±sd		mean±sd		mean±sd		F/p
Age	years	28.32±5.14		29.24±4.54		30.12±3.49		2.04/0.13
BMI before pregnancy	kg/m²	24.22±4.07		23.51±2.84		24.14±3.77		0.59/0.55
BMI during pregnancy	kg/m²	24.70±3.86		25.18±2.80		25.17±3.66		0.30/0.73
		N	%	n	%	n	%	x^2/p
Gestational week	I. Trimester	20	40	14	28	21	42	18.41
	II. Trimester	30	60	36	72	29	58	/.56
Number of pregnancy	First pregnancy	25	50	29	58	32	64	2.01
	Second and over	25	50	21	42	18	36	/.36
Education	Primary school	15	30	9	18	7	14	6.36
	High school	10	20	12	24	18	36	/.17
	University	25	50	29	58	25	50	
Income status	Good	3	6	5	10	1	2	2.83
	Moderate	47	94	45	90	49	98	/.24
Smoking	Smoker	2	4	5	10	0	0	6.15
	Non-smoker	39	78	36	72	38	76	/.18
	Quit smoking	9	18	9	18	12	24	
Health education about pregnancy	Educated	2	4	6	12	5	10	2.19
	Non-educated	48	96	44	88	45	90	/.33

F=one way anova test, x2= kikare test, TMG=text messages group, EG= education group, Con=control group, sd=standard deviation

Table 3. *Differences in health practices among the three group (n=150)*

	[1]TMG (n=50)	[2]EG (n=50)	[3]Con (n=50)	Inter-group comparison mean difference (%95 CI), p		
	mean(SD)	mean(SD)	mean(SD)	1 vs 2	1 vs 3	2 vs 3
Pre-intervention	107.52 (9.14)	111.34 (9.25)	109.48 (10.79)	-3.82 (-8.44 to 0.80), 0.12¥	-2.06 (-6.68 to 2.56), 0.54¥	1.76 (-2.86 to 6.38), 0.64¥
Post-intervention	110.62 (8.39)	113.44 (8.85)	109.14 (9.98)	-2.82 (-1.49 to 7.13); 0.27¥	1.48 (-2.83 to 5.79); 0.69¥	4.30 (-0.01 to 8.61); *0.05¥
Intra-group comparison mean difference (%95 CI), p	-3.10 (-4.90 to – 1.29), *0.01€	-2.10 (-4.33 to 0.13); 0.06€	0.44 (-0.63 to 1.51); 0.41€	Effect size TMG (1), EG(2), Con (3)		
				1 vs 2	1 vs 3	2 vs 3
				0.32	0.16	0.45

HPPS=Health Practice in Pregnancy Scale, TMG=text messages group, EG=education group, Con=control group, sd=standard deviation, €; paired sample t test, ¥; one way Anova, Post-hoc Duncan test (2>3), *$p \leq 0.05$

4. DISCUSSION

This study is the first study conducted in Turkey to evaluate the effect of text messages on the health practices of pregnant women. The results of the study showed that text messages are an effective method to improve the health practices of pregnant women.

At the end of the study, it was found that the health practices of the pregnant women in the education group had not effectively improved. Some studies in the literature suggest that education is not effective in reducing pregnant women's fear of childbirth (25), or in terms of reducing smoking, increasing knowledge about infant care, improving psychosocial health (26), enhancing knowledge about breastfeeding (27). In some other studies, however, the education group was found to be effective in reducing the fear of childbirth (28) and increasing nutritional knowledge (29). The differences are thought to stem from the duration and number of training sessions, the materials used, and the diversity of the working groups.

In previous studies, text messages have been shown to increase the health knowledge of pregnant women (19), to encourage smoking cessation or reduction in pregnant women (20), to encourage breastfeeding (21), and to develop a positive attitude toward vaccination (22). Also, in meta-analysis and systematic review studies, it has been stated that text messages increase the number of prenatal care visits of pregnant women and is an effective tool in pregnancy education (23, 24).

In this study, the content of text messages was made short, simple, and understandable and then evaluated by the experts. It has been reported in studies that families want to receive short and simple messages and do not want to read lengthy messages (30).

To ensure reliability, the information in health messages presented with text messages should be provided by health professionals. It has been reported that health professionals

are the primary source of health information that women will trust the most (31).

At the end of the study, there was a positive increase in the health practices of the text message group, but the education group recorded no difference in their health practices. This result showed that text messages are seen as more advantageous compared to group education methods (traditional education, brochures, posters, etc.) in reaching women during pregnancy, especially in rural areas where access to health services is less. These advantages include lower costs, time saving, and ease of access (32).

4.1. Limitations

The non-randomized design of this study induced a risk of bias due to the unequal distribution of confounding factors between the groups. Against the presence of this bias, however, are the observations that the groups were similar both demographically and in terms of health practices.

The pregnant women included in the study could not be randomized. There were some reasons for this. Firstly, the study was carried out with pregnant women in their first trimester and since, in the Turkish family medicine system, pregnancies are registered as soon as they are detected, each pregnant woman applying to the family health center were eligible for inclusion in the research. Another factor was that registration records change every day and access to these records can only be achieved individually with the permission of the family physician, even if institutional permission has already been granted by the Ministry of Health. Some family physicians did not want to share the records needed for the scope of the study. For this reason, records could only be obtained from family physicians willing to share the records. Finally, there were time limitations in the conduct of the study since the pregnant women who were in their first trimester had to be contacted during that period of time.

5. CONCLUSION

At the end of the study, it was concluded that text messages are effective in delivering cheap, reliable, and accessible information to pregnant women. It may be suggested that the use of text messages, shown to be effective in this study, should be integrated into the provision of maternal and child health services within the scope of primary health care services, and the effectiveness of text messages should be tested in different samples.

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