



# Text Messages Based Interventions for Pregnant Women's Health: Systematic Review

Ayşe Sezer Balci<sup>1</sup> , Hasibe Kadioglu<sup>2</sup> 

<sup>1</sup>Marmara University, Health Science Faculty, Department of Public Health Nursing, Istanbul, Turkey

<sup>2</sup>Marmara University, Health Science Faculty, Department of Public Health Nursing, , Istanbul, Turkey

**Correspondence Author:** Ayşe Sezer Balci

**E-mail:** ayses\_18\_9@hotmail.com

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## ABSTRACT

**Objective:** The aim of this systematic review was to summarize evidence for the effectiveness of text message-based randomized controlled studies for the health of pregnant women.

**Methods:** We searched the following databases from 2005 and 2015, using databases Google Scholar, Pubmed, Ovid, Cochrane Library. The question of this systematic review; what are results of text message-based interventions on the health of pregnant women? Total of 15 articles was received that met the inclusion criteria for the study. After each full article was read, fifteen articles were included in this review.

**Results:** Text message were effective on smoking cessation, weight control, diabetes management, motherhood readiness, developing negative attitudes towards alcohol consumption.

**Conclusion:** This systematic review suggests use of text message is more practical and cost-effective method for promoting the health of pregnant women and they had a positive effect on health practices of pregnant women.

**Keywords:** health applications, mobile health, pregnant women, primary care, text message.

## 1. INTRODUCTION

Use of mobile health applications (mHealth) in developing healthcare and healthy lifestyle behaviors has increased in recent years (1, 2). World Health Organization (WHO) defines mHealth applications as supporting the public health and medical practices through mobile phones, patient follow-up monitors, personal digital assistant, other wireless devices (3). Some of the mobile health applications are formed as a reminder system in the smoking cessation, weight control and disease management and treatment for diabetes (4, 5). Mobile phones have a privileged place among the other mobile applications due to their properties such as being ubiquity, mobility, continuity and multi-media methods (2, 6). Sending a text message (SMS) is the simpler format commonly used among mobile health applications (7, 8). Health-related functions of the text messages include reminding health behaviors, reminding scheduled appointments and medication intake, notification of clinical test results, notification of health status, promotion of positive health behaviors, and increasing self-efficacy by giving information about access to information and sources (9, 10). Promotion of maternal-infant health is one of the fields where the mobile health applications has increased. Pregnant women and mothers can be encouraged by this way for many health behaviors during prenatal and postpartum periods (11,

12). SMS intervention studies on the importance of mobile technology in health promotion and pregnancy complication readiness, pregnant woman viewed the SMS intervention as useful in maternal healthcare services (13). The aim of this systematic review was to summarize evidence for the effectiveness of text message-based randomized controlled studies for the health of pregnant women.

## 2. METHODS

The question of this systematic review was "What are results of short message-based interventions on the health of pregnant women?"

### 2.1. Search Strategy

The systematic review included articles published between 2005 and 2015 and was performed in accordance with the Centre for Reviews and Dissemination 2009 (CRD)'s guideline (14). The question of this systematic review, "What are results of text message-based interventions on the health of pregnant women? We used for data summarizing "Checklist of Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement (PRISMA) which is a valid and reliable guideline (15, 16). We performed searches on:

Google Scholar, Pubmed, Ovid, Cochrane Library databases with the keywords of “pregnancy” and “text message” .

Inclusion criteria for the review included studies focused on the use of text messages with randomized controlled trial interventions for pregnant health.

## 2.2. Critical Appraisal

Quality evaluation of randomized controlled trials was conducted independently by the two authors. The methodological quality of eligible randomized controlled trials was assessed using tool developed by the Cochrane Collaboration (17).

According to our systematic literature review, 15 randomized controlled studies were included in the review. Ten of the articles examined within the scope of this review had low risk in Random Sequence Generation. Eight studies had low risk in Allocation concealment; whereas, 7 had uncertain risk (Figure 1).

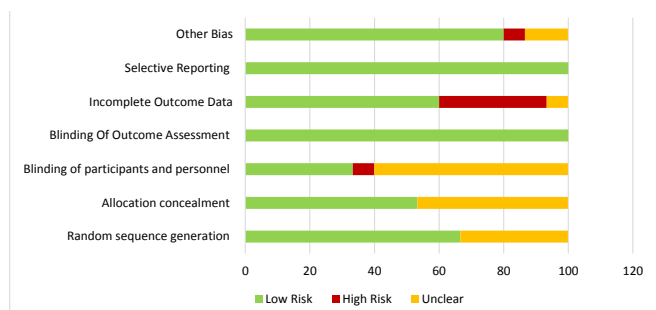


Figure 1. Risk of bias

## 3. RESULTS

After reading each one full article 15 randomized controlled studies were involved in this systematic review study (Figure 2). There were three studies Text4 baby program, three studies having influenza vaccine, two studies smoking reduction and cessation, two studies prevention of gestational diabetes, two studies increasing of health knowledge and awareness

in pregnancy, one studies reducing anxiety in screening tests, one studies prevention of obesity, one studies having HIV test.

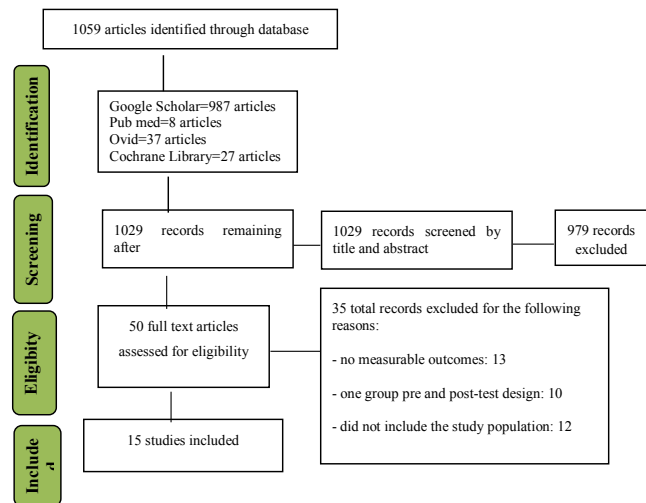


Figure 2. PRISMA Flow diagram for literature search

### 3.1. Effect of Text Messages on Smoking Cessation-Reduction

Result of studies pregnant woman’s self-efficacy, beliefs about its harms and quitting commitment scores increased, frequency of 7 day staying away from smoking of the was found to be increased. The amount of smoking was decreased. Also warning messages about reducing smoking gradually were found more effective (18, 19) (Table 1).

### 3.2. Effect of Text Messages on Influenza vaccine

Vaccination in pregnancy helps to protect newborns both through passive transfer of immunity (20). Result of one studies was determined that text message did not affect the influenza vaccination (21). Jordan et al. (2015) was found that vaccination rate was increased with text messages. Also reminder messages increased the vaccination possibility among pregnant women and mothers who thought to be vaccinated (22).

**Table 1.** Summary of literature review

Research	Sampling	Program Applied	Results
Naughton et al. (2012)	Experimental Group =102 Control Group =105	Text messages were sent two times daily to help the experimental group to quit smoking by themselves for 11 weeks, A general brochure was sent to the control group.	The probability of setting a date to quit smoking ( $p=0.04$ ), self-efficacy ( $p=0.02$ ), beliefs about its harms ( $p=0.05$ ) and quitting commitment ( $p=0.01$ ) scores were found to be higher for the experimental group than the control group.
Pollak et al. (2013)	Support message (group I)= 15 Support Text message+ gradually smoking cessation text messages (group II)=16	5 messages were sent daily for 5 weeks to the group I to choose a date to quit smoking within 2-3 weeks. Warning messages were sent to the group II for 5 weeks to quit smoking completely at the end of the 4 <sup>th</sup> week.	Frequency of 7 day staying away from smoking of the first group (7.5%) was found to be lower than the second group (13.4%). The amount of smoking in the first group ( $12\pm 07$ ) was found to be lower than the second group ( $16\pm 11$ ).
Moniz et al. (2013)	General Care Group=100 General Care+text message group=104	General care group was received general health text messages during pregnancy for 12 weeks, General care+text message group was received text messages about health+ influenza vaccine during pregnancy for 12 weeks.	At the end of the study, no difference was found between the influenza vaccination rate of the general care group (31%) and the influenza vaccination rate (33%) of the general care+ influenza vaccine group ( $p>0.05$ ).
Stockwell et al. (2014)	Experimental Group=576 Control group=577	Test group was received 5 text messages containing information about influenza vaccine and 2 reminder messages for 5 weeks, Control group was received 2 reminder messages.	At the end of the study, the vaccination rate of the experimental group (61.9%) was found to be higher than the control group (49%).
Jordan et al. (2015)	Text message group = 3021 Education group =3820	Encouraging and reminder messages were sent to the one group, specific health education messages were sent to the other group.	It was found that the reminder messages increased the vaccination probability in mothers at the end of the year and pregnant women thinking to have vaccine. Health education not effective plan to have vaccine.
Cheng et al. (2008)	Text messages group = 1360 Control Group = 1422	Screening test results were sent to the group receiving text messages before the appointment, Test results were given to the group not receiving text messages during the appointment. Their anxiety status were evaluated before and 3 days after the appointment.	Anxiety level of text messages group was found to be lower before the appointment ( $33.8\pm 7.9$ ) than those ( $39.1\pm 10.1$ ) who did not ( $p=0.02$ ).
Evans et al. (2012)	Intervention group= 48 Control group=38	Text messages about healthy lifestyle behaviors were sent to the intervention group during the pregnancy. Any application was not performed on control group. Pregnant women were evaluated again 2-3 months after the intervention.	The statement "I am ready to be a mother" for the pregnant women receiving Text4 baby sms contents increased compared to the beginning and follow-up ( $p=0.04$ ). A positive development was determined in their attitudes towards alcohol consumption ( $p=0.02$ ). No change occurred in the control group ( $p>0.05$ ).
Evans et al. (2014)	Intervention group =229 Control group=230	text message about healthy lifestyle behaviors during the pregnancy were weekly sent to intervention group for 4 weeks according to their gestational week, No application was applied to the control group.	Beliefs of the pregnant women receiving vitamin intake during pregnancy increased (OR 1.91, 95% $p=0.02$ ). Additionally, their beliefs towards the importance of prenatal care ( $p=0.04$ ) and the harms of alcohol consumption ( $p=0.05$ ) were found to increase.
Evans et al. (2015)	Intervention group= 230 Control group=220	Women in the intervention group were followed up 3 times (after 4 weeks, in 28 <sup>th</sup> week and right after the birth) and they received weekly 3 text messages according to their gestational weeks. No intervention was applied to the control group.	At the end of the study, text messages were found to affect postpartum alcohol consumption of women in the intervention group ( $p=0.04$ ).
Lau et al. (2014)	Intervention group =102 Control group =104	Starting to send 3-4 messages in a week to the women in the intervention group about increasing their health knowledge in pregnancy. No intervention was applied to the control group.	No significant difference was found between the pregnancy health knowledge scores of intervention and control groups ( $p>0.05$ ).
Lund (2014) et al.	Intervention group = 1311 Control group = 1239	Weekly text messages about the subjects like the changes in the pregnancy in the intervention group. No intervention was applied to the control group.	Mortality rate of the intervention group (19 %) was lower than the control group (36 %) at the end of the study. In addition, the intervention was found to be associated with a significant reduction in perinatal mortality rate (OR0.50, CI:0.27-0.93, confidence interval of 95).

<b>Soltani (2015) et al.</b>	Intervention group = 14 Control group = 15	Daily messages encouraging healthy diet and physical activities were sent to the women from the intervention group. No intervention was applied to the control group.	Mean weight gain of women in the intervention group during the pregnancy (6.65 kg) was found to be lower than the control group (9.74 kg).
<b>Odeny (2014) et al.</b>	Intervention group = 195 Control group = 193	8 text messages during the pregnancy period and 8 text messages during the postpartum period were sent to the women in the intervention group. No intervention was applied to the control group.	As a result of the study, 19.6% of women in the intervention group and 11.8% of women in the control group applied to clinic during the postpartum period.
<b>Van Ryswyk et al. (2015)</b>	Intervention group = 140 Control group = 136	Messages were sent to women in the intervention group for reminding to have OGTT test in postpartum 6 <sup>th</sup> week and 3 <sup>rd</sup> and 6 <sup>th</sup> months; reminder message was sent to women in control group in postpartum 6 <sup>th</sup> month.	OGTT participation of the intervention group (77.6%) were found not to increase in postpartum 6 <sup>th</sup> month compared to the control group (76.8%) at the end of the study.
<b>Perez Ferre (2010) et al.</b>	Intervention group = 48 Control group = 49	Glucometers and mobile phones were given to the women in the intervention group. No intervention was applied to the control group.	At the end of the study, clinical visit of the experimental group reduced at the rate of 2%. While the average clinic visit number was 4.25 in the experimental group, it was 9.11 in the control group.

### 3.3. Effect on Reducing Anxiety

Pregnancy is one of the most important periods in a woman's life; not only in physical directions, but also in a number of social and psychological changes. Table 1 shows studies on the effect of text messages on reducing anxiety. Study subjects included come clinic for prenatal screen test. Result of one studies was determined text messages not effective for reducing anxiety (23).

### 3.4. Effect on The Text4 Baby Program

Result of studies text4 baby program increased pregnant women state ready to be a mother, developed negative attitudes towards alcohol consumption (24). Also text4 baby program increased pregnant women beliefs about taking vitamin during pregnancy, the importance of prenatal care, and the harms of alcohol consumption increased (24, 25) (Table 1).

### 3.5. Effect on Text Messages Antenatal Health Knowledge and Awareness

Adequate antenatal care is important to both the health of a pregnant woman and her unborn baby. Result of this study text messages found to be not effective for antenatal health knowledge and awareness (26, 27) (Table 1).

### 3.6. Effect on Text Messages Reducing Obesity

Mother obesity and excessive gestational weight gain (GWG) negatively affect pregnancy and delivery outcomes. Result of this study text messages found to be effective for weight gain during pregnancy (28) (Table 1).

### 3.7. Effect on Text Messages Having HIV Test

Mobile health (mHealth) interventions have been shown to improve adherence to HIV test among adults and improve

health service usage (29). The result of this review text messages found to be increased having HIV test pregnant woman (30) (Table 1).

### 3.8. Effect on Text Messages Diabetes Management

Gestational diabetes mellitus is defined as new onset or recognition of glucose intolerance in pregnancy (31). The result of this review text messages found to reduced clinical visits diabetic pregnant woman (32) (Table 1).

## 4. DISCUSSION

Our results suggest that text messages interventions that appear to have positive effects on pregnant women's health. For example that text messages were found to have positive effects on on smoking cessation and reduction of pregnant women (33-35).

It was found that only sending short text messages to pregnant women was not effective in influenza vaccination (17), but in addition to short messages, the use of reminder messages was found to be effective (21, 36).

Result of this review text4 baby program increased pregnant women's motherhood readiness, negative attitudes against alcohol usage, beliefs about vitamin intake during pregnancy (23, 24).

Result of this review found that text messages are effective in antenatal health knowledge and awareness, increasing nutrition knowledge and creating behavioral changes in the fight against obesity among the individuals (27, 28, 37, 38).

Text messages are suitable and useful in the self-management of diabetes (39). One of studies on the use of text message in diabetes management in pregnancy, reminder messages for Oral Glucose Tolerance Test (OGTT) were determined not to be effective in pregnant women, but decreased the clinic visit rates (40).

Our results show that some of the positive effects of text message interventions on pregnant women's health, however text message not effective for reducing anxiety. Although there is suggestive evidence of benefit in pregnant health, more research is needed to identify the other areas effect on pregnant health.

The limitation of our review is that we excluded all studies that did not report RCT results, another limitation of the review process may lead to a restriction (English).

## 5. CONCLUSION

Our review including the 15 studies results of RCTs of interventions that text messages interventions for pregnant women. This systematic review suggests use of text message is more practical and cost-effective method for promoting the health of pregnant women and they had a positive effect on health practices of pregnant women.

**Conflicts of Interest:** Authors declare that there is no conflict of interest.

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