

Effect of "Motivational Interviewing" and "Information, Motivation and Behavioral Skills" on Choosing Mode of Delivery in Pregnant Women: A Randomized Controlled Trial

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Abstract

Background: Cesarean section is an important surgical procedure to save mothers and/or babies' lives. Current trends show that the rate of Cesarean section is increasing dramatically over the years. The aims of this study were to compare the effects of "motivational interviewing" and "information, motivation and behavioral skills" model on choosing mode of delivery among pregnant women.

Methods: In a four-armed, parallel-design randomized controlled trial, 120 women were randomly assigned to three brief interventions and one control groups. We recruited pregnant women referring to Ebnesina hospital, Tehran- Iran from 2019-2020. The intervention groups included: 1) motivational interviewing; 2) face-to-face information, motivation and behavioural skills model; and 3) information, motivation and behavioural skills model provided using a mobile application. The inclusion criteria were being literate, gestational age 24 to 32 weeks, being able to speak Persian, having no complications in the current pregnancy, having no indications for CS, and having enough time to participate in the study. The most important outcomes of the study included women's intentions to undergo any mode of delivery, women's self-efficacy in choosing the mode of delivery, and mode of delivery. Data were analyzed using descriptive statistics (mean, frequency and standard deviation), inferential statistics including independent *t*-test, paired *t*-test, Chi-squared and One-way ANOVA tests and logistic regression.

Results: Following the interventions, significant differences were found in the mode of delivery ($P < 0.05$) and women's self-efficacy and intention ($P < 0.05$). Women who had used the mobile application had more improvements in the self-efficacy and intention than the face-to-face intervention groups.

Conclusions: Our study showed positive significant effects of various types of brief interventions to reduce unnecessary Cesarean section rate among the participant women. Providing the intervention using mobile application showed even better results. Our findings may contribute to a rise in normal vaginal delivery; and these simple, non-expensive, tailored to women, and culture-oriented brief interventions can be considered as appropriate strategies to reduce Cesarean section rate in local, national, and/or regional levels.

Trial registration: This study has been registered in Iran Randomized Clinical Trial Center (IRCT20151208025431N7). Registered October 07, 2018.

Plain English Summary

There is a dramatic increase in the rate of Caesarean section in Iran. Several interventions have been implemented to reduce the rate of unnecessary Caesarean section in Iran during last years; however the rate still remains high. In this study, we have conducted a randomized controlled trial with four groups to compare the effects of two models including "motivational interviewing" and "information, motivation and behavioural skills" (face-to-face and via mobile application) on choosing the mode of delivery in 120 pregnant women. These brief psycho-education interventions were conducted during limited sessions in 24 to 32 gestation weeks for pregnant women. Our findings showed that these brief psycho-education interventions could motivate women to improve their self-efficacy and intention to choose right mode of delivery. Moreover, it was shown that providing the psycho-education through a mobile phone was more effective than the other two interventions. Delivering these simple, non-expensive, brief educations to pregnant women may reduce the rate of unnecessary Cesarean sections.

Introduction

Cesarean Section (CS) is an important surgical procedure to save women's and/or babies' lives (1). According to WHO, the ideal rate for CS has been considered to be between 10% and 15% (2). Iran and Turkey (47.9% and 47.5%, respectively) have the highest rates of the CS in Asia (3). Other countries with the highest CS rates are Brazil (55.6%) and Dominican Republic (56.4%) in Latin America and the Caribbean (3). In Iran, the rate is even higher in private hospitals (72-89%) (4-7); and most of the cases have no medical indications in many settings (8).

CS can be life-saving when medically indicated; however, this procedure can also lead to short- and long-term risks for mother and infant (9, 10). Studies has identified that unnecessary CSs can create several complications with no benefits to both mother and baby (3, 11-14). CS can be associated with significant short-term risks such as asphyxia, if the uterus is hypo perfused due to anesthesia, uterine rupture, abnormal placentation, ectopic pregnancy, scalpel lacerations, and neonatal respiratory morbidities (11). A study showed that babies born by CS has different hormonal, physical, bacterial, and medical exposures, and that these exposures can subtly alter neonatal physiology (10). Other short-term risks of CS include altered immune development, an increased likelihood of allergy, atopy, and asthma, and reduced intestinal gut microbiome diversity, increased risk of infection and lower likelihood of breast-feeding (10, 12, 13, 15). Moreover, urinary catheterization is associated with post CS bacteriuria and has been reported to be as high as 11% (16). Increasing rates of CS is associated to increased maternal and perinatal morbidities (17). According to an observational study conducted by WHO in nine Asian countries, women who underwent unplanned CS before or during labor or had assisted (operative) vaginal delivery were more likely to experience morbidity than those who had spontaneous vaginal delivery (18).

Previous studies have showed a list of probable reasons for high rate of CS including several economic, organizational, social and cultural issues (19, 20). The underlying factors of continuing high rates of CS have been studied in a mixed method review in Iran (21). This review reported that preferences for CS were often associated with all 'women's factors', 'health professional factors', and 'health organization, facility, or system factors'(21). The review showed that most of the women had fear of pain during labor and childbirth (22-24), had concerns about genital modifications after vaginal delivery(22, 24-26), believed that CS was safer for baby(27-30), and believed that CS was convenient for women and their families (29). Other studies show that women can play a major role in decision-making process about their birth (24, 31, 32).

In view of this unprecedented rise of CS in Iran, different interventions have been designed to reduce this trend (33-36). In Iran, many efforts have been made during last years to reduce CS rate. For instance, in 2014, Iran has been conducted a "health sector evolution policy" to improve public health; and increasing

the rate of normal vaginal delivery (NVD) was one the most important objectives of this policy (37). Several strategies have been conducted through this policy such as freeing NVDs in all public hospitals, developing mother-friendly hospitals, developing standard protocols of birth and preparation classes for women, improving privacy and infrastructure of labor, promoting standards in birth facilities, promoting water birth, determining financial incentives to doctors to encourage them to do NVDs in public hospitals (38). There was a reduction in CS rate after implementing the policy; however the rate is still significantly higher than the rate recommended by WHO (38).

The WHO recommended that non-clinical interventions can be effective to reduce unnecessary CSs. The recommendations are grouped according to the target of intervention: (a) interventions targeted at women, (b) interventions targeted at health-care professionals; and (c) interventions targeted at health organizations, facilities or systems (39). According to this guideline, an important target for interventions is women. Previous experiences also makes it explicit that, in order to further reduce the rate of CS, it is necessary not only to address health system, health facility, and health professional factors, but also change women's choice behaviors (38).

Implementing psycho-education interventions for women has been recommended by WHO in order to reduce unnecessary CS (40, 41). A Cochrane systematic review conducted by Chen et al (2018) on non-clinical interventions for reducing unnecessary CS reported that psycho-education interventions were effective in reducing unnecessary CSs (42). The educational interventions included psycho-education on fear of childbirth (43), intensive group therapy (cognitive behavioral therapy and childbirth psycho-therapy) (44), psycho-education by telephone (45), role-play education versus standard education using lectures (46), and nurse-led applied relaxation training program (43).

Motivational interviewing (MI) is a patient-centered counseling approach that has been proved to be influential in choosing suitable health behaviors (47); and is specifically aimed to improve motivation to change among individuals not ready to change unhealthy behavior (48). Research on MI has demonstrated positive effects of helping patients clarify goals, explore obstacles to treatment, and make commitments to change (48). MI is a relatively new cognitive-behavioral technique that aims to elevate internal motivation to identify and change behaviors that may be placing them at risk of developing health problems or may be preventing optimal management of a chronic condition.

In Information-Motivation-Behavioural skills (IMB) model, individuals should be informed, motivated and behaviorally skilled to change behaviour (49). The IMB model is a generalizable, and simple model to guide thinking about complex health behaviours. The IMB constructs, and how they pertain to patient adherence, are outlined as follows: 1) Information is the basic knowledge about a medical condition that might include how the disease develops, its expected course and effective strategies for its management; 2) Motivation encompasses personal attitudes towards the adherence behaviour, perceived social support for such behaviour, and the patients' subjective norm or perception of how others with this medical condition might behave; and 3) Behavioural skills include ensuring that the patient has the specific behavioural tools or strategies necessary to perform the adherence behaviour such as enlisting social support and other self-regulation strategies. The IMB model has been widely used in changing behavior for health problems (50-53).

In the modern age of information and communication, mobile applications play an important role in delivering educational contents nowadays. Educational interventions should be delivered at any time to anyone with extra support upon to request wherever and whenever it is needed (54); and mobile applications can easily make this access to people. This route provides simple, user friendly, downloadable, and non-expensive interventions to various ranges of individuals. Motivational messages, monitoring, and behaviour change tools can be modified for delivery via mobile phones (55). This type of interventions have been reported to be effective in several behavior change studies including smoking cessation (56), adherence to prescribed medication (57), blood pressure management; and delivering interventions(58) .

The aim of this study was to compare the effect of "motivational interviewing" and "information, motivation and behavioral skills" with face-to-face and mobile application in brief psychological interventions on women's self-efficacy, intention to choose mode of delivery, and the mode of delivery among pregnant women.

Methods

In this four-armed randomized controlled, parallel-design trial, we recruited 120 pregnant women referring to Ebnesina hospital, Tehran- Iran from 2019-2020. The inclusion criteria were being literate, being in gestational age 24 to 32 weeks, being able to speak Persian, having no complications in current pregnancy, having no indications for CS, and having enough time to participate in the study. We excluded women who showed complications during the study, had preterm labour, and were reluctant to continue to participate in this study. The sample size was calculated to be 120 pregnant women (30 women in each group) with a power of 80% to detect a minimum difference. Pregnant women were chosen from a private hospital located in Tehran. We had three intervention and one control groups. The study was approved by the Ethics committee of Tehran University of Medical Sciences (Ethics code: IR.TUMS.SPH.REC-1397-130). The study protocol has been published previously (59). Written informed consents were obtained from all participants prior to enrolment. Due to the nature of the intervention, there were no adverse event and no harms in this study. Based on our knowledge, the study did not have any negative consequences.

Randomization and masking

The participants were randomly assigned to four groups after the initial assessment and upon completing the baseline data form. We recruited the participants based on registration order of women with clinic, and no other factor contributed to the participants' order on the list. Each participant on the list assigned a consecutive research identification number according to the order by which they were registered with the clinic. The first participant on the list was randomly assigned to the MI intervention group, and the next two participants were assigned to the IMB and IMB app-based interventions, respectively. The forth group of participants was assigned to the control group. To avoid bias in the outcome assessment, research assistants concerned with data collection and/or preparation were blind to the allocation of the participants.

Interventions

Educational contents were developed using findings of a qualitative evidence synthesis and a quantitative systematic review and meta-analysis (21) and a qualitative study conducted in Iran (37). We designed the interventions tailored to the participants' time and prenatal care appointments.

1. Motivational interviewing

In this intervention group, pregnant women were interviewed face-to-face during three 45-60 minutes sessions. MI techniques were provided to the participants. MI is a directive, client-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence. It is most centrally defined not by technique but by its spirit as a facilitative style for interpersonal relationship. MI is a relatively simple, transparent and supportive talk therapy based on the principles of cognitive-behavior therapy. In this intervention group, we helped women to explore and resolve ambivalence about mode of delivery and build their intrinsic motivation. We did not force women to choose a specific mode of delivery. We asked open-ended questions (for example "Tell me what you think about CS?" or "What do encourage you to choose this type of delivery (CS or NVD)?"). Open-ended questions could help us to understand how they were thinking about mode of delivery. Affirming is one of the fundamental MI skills. We used it to support engagement, encourage the women to further explore change processes and build confidence. We found an opinion the client was making or a strength she noticed and reflected it back to her (for example "So how did you manage to control your fear after attending our training sessions?"). We used reflective listening. It is a simple method to reduce resistance in MI and the last step of this technique is to summarize what the pregnant women have said.

2. Information, motivation and behavioral skill model through face-to-face approach

The model's strategies were presented to the pregnant women, in three 45-60 minutes sessions. Women have received information and behavioral skills related to the choice of mode of delivery as well as internal and external motivational factors related to the choice of delivery. The strategy included: 1) Information: the intervention began with information on prevalence of CS and CS-related complications in women; and outcome of unnecessary CS; 2) Motivation: the interventionist performed this technique to motivate pregnant women; providing personal feedback, asking open ended questions, affirming desirable behavior, reflective listening, working at the women's pace and negotiating goals that was realistic and attainable; 3) Behavioral skills: women were given behavioural skills training on how to control the obstacle of NVD. To build skills for choosing the mode of delivery, training was given on how reduce these barriers.

3. Information, motivation and behavioral skill model through Mobile App

The mobile application (M-health) had designed based on IMB model (flowchart 1 and appendix 1-9). The software was installed on mobile phones of participants in this group; and its operation was taught individually to them. Women worked with the application in presence of one of the researchers, and any existing problems were resolved. The strategies foreseen for adherence improvement included reminders set at defined intervals in the form of pop-up messages. In order to monitor adherence, the data collected on the server were used. In addition to the application, a server was designed in which the users' activities were collected. Items such as the duration of application usage, the sections were used by the user (in addition to registering their time and duration) (appendix10), etc. was registered. Every time the user's mobile was connected to the Internet, the data was uploaded and saved on to the server. These data could be used as a proxy of adherence to the intervention. There was no intervention in the control group.

Table 1:
Interventions by four study groups

Training session	App group based on IMB	IMB face-to-face group	MI face-to-face group	Control group
First session	Same as IMB face-to-face group	Information: introducing and explaining the program of norms and standards of the group, asking questions to start the discussion about CS and NVD, rate of CS, prevalence of CS, risk factors for CS, consequences of unnecessary CS, NVD	Familiarization: Introduction, norms and group process, facilitating philosophy, practice of freedom, practice of dimensions of effect of behavior, practice of change of assessment change. Emotions: Identifying emotions, exercising and completing practice dimensions of influence with emotional dimensions and homework	None
Second session	Same as face-to-face IMB group	Motivation: asking open ended questions about unnecessary CS, providing personal feedback, reasons for needing to change current behavior, feedback and affirmation, affirming desirable behavior, reflective listening, working at the women's pace and negotiating goals that was realistic and attainable and empowerment to change behavior, summarizing, discussing.	Pros and cons of the CS and NVD: brainstorming of short-term and long-term pros and cons of the CS, completing table of the pros and cons of the CS and NVD, describe and practice about the NVD	None
Final session	Same as IMB face-to-face group	Behavioral Skills: how they should cope with NVD, and how they can control themselves problem with NVD and conclusion	Values, Perspective and Final Assessment: Defining values (what is the important thing for women?), identification and prioritization of first class values, adaptation of value and mode of delivery, summarizing and summarizing practice of previous sessions in perspective practice training be prepared to start a behavior change program (decision about NVD)	None

Measures

The questionnaires contained the women's demographic information, self-efficacy to choose mode of delivery, and intention behavior. The validity and reliability of the questionnaires have been examined and verified (60, 61). The demographic section included items on age, income, educational level (pregnant women and their partners), employment status (pregnant women and their partners), number of births, number of pregnancies, current gestational age, number of live children, history of infertility, history of illness, occupation, date of birth, participating in birth classes, and preferred mode of delivery. The questionnaire also consisted of 17 items about self-efficacy and two items about intention to choose mode of delivery. The Cronbach's coefficient alpha was calculated to test the reliability; and exploratory factor analysis was conducted to examine construct validity of the Persian version of the questionnaires.

Follow-up: We followed the participants until time of delivery to determine final mode of delivery. The pregnant women were participated in this study after ensuring that they had study criteria. They completed informed consent forms. In the first visit, the baseline data questionnaire was completed by the researcher. During the second visit, the application was installed on cell phones of the IMB app-based group and its operation was taught to them.

Statistical methods: Data were analyzed using SPSS 16 using descriptive statistics (mean, frequency and standard deviation), inferential statistics including independent *t*-test, paired *t*-test, Chi-squared and One-way ANOVA tests and logistic regression modeling to examine the factors affecting the women's choice on mode of delivery in order to examine the simultaneous effect of variables on the chances of choosing CS. The significance level of the tests was less than 0.05.

Role of the funding source: The roles of the funders were to monitor the corresponding research planning and progression.

Results

Demographic characteristics of the participants are shown in Table 1. Most of the participants (57.5%) were 18-30 years old. Most of the women (57.5%) were nulliparous and were employed (70.0%). Our findings showed that there were no significant differences between the groups at baseline measurement in terms of age, educational level of pregnant women and their partners, income, occupation of pregnant woman, and source of information about mode of delivery.

Table 1:
Demographic characteristics of the pregnant women in four groups

Demographic information		Mobile Application		IMB ¹		MI ²		Control Group		Total		χ ²
		N	%	N	%	N	%	N	%	N	%	P-value
Women's age	18-30 years	13	43.3	16	53.3	18	60.0	10	33.3	56	57.5	0.178
	> 30years	17	56.7	14	46.7	12	40	20	66.7	63	52.5	
Parity	Nulliparous	21	70.0	20	66.7	14	46.7	14	46.7	69	57.5	0.242
	Multiparous	9	30.0	10	33.3	16	53.3	16	53.3	51	42.5	
Number of previous deliveries	1	22	73.3	23	76.7	14	46.7	15	50.0	74	61.7	0.106
	2	5	16.7	6	20.0	10	33.3	11	36.7	32	26.7	
	2<	3	10.0	1	3.3	6	20.0	4	13.3	14	11.7	
Number of children	0	24	80.0	18	60.0	12	40.0	16	53.3	70	57.3	0.086
	1	4	13.3	9	30.0	12	40.0	11	36.7	36	30.0	
	1<	2	6.70	3	10.0	6	20.0	3	10.0	14	11.7	
Ethnicity	Azari	21	40.0	11	36.7	12	40.0	11	36.7	46	38.3	0.267
	Fars	7	46.7	13	43.3	5	16.7	10	33.3	42	35.0	
	Kord	2	10.0	4	13.3	7	23.3	5	16.7	19	15.8	
	Others	1	3.3	2	6.7	6	20.0	4	13.3	13	10.8	
Income per month	<50 million Rial	17	56.7	19	63.3	20	66.7	19	63.3	75	62.5	0.879
	50-100 million Rial	13	43.3	11	36.7	10	33.3	11	36.7	45	37.5	
Women's education level	<12 years	1	3.3	2	6.7	5	16.7	2	6.7	10	8.3	0.095
	High school diploma	8	26.7	1	3.3	7	23.3	6	20.0	22	18.3	
	college or university	21	70.0	27	90.0	18	60.0	22	73.3	88	73.3	
Spouse's education level	<12 year	3	10.3	2	6.7	6	20.0	2	6.7	13	10.8	0.370
	High school diploma	6	20.7	4	13.3	7	23.3	9	30.0	27	22.5	
	College or university	20	69.0	24	80.0	17	56.7	19	63.3	80	66.7	
Women's job status	Employed	20	66.7	21	70.0	19	63.3	24	80.0	84	70.0	0.528
	Housewife	10	33.3	9	30.0	11	36.7	6	20.0	36	30.0	
Prenatal education	No education	21	70.0	17	56.7	20	66.7	16	53.3	74	61.7	0.760
	Yes	9	30.0	13	43.4	10	33.3	14	46.6	46	38.4	
Preferred method of receiving education	By phone	10	33.3	5	16.7	7	23.3	7	23.3	29	24.2	0.520
	Face-to-face	4	13.3	3	10.0	4	13.3	6	20.0	17	14.2	
	Film	8	26.7	7	23.3	5	16.7	2	6.7	22	18.3	
	Book	3	10	2	6.7	4	13.3	4	13.3	13	10.8	
	Group classes	5	16.7	13	43.3	10	33.3	11	36.7	39	32.5	

¹Information, motivational and behavioral skills model; ²Motivational interviewing

Mean scores of self-efficacy and intention are shown in Table 2. The results of the paired samples *t*-test showed that there was a significant increase in the self-efficacy and intention scores of the pregnant women in all intervention groups after the interventions. Findings showed that the psycho-education interventions had significant effect on the mean score of preferred mode of delivery among pregnant women in all intervention groups.

Table 2:
Comparison of the mean scores of before and after the psycho-education interventions according to the study groups

Variables	Mobile application group		p-value	IMB group		p-value	MI group		p-value	Control group	
	Before	After		Before	After		Before	After		Before	After
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD
Self-efficacy	77.17±38.67	99.77±30.71	< 0.001	86.87±24.54	103.23±24.94	< 0.001	66.10±18.25	80.50±22.71	< 0.001	81.77±40.82	84.17±40.82
Intention	1.10±0.305	1.70±0.466	0.000	1.33±0.479	1.73±0.450	0.000	1.17±0.379	1.57±0.504	0.000	1.30±0.466	1.20±0.466

Mean values were significantly different from those before the intervention (paired-samples t-tests): *P<0.05.

Based on the paired-comparison t-test results, the mean self-efficacy score of pregnant women in the mobile application group was 77.1±38.6 before the intervention and 99.7±30.7 after the intervention. In the IMB group, mean self-efficacy was 86.8±24.5 before and 103.2±24.9 after the intervention; and in the MI group, it was 66.1±18.2 before and 80.5±22.7 after the intervention. Therefore, significant differences were observed between the four groups (p.value < 0.001) after the intervention. There were no significant differences before and after the intervention in control group (p.value < 0.47). Women's self-efficacy had been increased more in the APP group than the IMB and MI groups.

An independent-samples t-test was conducted to compare self-efficacy in CS and NVD delivery before and after the interventions. There was a significant difference in the scores for CS (66.30±04.71) and NVD (89.04±34.28) delivery; t=2.978, p=0.004 before and a significant difference in the scores for CS (86.41±30.62) and NVD (101.09±27.53) delivery; t=2.637, p=0.009 after the intervention. These results suggested that self-efficacy really did have an effect on mode of delivery choice (Table 3).

Table 3:
Comparison of self-efficacy in women undergone CS or NVD

Mode of delivery	Self-efficacy	Before intervention	After intervention
		Mean ±SD	Mean ±SD
NVD		89.04±34.28	101.09±27.53
CS		66.30±04.71	86.41±30.62
Result		t =2.978, p=0.004	t=2.637, p=0.009

Mean values were significantly different from those before the intervention (independent sample t-tests): *P<0.05

The number of women undergone CS decreased in the intervention groups after the interventions (P-value=0.001); and women in the app group, underwent more NVDs than the other intervention groups (Table 4).

Table 4:
Frequency and percent of NVD and CS in each group before and after the interventions

Variables	App group				IMB group				MI group				Control group			
	Before		After		Before		After		Before		After		Before		After	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
NVD	3	10.0	21	70.0	10	33.3	22	73.3	5	16.7	17	56.7	9	30.0	8	26.7
CS	27	90.0	9	30.0	20	66.7	8	26.7	25	83.3	13	43.3	21	70.0	22	73.3
p-value	P-value(Before)=0.100				t=6.260				P-value(After)=0.001				t= 16.561			

Table 5 compares the preferred mode of delivery by women and the performed delivery mode. Although 56.7% women preferred NVD, only 37.5% of them underwent NVD and 62.5% underwent CS.

Table 5:
Comparison between preferred mode of delivery by women and performed delivery mode

Variable	Preferred mode of delivery by women		Performed delivery mode	
	N	%	N	%
NVD	68	56.7	45	37.5
CS	52	43.3	75	62.5

Among women who underwent CS, 53.3% indicated that there were medical indications reported by their doctors to undergo CS. About one third of women (29.3%) reported that CS was their own choice; and 17.3% stated that they underwent CS due to their doctors' advice.

Table 6 shows the assessment of usability of mobile application by the pregnant women. Based on the women's assessment, most of the women have been assessed this app as useful (appendix 3).

Table 6:
Assessment of the usability of mobile application by the participants

Ranking	N=30	%	Minimum score	Maximum score
17-40(weak)	1	3.3	32	85
41-60(Moderate)	6	20.0	54	85
61-85(good)	23	76.6	82	85

Discussion

The purpose of this study was to examine the effect of "motivational interviewing" and "information, motivation and behavioral skills" on choosing mode of delivery in pregnant women. Findings indicated that these psycho-education interventions had positive effects on decreasing CS rates in pregnant women. Our study also showed that the interventions based on psych-education contributed to improvements in women's self-efficacy towards choosing mode of delivery and their intention. Psycho-education interventions have been recommended as useful approaches to decrease the increasing trend of CS (39). Due to the situation of our target group and probable issues with long-term interventions, we used brief interventions that were tailored with their prenatal care clinic appointments.

The effectiveness of brief interventions has been approved by several studies (62, 63). A Cochrane systematic review conducted by Chen et al (42) in China on non-clinical interventions to reduce unnecessary CS showed that psych-education interventions were effective in reducing unnecessary CS. Our study has also shown that the psycho-education interventions based on IMB and MI were effective in reducing the rate of CS.

According to the results of this study, self-efficacy and intention of pregnant women improved after the interventions. Self-efficacy can help women and improve their ability to cope with labor and women who have high self-efficacy could cope with labor pain during childbirth much better than the others. Our study showed that women with higher self-efficacy, chose more NVDs that is consistent with the results of Dilks et al (64) and Taheri et al (65). Taheri et al reported that implementing a curriculum-based strategy to increase self-efficacy in pregnant women was effective in encouraging women to choose NVD (65). Thus, it seems that improvements in self-efficacy could empower women to choose proper mode of delivery.

Our study showed that mobile application intervention group had higher improvements in self-efficacy and intention to choose mode of delivery than other intervention groups. Educational interventions at any time and in any place can easily provide persistent educational content to anyone who needs it. Motivational messages, management tools, and behavior change messages can be available to individuals via mobile phones (55). The results are in agreement with the results of previous studies that support the effectiveness of mobile technology to influence lifestyles and provide health education and behavior change contents (56, 57, 66). The value of using m-health has been highlighted these months with COVID-19 pandemic. Pregnant women as at risk group need to be careful about social contacts and m-health provides them appropriate educational interventions through proper channel.

Implications for policymakers

Our findings showed that psych-education may be effective approach as a policy option for tackling the outcomes of unnecessary CS. The results of this study can draw policy attention appropriately to implement this type of interventions for the larger health programmes in local, national, and/or regional level. Now that smart mobile phones are accessible for everyone around the country, using mobile application also makes it possible to determine the implications of this diverse intervention for policymaking based on the situations. Using these simple, non-expensive, tailored to women's prenatal care appointments, culture-oriented brief interventions might fruitfully be used to help women make proper and self-efficient decisions regarding their mode of delivery. However, wide variety of implementation strategies should be considered to deliver this kind of brief intervention in a wide population and through prenatal clinics.

Implications for further studies

Implementation frameworks related to the psycho-education interventions should be studied to identify barriers and facilitators of implementing such strategies. We have conducted our study in a private hospital. Future studies should assess the effectiveness of the interventions in public sector among a larger number of participants measuring more outcomes such as APGAR score of newborn babies. Conducting studies to implement multifaceted strategies targeting at women, health professionals, and healthcare systems is suggested. In order to conduct such interventions, the reasons behind the high rates of CS in the context should be identified to design proper psycho-education interventions.

Strengths and limitations

This was a non-clinical interventional study targeted at women that helped in decreasing unnecessary CS among participant women. We used a robust randomized controlled trial design and found effective results. However, the study was conducted in a private hospital with limited number of participants. We ensured women that their responses would not affect the service they would receive and ensured confidentiality. We used the results of two other studies conducted among Iranian women (21, 37) to design the content of the intervention as a culture-oriented content. Moreover, we tailored the brief interventions to women's prenatal care appointments.

Conclusion

Our study showed that that brief psycho-education intervention based on IM and IMB were effective to improve self-efficacy and intention among pregnant women and helped them to choose their proper mode of delivery. Moreover, the study showed that implementing the psycho-education intervention through mobile application was more effective in reducing CS rate and improving self-efficacy and behavior intention than the others two intervention groups. Using these psycho-education strategies targeted at women along with interventions targeted at healthcare providers and health system would probably be effective in reducing unnecessary CS rate in local and/or regional levels.

Abbreviations

CS= Cesarean Section

NVD= Normal Vaginal Delivery

WHO= World Health Organization

MI= Motivational Interviewing

IMB= Information Motivation and Behavioural skills modal.

Declarations

Acknowledgements

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Data sharing

Additional documents related to this study are available on request to the corresponding author.

The trial protocol and the pictures of the Mobile-Application are also available in the appendix.

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Authors' contributions

E. Sh., M. Sh., and M. A. conceptualized the study. E. Sh. M. Sh., and H. P. developed the study design and data collection plans. M. Sh. collected the data. M. Sh. and A. R. F. analyzed the data. E. Sh. and M. Sh. drafted the manuscript. All authors provided critical inputs on an earlier version of the manuscript and read and approved the final version of the manuscript.

Ethics approval and consent to participate

This was conducted as part of a PhD thesis project at Tehran University of Medical Sciences (TUMS). This study was approved by the School of Public Health, TUMS Ethics Committee (Ethics code: IR.TUMS.SPH.REC-1397-130). All participants were informed about the study and purposes and were ensured that all information collected would remain confidential. Every participant signed an informed consent form.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

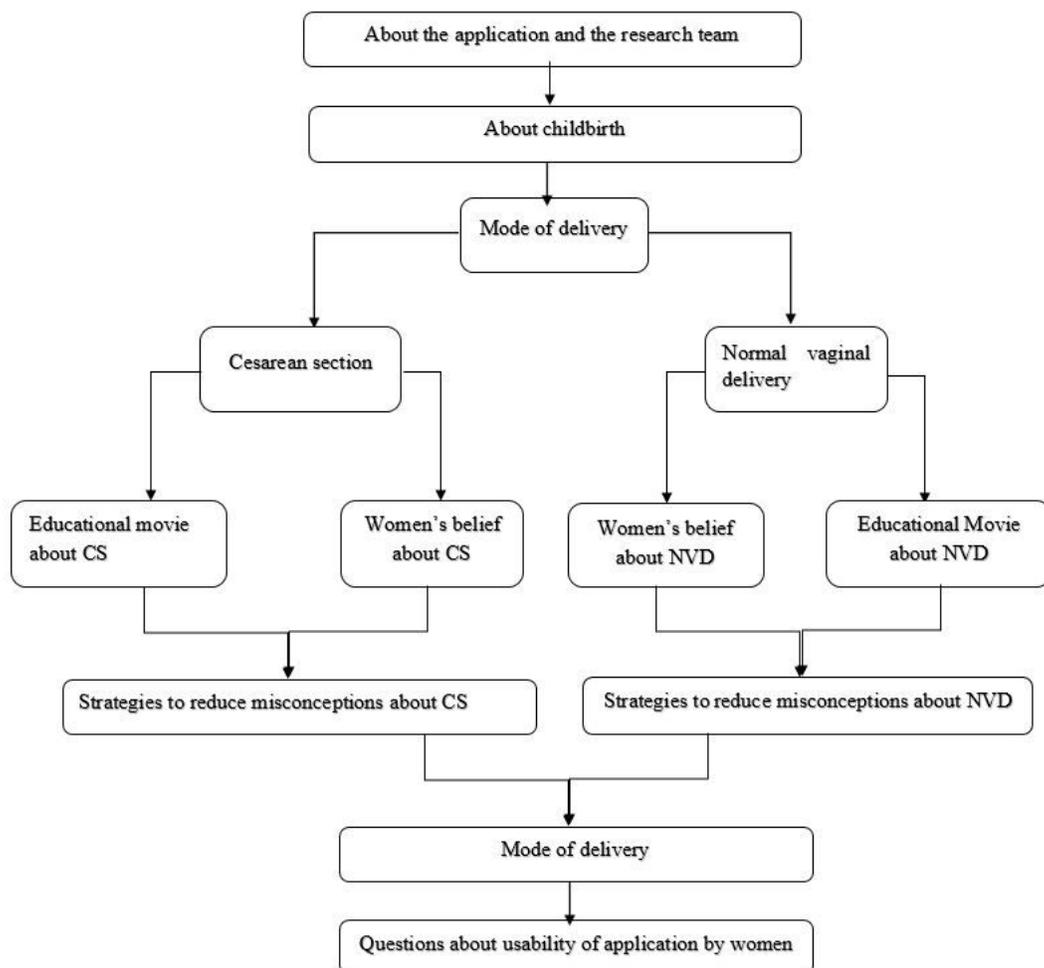


Figure 1

Flowchart 1: process of designing application

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