



# Assessment of Strategies for the Reduction of Cesarean Section Rate in Iranian and Foreign Studies: A Narrative Review

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## Abstract

**Objectives:** This study was conducted aiming at exploring strategies for reducing cesarean section (C-section) in Iranian and foreign studies.

**Materials and Methods:** The present study was carried out using a matrix approach and searching keywords including “Cesarean”, “Effective Intervention”, and “Cesarean Section Reduction Strategy” to find studies (2000-2019) in databases such as PubMed, SID, Science Direct, Google Scholar, and WHO.

**Results:** CS reduction strategies were classified into 3 categories of psychological, clinical, and structural-policy interventions. The first category supports women throughout labor and childbirth by the midwife, doula, coping skills with fear and pain of labor, changes in the attitudes of service providers and pregnant women. Clinical interventions include vaginal birth after CS, vaginal breech delivery, external cephalic version (ECV) for breech presentation, encouragement of service providers into intermittent auscultation for the fetal heart rate instead of continuous electronic fetal monitoring (EFM), and training of service providers, pregnant woman, and her family. The last category encompassed managing insurance and financial services, receiving one-to-one care and midwifery care throughout active labor, and updating policy of labor induction in post-term pregnancy, as well as women's admission policy with cervical dilatation of more than 4 cm with regular uterine contractions, active team care in labor, and auditing and feedback.

**Conclusions:** It seems that multi-dimensional interventions are required to reduce the CS rate. Concerning some of the strategies (e.g., ECV), it is suggested that further research should be performed by addressing the limitations and drawbacks of previous studies before applying clinical procedures due to contradictory results.

**Keywords:** Effective intervention, Cesarean section reduction strategy

## Introduction

Cesarean section (C-section) is nowadays raised as a serious concern around the world (1) and various studies indicate the growing number of C-sections worldwide, including Iran (2). During the last decade, the rate of the C-section has been alarming in both developing and developed countries, and it is now rising (3). However, statistics (4) show that there is a significant difference between C-section statistics at the international level (10%-20%) and Iran (50%-60%). According to the guidelines of the World Health Organization (WHO), the ratio of C-section to total birth is an important indicator of pregnancy care in any community, and a ratio of more than 15% represents that C-section is used for reasons other than saving the lives of both the mother and the fetus (5). Therefore, differences in C-section rates in societies can be due to different factors. A previous study reported that

several factors lead to the choice of C-section, including maternal diseases, along with neonatal and midwifery factors (6). Despite the above-mentioned report, other studies have shown that the C-section can be performed for non-medical reasons in some cases. The C-section rate may increase due to some effective factors including occupation, education, age (7), lack of awareness of C-section complications, misinformation about vaginal delivery, and maternal satisfaction from previous delivery experience (4). Other contributing factors are previous C-section history, reduced number of deliveries, increased age of women in the first pregnancy, weight gain and obesity (8-10), and changes in maternal care policies and procedures (9). In some studies, C-section is mentioned as the most important cause of a high C-section rate in accordance with the maternal demand (7-9,11). Based on the evidence, the main cause of a global increase in the

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C-section rate is the deliveries following the treatment with assisted reproductive techniques. A study documented that changing conditions and medical facilities play a role in the high C-section rate. According to another study, the number of women preferring to have the C-section is twice as likely as women who prefer vaginal delivery despite moderating maternal and medical factors (6). Fear (11), anxiety, and pain are important in choosing the type of delivery (4).

Compared to vaginal delivery, C-section has a high risk for maternal-fetal health and a huge cost to the healthcare system of countries. Further, it is associated with physical and psychological complications for the mother and the fetus. Complications due to C-section include a high mortality rate in mothers shortly after C-section, incidence and problems in later pregnancy (12), endometritis, urinary tract infection, unknown abdominal pain, ileus due to surgery, and opening the C-section scar in the next pregnancy, fear of anesthesia, and fear of surgery and death (13). The other complications are decreased femininity, lack of good communication with the baby, fear of the next pregnancy, mood disorders such as depression, self-blame and guilt feelings (13), anger and anxiety (14), postpartum infection, embolism, and postpartum hemorrhage (13). Finally, the onset of problems due to C-section scars in the following pregnancies, increased pain, slower postpartum healing, family deprivation (15,16), and disability and loss of strength (16-17) were among the other related problems. In addition, infantile complications include an increase in the incidence of asthma and respiratory problems, the development of type 1 diabetes in childhood and the development of nutritional allergies (14), an increase in infant admission rates, weight loss, and early childhood injury (18).

Considering the high side effects of the C-section for both mothers and fetuses, and the sensitivity and importance of maternal and neonatal health as vulnerable groups, it seems critical to implement appropriate strategies for reducing unnecessary C-sections. Therefore, the present study aimed to examine C-section reduction strategies in Iranian and international studies.

## Materials and Methods

This review study was conducted using the matrix approach in 2019. Further, it provides a summary of the results of previous studies on strategies for reducing the C-section worldwide and contains valuable information in this regard. A systematic approach is needed to review the literature and obtain the most important results, thus the matrix method was applied to achieve the study objectives (19).

Initially, the search was conducted by the original author (JG). Then, the texts were independently extracted by the other author of the article and appropriate papers and documents were extracted accordingly. The steps in the compilation of this review article were as follows:

What are the strategies for reduce cesarean section in Iranian and foreign studies? After the MESH-based keyword termination, Barekat, Iran Medex, Irandoc, Magiran, and SID databases were searched with various combinations of keywords to review studies in Iran, including “cesarean section”, “effective interventions”, “cesarean reduction strategy”, and “midwifery interventions”. Other databases such as Google Scholar, Scopus, Cochrane Library, Science Direct, PubMed, Web of Science, UpToDate, and WHO were searched for reviewing studies in other countries using various combinations of keywords including “cesarean section”, “midwifery intervention”, “effect inventions”, and “reduce cesarean section strategy”. It should be noted that the included studies were all published during 2000-2019. All Iranian and foreign articles and documents focusing on cesarean delivery strategies were excluded, and the exclusion criterion was non-title studies. In general, 239 articles were obtained, which were separately screened in duplicate articles of 88 cases. Finally, 53 related articles were selected (Figure 1), and then data were extracted and analyzed according to the released date. The main feature of this analysis included reviewing studies specifically focusing on cesarean delivery, outcome studies and their results, and the method of work of those studies. Then, they were categorized, organized, and integrated, and themes were formed based on common meanings and central issues of these findings.

## Results

In general, 53 articles enrolled in the study, including cross-sectional, clinical practice, and qualitative and overview studies. After the review of the texts, the codes related to the research questions were extracted and qualitatively classified by the research team and in the form of themes. The C-section reduction strategies in Iranian and international studies have been categorized into three main themes of psychological, clinical, and structural-policy interventions (Table 1).

### Psychological Interventions

The psychological intervention was a notable C-section reduction strategy. The results of this study were categorized into five sub-themes of continuous supportive care during labor, attendant midwife, coping with fear and labor pain, and changes in the attitude of the service provider and the pregnant woman toward the type of delivery.

### Clinical Interventions

Clinical intervention is another effective strategy for reducing the C-section rate. Based on the results, studies were categorized into six sub-themes of vaginal birth after cesarean (VBAC), breech vaginal delivery, external cephalic version (ECV), encouragement of service providers' intermittent auscultation (IA) of the fetal heart

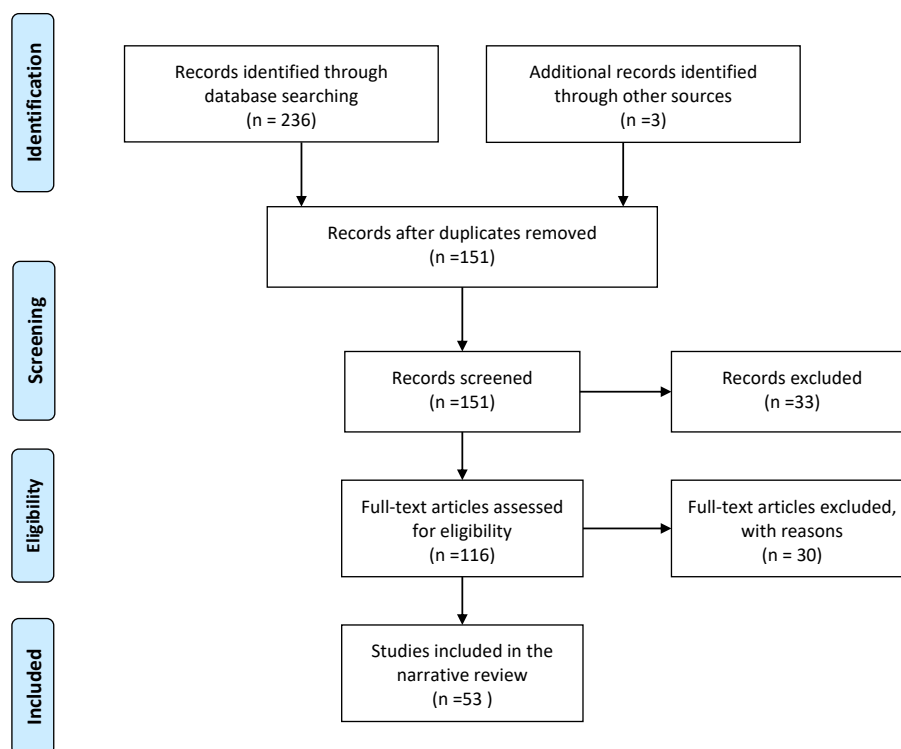


Figure 1. Flowchart of Enrolled Articles.

rate instead of continuous electronic fetal monitoring (EFM) during labor, and the training of the service provider and pregnant woman and her family.

#### Structural-policy Interventions

Structural-policy intervention is another effective strategy for reducing the C-section rate. According to the findings, studies were grouped into six sub-themes of managing insurance and financial affairs, receiving one-to-one care and midwifery care by the service provider in active labor, updating labor induction policy in post-term pregnancy, making policy of admission and hospitalization of women with cervical dilatation of more than 4 cm and regular uterine contractions, along with active team care in labor and audit and feedback.

#### Discussion

Overall, C-section reduction strategies in Iranian and international studies were categorized into three main themes of psychological, clinical, and structural-policy interventions.

#### The Role of Supporting Women Throughout Labor and Childbirth by the Midwife and Doula

The continuity of care by the midwife is the concept of accompanying a skillful midwife at all stages of childbirth in order to meet all the physical and psychological needs of the pregnant woman during labor and delivery using non-pharmacological methods of pain control and coping with stress that reduces the C-section rate and assisted

vaginal breech delivery. Moslemabadi Farahani et al (69) showed that the continuity of care by the midwife causes women to react with sustained calmness, awareness, and control when dealing with painful uterine contractions rather than anxiety and stress, and restlessness, thus improving the natural process of delivery and boosting the progress in labor and childbirth. It was also found that care-based midwifery helps maintain maternal and fetal health, especially during oxytocin induction. Dias et al (64) concluded that the attendant midwife during labor and delivery reduces the C-section rate with good performance during labor and less use of medication. Trueba et al (21) also reported that women with an attendant midwife demonstrated a considerable decrease in the C-section rate, the use of epidural anesthetic, and the length of the labor. Moreover, attendant support during labor was associated with positive physical, psychological, and economical outcomes.

#### Skills for Dealing With the Fear and Pain of Labor

Andaroon et al (27) represented that severe fear of delivery and its pain during pregnancy is associated with physical and anxiety symptoms and affects pregnancy and increases the tendency to C-section. Hypoxia caused by decreased blood flow to the pelvic muscles for coping with increased serum catecholamines and cortisol due to fear causes increasing pain that becomes a coping response to perform C-section upon the request of the mother (24). In another study, Stoll et al (23) reported that fear of unbearable pain and physical injury is the main cause

**Table 1.** C-section Reduction Strategies Based on Iranian and International Studies

Main Themes	Sub-themes	Results	Ref.
Psychological interventions	Supporting women throughout labor and childbirth by a midwife	Continuity of care by a midwife reduces the use of epidural anesthesia and C-section rates while increasing vaginal delivery and non-vaginal labor rates, as well as fetal distress and C-section.	(17,20)
	Doula	The attendant midwife in the C-section reduction policy program is an effective factor in decreasing the C-section rate.	(21,22)
	Coping skills with fear and pain of labor	Fear of giving birth and related pain is one of the reasons for C-section. Thus, teaching pregnant women and their families can dramatically decrease C-section rates by increasing the skill of coping with fear and pain.	(23-27)
	Attitude of pregnant women toward the choice of delivery type	There was a significant relationship between the knowledge and attitude of pregnant women about the choice of vaginal delivery. The C-section rate is higher in people with negative attitudes toward vaginal delivery. The attitude of a pregnant woman is a predictive factor for choosing the type of delivery. If a pregnant woman has no good attitude toward vaginal delivery, she will prefer the C-section.	(28-30)
	Attitude of service providers toward the choice of delivery type	The attitude of midwifery professionals has an important impact on the C-section rate. Older age and more work experience lead to a positive attitude toward the C-section at the request of the mother in pregnant women who are afraid of vaginal delivery, and female gynecologists have a more positive attitude toward the C-section, as requested by the mother.	(31,32)
Clinical and medical interventions	Vaginal delivery after Cesarean Section	Hospitalized women with a dilatation greater than 3 cm have been more successful with VBAC. The VBAC can be performed in cases where there is no risk of fetal or maternal risk.	(33-36)
	Vaginal delivery at Breach Presentation	Neonatal mortality or serious complications for the planned C-section group were significantly lower than the vaginal delivery group.	(37-39)
	Vaginal delivery at breach presentation	In a review study, they expressed uncertainty that the vaginal delivery is associated with more complications compared to the planned C-section due to selection bias and different methods for planning the vaginal delivery. Therefore, there is a need for further trials to draw definitive conclusions that the complication of assisted vaginal breech delivery is greater than the C-section.	(40-42)
	ECV in breach presentation	The ECV reduces C-section although further studies are needed to prove its safety.	(43-45)
	Encouraging service providers to listen to fetal heart sounds instead of continuous e-monitoring during labor	The electronic monitoring of the fetal heart in unnecessary cases during labor to an increase in the C-section rate.	(46-49)
	Training to service providers	Vaginal delivery skill training for service providers (midwife-specialist) increases their knowledge and skills while significantly reducing the elective C-section rate.	(50,51)
	Training to pregnant women and their families	By educating pregnant women and their families, C-section rates can be significantly reduced through raising their awareness of vaginal delivery and C-section complications.	(12,52,53)
Structural-policy interventions	Managing insurance and financial affairs	Strong supervision of the insurance and modification of the payment system, adjustment of tariffs, and performance monitoring, including registering a logarithm of a specialist in terms of the C-section rate and organizational performance data analysis, can be effective in reducing C-section rates.	(54-57)
	One-to-one care and midwifery care in active labor	Providing individual care by the service provider leads to a reduction in C-section.	(58-60)
	Updating labor induction policy in post-term pregnancy	The policy of inducing labor in post-term pregnancy in low-risk pregnancies after 42 weeks reduces the C-section rate and induces 41-42 weeks for 39 weeks of C-section.	(61,62)
	Women's admission policy with the cervical dilatation of more than 4 cm with regular uterine contractions	The labor induction in the latent phase was associated with the increase in C-section compared to the active phase of labor.	(63-66)
	Active team care in labor	Active teamwork in labor and group decision-making (anesthesiologists, gynecologists, and nursing staff) to perform a C-section for medical reasons can lead to good outcomes for the mother and the baby and reduces C-section.	(59, 67)
	Audit and feedback	Audit, feedback, and multiple strategies effectively reduce C-section rates and dystocia rates.	(11, 68)

Note. ECV: External cephalic version; C-section: Cesarean section; VBAC: Vaginal birth after cesarean.

of women's tendency to C-section. A smaller number of mothers prefer the C-section because it is a safer and healthier method for delivery.

According to Chai et al (25), a large number of pregnant women prefer the C-section due to fear of pain. The use of anesthesia in the delivery room can be effective in reducing fear. Likewise, Yazdizadeh et al (59) introduced training on the true nature of pain as a way to cope with fear. In their study, Ganji et al (1,70) found that the use of non-pharmacological methods such as acupressure and massage could reduce pain. Similarly, Jamshidimanesh et al (26) reported that screaming and tearing by other parturient women and their frequent examinations can cause the fear of vaginal delivery. Therefore, awareness of pregnant women and their skills regarding coping with fear should be elevated to reduce the C-section and related complications. Stoll et al (23) also concluded that knowledge and awareness of pregnant women should be promoted about having a healthy pregnancy, a labor and delivery project, and the benefits and disadvantages of vaginal delivery and C-section.

#### Changing the Attitudes of Pregnant Women

Sharifirad et al (72) and Faraji Darkhaneh et al (30) revealed that attitudes play an important role in choosing the type of delivery. The attitude of individuals affects their actions and immediate behaviors. The attitudes affect all aspects of human life and choices. The choice of delivery type is no exception. Accordingly, low awareness and negative attitudes toward vaginal delivery lead to an increase in C-section rates. According to Yazdizadeh et al (59) and Abedian et al (73), increasing the awareness of pregnant women is one of the ways to modify the negative attitude, and the prenatal period is the best time in this regard.

#### Changing the Attitudes of Service Providers

Fayazi et al found that the attitudes of midwives and doctors on the type of delivery are of great importance because caring for pregnant women is a major responsibility of relevant communities and their attitude influence women if it is positive toward C-section. On the other hand, the performance of service providers as a model for other people in the community can be an indicator of their belief in the provided training (74). Mostafazadeh and Rostamnejad (75) stated that most staff prefer the C-section due to legal issues and maternal and fetal complications. Another study reported that increasing the knowledge and skills of personnel in vaginal delivery and changing their attitude toward vaginal delivery can reduce the rate of C-section (76).

#### Vaginal Birth After Cesarean

VBAC has been approved by the National Institutes of Health as a mechanism for reducing C-section rates since 1980. The VBAC was considered as an effective factor in

reducing C-section (77).

Shipp et al (78) reported that the probability of a C-section scar rupture depends on the current pregnancy interval with the previous C-section. If the current pregnancy interval is more than 18 months with the previous C-section, the probability of C-section scar rupture will be 2.3%. Bangal (35) also found a probability of scar rupture of 2% and stated that the success of VBAC would be 83% if the previous C-section was due to fetal distress. In other studies, this rate was 635-68% (94-96). Bangal et al showed that if the previous C-section was due to cephalopelvic disproportion, the probability of VBAC success would be 85%, which was higher than the other research (35). According to Phelan et al (79), the probability of VBAC success will be 80% if previous C-section is due to breech.

Some studies demonstrated that the incidence of placenta previa, placenta accreta, placenta increta, and placenta percreta is lower in women with successful VBAC compared to subjects with repeated the C-section. They further revealed that the rate of abnormal placenta increases with higher C-section rates (35,80,81).

The success of the VBAC will increase if the weight of the fetus is less than 3 kg and the mother is checked in the dilatation of the cervix 3 cm or more (35).

The Committee on Practice Bulletins-Obstetrics indicated that the VBAC can be proposed with proper selection and considering maternal and fetal risk factors (82).

Although the results of the above-mentioned studies suggest that VBAC takes into account maternal and fetal factors, Firoozi et al reported that the existence of legal issues and the lack of support for service providers could prevent the clinicians toward VBAC in Iran (83).

#### *Assisted Vaginal Breech Delivery*

Assisted vaginal breech delivery accounts for 3%-4% of pregnancies. In the studies of Daniel et al (42), Tatum et al (41), and Giuliani et al (84), maternal and neonatal complications did not increase after assisted vaginal breech delivery.

Some studies represented that vaginal delivery may be a problem if there is a footling position and a lack of sufficient experience in such deliveries, large embryos, or embryos with congenital anomalies (85,86). Assisted vaginal breech delivery seems to be performed to reduce the C-section rate with the right selection criteria, a precise protocol for controlling labor, and an experienced obstetrician (87).

#### *ECV in the Breech Position*

According to evidence, the ECV in the breech position is a technique in which the embryo is manipulated into a cephalic position by pushing the mother's abdominal wall. The breech position may occur due to factors such as abnormalities in the fetus or the mother, placenta, or the

accidental position. Before the 34th week of gestation, the ECV is usually common for midwifery functions. It may be appropriate for women who have insufficient C-section services during labor or the C-section is unsafe for them. An overview by Hofmeyr et al on ECV in the breech position (43) showed that the ECV leads to a decrease in C-section rates. Neonatal and maternal complications were not different in the two methods of assisted vaginal breech delivery and C-section, but further studies are needed to adopt this method more widely. Ebner et al (88) indicated that the ECV is a safe way. The ECV should be presented as a suggested option for the mother based on informed consent. Accordingly, identifying factors affecting ECV will help increase the chances of the success of this method. Hutton et al (44) also documented that ECV is an effective way for reducing the C-section rate although further studies are required on maternal and neonatal complications associated with this method.

#### *Encouraging Service Providers to the IA of the Fetal Heart Rate Instead of Continuous Electronic Monitoring During Labor in Unnecessary Cases*

Mobarakabadi (47), Pur Jahromi Hadi et al (48), and Thacker et al (46) stated that the IA of the fetal heart rate instead of EFM in unnecessary cases during the labor leads to an increase in the C-section rate. Moreover, Blomberg (89), Rossignol et al (90), and Shoemaker et al (91) emphasized that service providers should receive training on the benefits of supportive care during labor and need to auscultate the heart rate with a probe device instead of EFM (89-91) and learn how to revive babies. They should also be trained and run fetal monitoring skills professionally (89).

Withiam-Leitch et al (92) reported that C-section rates, hospital admission rates for neonatal intensive care units, or APGAR scores below 7 did not differ with or without EFM. Therefore, the routine use of EFM is not recommended in unnecessary cases.

#### *Training Service Providers*

Kaboré et al indicated that staff training should be based on WHO guidelines for managing pregnancy complications, childbirth, and clinical decision-making algorithms for performing C-section (51). In addition, Merighi and Gualda (93) showed that education should be proportional to the curriculum and should be applied and technical. Health workers should have the necessary skills in this field. Many universities emphasize the basic knowledge of students while they are required to be trained in practical and technical skills so that to be able to practice in real-life situations at the clinic. The distance between theoretical and practical lessons needs to be reduced by correct training.

#### *Training a Pregnant Woman and her Family*

Mazaheri et al (8) and Hajian et al (94) found that training pregnant mothers increases an understanding of efficacy

and self-efficacy, reducing childbirth fear, behavioral intent, and awareness to increase the chance of vaginal delivery. Thus, providing group training and using group discussion in education increase the knowledge and skills of mothers and help them to use experiences and knowledge of others and enhance their ability and self-efficacy. It is better to begin with the second trimester since its effectiveness in reducing the C-section is greater than the third trimester of pregnancy. Yu et al (22) demonstrated that training can be performed publicly, and installing educational posters, distributing educational CDs on vaginal delivery and VBAC, as well as labor induction rates should be reported monthly on a large board at the entrance to the maternity care unit. Shoemaker et al underlined that the presentation of a training brochure (in the 16th-20th week of pregnancy) in pre-natal classes at the maternity care unit could promote vaginal delivery (91). Mothers should be divided into teams and a leader should be determined for each team. The needs of mothers should be evaluated before beginning training (50). Ganji et al (5) concluded that collaborative learning could be used to reduce C-section rates. This method is a form of training by the groups of people in which individuals share their knowledge, skills, and experiences for the education of mothers, helping in eliminating the impairment of the health status of the community and effectively achieving favorable health status in the field of gestational health. This training is globally considered as a new approach to help solve health problems. Yazdizadeh et al (59) showed that the lack of knowledge about labor and the inadequate knowledge of mothers about various methods of delivery and their complications, as well as the length of hospitalization reduce their tendency toward vaginal delivery. Therefore, it is necessary to enhance the education of mothers and their families, change their views on midwives, the vaginal delivery pleasurable process by holding training courses for mothers, raising awareness of vaginal delivery benefits and C-section complications. Chaillet and Dumont (68) and Stacey et al (95) represented that reviewing the content of prenatal classes can help in ensuring that evidence is provided to support natural physiological delivery in these classes, conducting group education and counseling sessions to raise awareness of mothers about the risks and benefits of vaginal delivery in low-risk women with C-section repetition, providing evidence and helping the patient decide on the type of delivery. Therefore, increasing the level of education of pregnant women about the delivery stages and raising awareness of the complications of the C-section are also relevant in this regard, as mentioned in the studies by Ghaffari et al (96) and Mardi et al (97).

#### *Management of Insurance and Financial Affairs*

According to Yazdizadeh et al (59), some physicians believe that the indications of the insurance company for a C-section worsen the situation. The main concern

in this area is that accurate C-section indication is not recorded in the patient file. Economic issues are the most important barriers faced by professionals. Lower tariffs for vaginal deliveries have led to an increase in the willingness of specialists to perform a C-section. Some claim that the costs of vaginal delivery are not enough for stress and the spent time. In this regard, Druzin et al (98) indicated that the lack of a significant difference between the costs of vaginal delivery and C-section increases the tendency for a selective C-section. Thus, changing the vaginal delivery tariff may help reduce the C-section rate.

#### Receiving Personalized and Midwifery Care by the Provider in Active Labor Cases

Based on previous evidence, vaginal delivery pleurability can prevent the C-section. Labor induction, the use of at least one good method during labor, and the presence of at least one midwife during labor and delivery are some of the supportive factors for C-section. Yazdizadeh et al (59) and Thomas et al (60) concluded that women would receive at least 80% of care during active labor if the ratio of the midwife to the pregnant woman is 1:1. In each room, a desk and a chair should be placed next to the parturient woman to place the midwife for better care.

#### Updating Labor Induction Policy in Post-term Pregnancy

The post-term pregnancy may be associated with an increased risk of abnormalities in gestational age and obstetric disorders. On the other hand, expecting for delivery can create anxiety for pregnant women. Some studies recommend induction for labor during post-term pregnancy at week 41 while some other studies suggested it from week 42 (45). Heimstad et al (99) found no significant difference between maternal and neonatal mortality in labor induction or monitoring at week 41 of gestation. Pregnancy over 42 weeks is accompanied by hazards such as a significant increase in perinatal mortality. The labor induction policies should ensure that induction occurs after a period of 3 + 41 days. According to Spong et al (100), one of the ways to reduce the C-section rate is the appropriate selection of mothers for the induction of childbirth based on midwifery indications and completion of a full course of labor induction within a suitable period.

#### The Policies for Admission and Hospitalization of Women With the Cervical Dilatation of More Than 4 cm

Chai et al (25) stated that inappropriate interventions and inadequate training in labor led to an increase in the C-section rate. Dias et al (64) also showed that the hospitalization of less than 4 cm cervical dilatation and the use of analgesics are some of the midwifery factors leading to an increase in C-section rates. Therefore, raising the midwives' precision and empowering them in this profession, and training the required skills and a system for evaluating and reducing medical interventions can reduce the C-section rate (25, 68).

#### Teamwork Skills in the Labor

Simpson et al (101) and Thomas et al (60) reported that one of the supportive issues is teamwork in labor, which is vital. The probability of a successful outcome will be high if a midwife, a gynecologist, and a nurse are working in the delivery unit as a team with a common goal for vaginal delivery. Blomberg (89) and Kinney et al (102) demonstrated that if the physicians do not attend during vaginal delivery, they will not gain the experience of vaginal birth support and will come in other ways such as assisted delivery or C-section. Berghella et al (103) showed that teamwork could reduce the C-section rate via the expected labor management instead of induction.

#### Audit and Feedback

Alonso et al (10) and Peng et al (11) indicated that the audit and feedback technique is one of the effective ways for reducing the C-section rate. In this method, the report is issued once every three months on the C-section rate, VBAC, and the induction rate (initially subtly and without informing colleagues and then consciously). Blomberg (89) stated that the supervision of midwifery activities should take place in labor. Midwifery care provided to women during labor should be evaluated and reported to the authorities of the unit to be aware of the results of the work. Kaboré et al (51), Peng et al (11), and Chaillet and Dumont (68) reported that audit and feedback are well-known as important elements of programs designed to change clinical performance and reduce C-section rates. The audit and feedback strategy should accurately include changing the program, targeting different barriers, and improving feedback to be fully effective. Thus, the identification of facilitators and barriers is a necessary step to improve the position and accept the final structure of the intervention process. These barriers and facilitators affect the work environment. Therefore, effective strategies for using the guidelines should be taken into account.

#### Conclusions

In general, it seems that multi-dimensional interventions are required for reducing the C-section rate. Some of these strategies include psychological, clinical, and structural-policy interventions, which can be used as a complementary method for reducing the C-section rate. Concerning some of these strategies such as ECV in the breech presentation and assisted vaginal breech delivery, it is suggested that further research be carried out by addressing the limitations and drawbacks of previous studies before applying clinical procedures due to the low number of meta-analysis studies in this area and reports of contradictory results. Research conducted in Iran on C-section reduction strategies focused on psychological interventions, and in some cases, structural-policy interventions. It is noteworthy that most studies on clinical strategies have been conducted in developed countries. Therefore, the results of this study can help

active researchers to select and focus on the areas that need further research (identified in this research). The results of this study can be used in research, education, policy-making, planning in connection with the C-section reduction and the promotion of women's health.

### Limitations and Strengths of the Study

One of the limitations of the study was to use a variety of studies with different methodological designs in this field, some of which had heterogeneity in measuring variables. One of the strengths of this study was to highlight the topics and parts of the issue of C-section reduction strategies, which require further studies. It is suggested that the subject should be examined individually while eliminating the limitations of the present study.

### Authors' Contribution

All authors were involved in conceptualizing the study, revising the manuscript, and interpreting the results.

### Conflict of Interests

Authors declare that they have no conflict of interests.

### Ethical Issues

Not applicable.

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