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Abstract

Caesarean section without medical indication imposes many problems to families, personnel and medical equipment causing some side effects to pregnant woman and foetus, compared to natural childbirth. The present study aimed to evaluate the interventions in reducing caesarean section in the world. This study was a systematic review using Embase, PubMed, Scopus, Web of Science, Science Direct, Magiran and SID databases and grey literature. All studies conducted during 2000–2018 were reviewed and finally the studies with inclusion and exclusion criteria were selected. A total of 19 studies were selected among 5,559 studies. The interventions conducted for reducing caesarean section included training the specialists and women by using Six Sigma method, changing the guidelines, reviewing the definition of natural childbirth various stages, encouraging the natural childbirth and expanding painless childbirth. All interventions were divided into educational strategy and managerial strategy. The interventions can be implemented to change the behaviour of physicians and attitude of pregnant women in order to reduce caesarean section. In this regard, the authorities are recommended to make more efforts.

Keywords: pregnant women, caesarean section, childbirth

Introduction

Childbirth is one of the most sensitive and important services of the health system in all societies and caesarean section is considered as one of the main concerns in this regard (1). Caesarean section refers to the removal of the placenta, embryo and membranes by cutting the abdominal wall and uterus (2). Although caesarean section has played a significant role in reducing the mortality and morbidity of high-risk natural childbirth in the last century, its high level is a challenging issue during the recent decades (3).

Caesarean section, without medical indication, creates a lot of troubles on families, medical personnel and medical equipment which can lead to side effects for pregnant women and foetus compared to natural childbirth including the problems related to anaesthesia, post-operative infection, high haemorrhage and thromboembolism (4–6). In addition, caesarean
section can have some side effects for infant such as respiratory problems, hospitalisation at the NICU, the possibility of infection, asthma in childhood and reduced breastfeeding (7). Some studies indicated that the reduction of caesarean section affects the maternal and neonatal mortality (8–10).

Further, caesarean section leads to more costs than natural childbirth (11, 12). Douangvichit et al., in their study, at two public hospitals in Latos indicated that the average cost for caesarean section and natural childbirth is 270 and 59 dollars, respectively (13). Based on the World Health Organization (WHO) statistics in different countries, the expected caesarean section should be 10%–15% and it is announced that there is no reason to increase the caesarean section (14). Based on the latest reports from 150 countries in the world, 18.6% of childbirths in the world are performed by caesarean section which is from 6.6% in developed countries and 27.2% in less developed countries (15).

Considering its effects on maternal health and reducing the cost of treatment and the economy of the family and country, most governments adopted some measures to reduce this problem. Such policies and interventions include the changes in the steps of natural childbirth leading to some caesarean section decisions and free natural childbirth (16). Since no study has been conducted on the interventions and policies implemented in different countries to reduce caesarean section, this study aimed to review the policies adopted in this area and evaluate their effectiveness.

Methods

Study Design

This systematic review study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (17). The present systematic review study aimed to examine the interventions to reduce caesarean section in the world during 2000–2018 through searching in Embase, PubMed, Scopus, Web of Science, Science Direct, Magiran, SID and grey literature.

Search Strategy

The key words and search strategy were as follows:

i) caesarean or caesarean section or repeat caesarean section or pregnancy or pregnant woman or parturition or birth or labour; and

ii) intervention or policy or plan or programme or, strategy or strategic planning; and

iii) decrease or change or impact or health impact assessment.

Eligibility Criteria

The inclusion criteria for selecting the studies related to the field of research included: i) the studies published during 2000–2018 ii) the studies in English or Persian and iii) the studies referring to at least one aspect of policy interventions to reduce caesarean section. The exclusion criteria included the letter to the editor, commentaries and the articles presented at the conferences.

Quality Assessment

After extracting the articles from the above-mentioned databases, they were evaluated using the descriptive-analytical, Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist and the articles without any good quality of reporting were excluded.

Results

A total of 5,559 articles were reviewed, among which 2,778 articles were repetitive. A total of 2,781 articles were screened of which 2,680 articles were eliminated in the review of the title and abstract. Then, the full text of 101 articles was studied among which 82 articles were excluded (62 articles due to inadequate results and 20 articles due to poor quality). Finally, 19 articles were included. The above-mentioned items are listed in Figure 1.

Data Extraction

After reviewing the quality of articles, 19 articles were eventually reviewed by three individuals. The information obtained from the articles were included in Word software and in the table containing the author’s name, year of publication, sample size, analysis method, type of intervention, method of investigation, the most important results and conclusion.
Summary of Reviewed Articles

A total of 19 articles conducted in different parts of the world during the year 2000–2018 were evaluated after screening in terms of quality and relevance. The processes of reviewing the studies are presented in Figure 1.

Regarding to the target population of the studies, 11 studies were conducted in hospital, 6 studies in health centres and 2 studies in other places. Most studies were conducted after the year 2010 (76%). Asia (67%) allocated the most studies. In terms of research methodology, most of the studies were interventional (67%) and 21% were retrospective studies related to the evaluation programmes, which were already conducted while 12% of the studies were combined. The context of other studies is shown in Table 1.

Figure 1. Review selection process and results based on the PRISMA guidelines
Table 1. Countries that studied

<table>
<thead>
<tr>
<th>Country</th>
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<tr>
<td>Iran</td>
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<td>China</td>
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<td>US</td>
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<td>France</td>
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<td>India</td>
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<td>Pakistan</td>
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<td>Taiwan</td>
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<td>Argentina, Brazil, Cuba, Guatemala, Mexico</td>
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<table>
<thead>
<tr>
<th>Number of studies</th>
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<tr>
<td>10 studies</td>
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<td>2 studies</td>
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<td>2 studies</td>
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The strategies obtained from the results of the studies were divided into managerial and educational strategies.

**Educational Strategy**

This strategy is a collection of methods and tools for raising the awareness of pregnant women, their families and specialists. Based on the current studies, this strategy has the following sub-categories:

i) Training the pregnant women and their families

ii) Training the specialists

iii) Applying an experienced person to accompany and train pregnant women in the hospital

iv) Training the benefits of natural childbirth and side effects of caesarean section to the husbands of pregnant women

**Managerial Strategy**

i) Performing natural childbirth as free

ii) Encouraging natural childbirth with the spread of painless childbirth

iii) Studying and making decision for caesarean section by experienced physicians in the hospital

iv) Having confidential correspondence with surgeons for conducting caesarean section in the hospital and the surgeon himself

v) Using the Six Sigma method

vi) Changing the guidelines and defining the various stages of childbirth
Table 2. Summary of data extraction of the selected articles to investigate the interventions in reducing caesarean section in the world (2000–2018)

<table>
<thead>
<tr>
<th>Authors &amp; Year</th>
<th>setting</th>
<th>Intervention</th>
<th>Sample size</th>
<th>Statistical analysis</th>
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<th>Result</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asadi et al. (2014) (36)</td>
<td>Iran</td>
<td>Training by question and answer method, video presentation and lecture for 60 min in the form of group meetings with at least five pregnant women who intended to perform caesarean section, holding a session with the presence of physicians and influential people including the learners' husbands, distribution of a book entitled “Reproductive Health” to remind the contents to the learners</td>
<td>90</td>
<td>Using statistical software (SPSS version 16) and chi-square, Mann-Whitney, Wilcoxon, t-test and paired t-tests</td>
<td>The study type was semi-experimental, prospective and case-control. The inclusion criteria included in the third trimester of gestation with a gestational age of 28–24 weeks, without a history of childbirth, with a high tendency to caesarean section and without a medical avoidance for natural childbirth-special training in the case group and normal training in the control group, the sampling was conducted in three areas of down, centre and top of the city and selecting 15 people in each area</td>
<td>After the intervention, seven (15.6%) subjects in the case group had the intent to choose natural childbirth but it did not happen in the control group</td>
<td>The theory of reasoned action can be effective in creating and increasing the intent of pregnant women to choose natural childbirth</td>
</tr>
<tr>
<td>Azh and Yonesian (2014) (37)</td>
<td>Iran</td>
<td>Training the case group including the use of slides and video tapes about the anatomy and physiology of pregnancy, preparation for natural childbirth and caesarean section, method of reducing pain, formation of a group discussion about the senses and attitudes of the patient in connection with childbirth, invitation of the husbands of the pregnant women, training them about postpartum problems and appropriate solutions to them, distribution of educational pamphlets on postpartum education, three training sessions for two hours: The inclusion criteria included: i) the last three months of pregnancy, ii). first or second pregnancy, iii). no history of illness and depression, iv). not having a child, v). age between 17 and 34 years, vi). having at least the middle school degree, vii). confirmation of the health of the foetus in ultrasound examination</td>
<td>410</td>
<td>Chi-square test</td>
<td>The study type was case-control and interventional, the case group included 187 subjects and control group included 223 subjects. Providing special training to the case group and regular training to the control group</td>
<td>The rate of caesarean section was 41.41% in the case group and 74.8% in the control group and the overall incidence was 59.8%. The caesarean section was 60.5% in the control group and 16.7% in the case group, and this difference was statistically significant (P ≤ 0.001)</td>
<td>Placing a coherent curriculum along with other social support methods can be effective in reducing caesarean section</td>
</tr>
</tbody>
</table>

(continued on next page)
Conclusion

Providing the necessary training during pregnancy was effective in encouraging pregnant women to have natural childbirth. After the intervention, the mean score of childbirth in the intervention group decreased and the mean score of waiting for childbirth and the efficiency of childbirth increased. 71.4% of the pregnant women of the intervention group and 53.8% of the pregnant women of the control group were given natural childbirth.

**Statistical analysis**

The study type was quasi-experimental. The population included pregnant women.

**Sample size**

130

**Intervention**

Training the pregnant women in three sessions of 60 min–90 min. Session 1: group discussion of pregnant women with one another on the cause of fear of delivery. Session 2: presentation of the successful natural pregnancy experience by pregnant women and education on the anxiety of pregnant mothers on the embryo, caesarean section, and Kegel exercise. Session 3: repetition of the training.

**Methods**

The study compared two public and private funding programs in two Indian states which were conducted for increasing the number of childbirth. In the state of Madhya, the fee paid for caesarean rates was higher than natural childbirth and the fee was ascendant while in the state of Gujarat, a fixed fee was paid to specialists based on the childbirth type.

**Descriptive statistics analysis.**

In the state of Madhya, the rate of caesarean section increased from 26.6% in 2007 to 40.7% in 2010, while the rate for caesarean section was 4.9% before the program was implemented. In Gujrat, the rate of caesarean section was reduced 4.3% than in 2004 which was 0.8%.

**Methods**

The study type was interventional-sampling and extracting information from archival files, determining the causes of caesarean section using fish bone charts as one of the Six sigma stages, determining intervention based on caesarean section.

**Statistical analysis**

Using Minitab software X2 test to compare classification information.

**Sample size**

1,016

**Intervention**

Monitoring and final decision making for senior resident caesarean, diabetes screening and prevention education for preventing diabetes and fetal enlargement and reducing caesarean section, training on neonatal resuscitation and natural childbirth, postpartum haemorrhage, childbirth using forceps by midwives as monthly.

**Methods**

The study type was interventional-sampling and extracting information from archival files, determining the causes of caesarean section using fish bone charts as one of the Six sigma stages, determining intervention based on caesarean section.

**Conclusion**

Six Sigma is an effective approach to reduce caesarean section.

**Authors & Year**

Taheri et al. (2014) (38)

**Intervention**

Training the pregnant women in three sessions of 60 min–90 min. Session 1: group discussion of pregnant women with one another on the cause of fear of delivery. Session 2: presentation of the successful natural pregnancy experience by pregnant women and education on the anxiety of pregnant mothers on the embryo, caesarean section, and Kegel exercise. Session 3: repetition of the training.

**Sample size**

130

**Statistical analysis**

Paired and independent t-test, chi-square and variance analysis.

**Methods**

The study type was quasi-experimental. The population included pregnant women.

**Result**

After the intervention, the mean score of childbirth in the intervention group decreased and the mean score of waiting for childbirth and the efficiency of childbirth increased. 71.4% of the pregnant women of the intervention group and 53.8% of the pregnant women of the control group were given natural childbirth.

**Conclusion**

Providing the necessary training during pregnancy was effective in encouraging pregnant women to have natural childbirth.

**Authors & Year**

Bogg et al. (2016) (39)

**Intervention**

Paying some money to maternity specialist to encourage childbirth. In the state of Madhya, the fee paid for caesarean rates was higher than natural childbirth and the fee was ascendant while in the state of Gujarat, a fixed fee was paid to specialists based on the childbirth type.

**Sample size**

805,000

**Statistical analysis**

Descriptive statistics analysis.

**Methods**

The study compared two public and private funding programs in two Indian states which were conducted for increasing the number of childbirth.

**Conclusion**

Findings indicated that financial incentives affect the selection of childbirth type.

**Authors & Year**

Chai et al. (2017) (40)

**Intervention**

Monitoring and final decision making for senior resident caesarean, diabetes screening and prevention education for preventing diabetes and fetal enlargement and reducing caesarean section, training on neonatal resuscitation and natural childbirth, postpartum haemorrhage, childbirth using forceps by midwives as monthly.

**Sample size**

1,016

**Statistical analysis**

Using Minitab software X2 test to compare classification information.

**Methods**

The study type was interventional-sampling and extracting information from archival files, determining the causes of caesarean section using fish bone charts as one of the Six sigma stages, determining intervention based on caesarean section.

**Result**

The defect rate declined from 41.83% to 32% and the Six Sigma score increased from 1.706 to 1.967 after improvement measures ($P < 0.01$).

**Conclusion**

Six Sigma is an effective approach to reduce caesarean section.
**Table 2. (continued)**

<table>
<thead>
<tr>
<th>Authors &amp; Year</th>
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<tbody>
<tr>
<td>Ganjee and Khosravi (2008) (41)</td>
<td>Iran</td>
<td>Training the pregnant women on the benefits of natural childbirth and complications of caesarean section by the health care team including midwives, health clinic physicians, and non-sanitary staff</td>
<td>171</td>
<td>Paired t-test and McNemar test</td>
<td>The study was field type and the research population included the pregnant women having no previous history of caesarean section and less than three times of pregnancy who were randomly selected and given the necessary training</td>
<td>In this study, 70% of pregnant women were satisfied with the provided training. The frequency of caesarean section decreased from 63% before the implementation to 52% after intervention ( (P &lt; 0.05) )</td>
<td>In some cases of health problems such as caesarean section which is rooted in the culture and beliefs of the people, the mobilisation of groups of people in solving the problem, along with the promotion of related health services, can have beneficial effects</td>
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<tr>
<td>Ghaffari et al. (2011)(42)</td>
<td>Iran</td>
<td>Educational programme was understood during six sessions according to the health belief model, including awareness, perceived severity, perceived barrier, perceived benefits, and self-efficacy. The information was provided by film and lecture</td>
<td>100</td>
<td>Using SPSS 14 and independent-t and t-paired tests, chi-square, and Mann–Whitney test</td>
<td>The study type was semi-experimental, the research population included pregnant women delivering their first child who were at the 20–30 weeks of gestation. The instrument of this study was a questionnaire based on the structure of the health belief model, intervention in the case group and completion of the questionnaire 4–8 weeks after intervention in both groups</td>
<td>There was a significant difference in the mean score of awareness ( (P \leq 0.001) ), Perceived severity ( (P \leq 0.001) ), Perceived benefits ( (P \leq 0.001) ) and Perceived self-efficacy ( (P = 0.02) ). There was no significant correlation between women in the case group than in the control group after intervention. In the case of perceived barrier structures ( (P = 0.09) ), there was no significant difference in the choice of childbirth type ( (P = 0.73) ) and performance ( (P = 0.24) )</td>
<td>Educational programme based on health belief model is effective in increasing the knowledge and attitudes of pregnant women in childbirth</td>
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### Table 2. (continued)

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<tbody>
<tr>
<td>Karami et al. (2017) (43)</td>
<td>Iran</td>
<td>Natural childbirth as free, the encouragement of natural childbirth with the spread of painless childbirth, the reconstruction of childbirth blocks by creating special spaces for the pleasantness of the natural childbirth environment</td>
<td>Fifteen hospitals affiliated to Kermanshah University of Medical Sciences</td>
<td>Discontinued time series</td>
<td>The study type was retrospective and quasi-experimental. The statistical population included the hospitals affiliated to Kermanshah UMS and the number of caesarean section was evaluated 25 months before and 28 months after the intervention</td>
<td>Caesarean section decreased to 0.11 in the first month after the interventions but it increased monthly to 0.17 ($P \leq 0.001$)</td>
<td>Although the rate of caesarean section declined in the first month after the implementation of the health plan, its rate increased during the study. This suggests that natural childbirth in Iran has not been increased as one of the goals set before the implementation of the plan</td>
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<td>Mawson (2004) (44)</td>
<td>Argentina, Brazil, Cuba, Guatemala, Mexico</td>
<td>The indications were examined using existing evidence from physicians being higher or at the same level in terms of the clinical experience and quality and the final decision was made by the physicians by drawing the flowchart</td>
<td>36 hospitals</td>
<td>This study was a randomised, controlled cluster clinical trial study. The population included the hospitals in Latin America with caesarean section rate as high as 15% per 1000 cases per year</td>
<td>In the hospitals where intervention was performed, the rate of caesarean section decreased (1.9% to 1% $P = 0.044$). 87% of physicians believed that this was an effective strategy in public hospitals and 41% believed that they were effective in private hospitals</td>
<td>Intervention of using the second physician’s opinion was effective in reducing the number of caesarean section</td>
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<tr>
<td>McGrath and Kennell (2008) (45)</td>
<td>US</td>
<td>Intervention involved the use of a trained and experienced person to accompany and support pregnant women after admission to the hospital. This support is provided in the physical proximity, eye contact and communication, training, assurance and insurance, and encouragement of pregnant women and their husbands</td>
<td>420</td>
<td>Descriptive analysis, analytical analysis for comparing intervention and control groups - Chi-square test for discrete variables analysis.</td>
<td>This study was a controlled clinical trial. The research population included the pregnant women during their third trimester. A total of 420 pregnant women were included in the study of whom 196 women were in the control group and 224 women were randomly assigned to the intervention group</td>
<td>In the intervention group, the number of caesarean sections decreased compared to the control group (23.4% versus 27%, $P = 0.002$). In the women with induction childbirth, the supported group had lower than caesarean section (12.5% versus 38.8%, $P = 0.007$) and less number of pregnant women in the intervention group received epidural anaesthesia than the control group (64.7% versus 76%, $P = 0.002$)</td>
<td>For the middle class women working with the support of their husband, the continuous attendance of a midwife in the hospital reduces the likelihood of caesarean section and the need for epidural anaesthesia</td>
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The found that our working plan for management of labor and delivery yielded and maintained a successful decline in the cesarean delivery rates without any negative effect on neonatal or maternal mortality rates.

The rate of caesarean section ranged from 16.59% to 10.92% and the initial caesarean was from 9.22 to 7.11 while the repeated caesarean section ranged from 7.37% to 3.81%. The rate of natural childbirth after caesarean section increased from 35.6 to 54.5 (\(P < 0.001\)). The use of oxytocin increased from 38.8 to 63.4 (\(P < 0.001\)).

The study type was retrospective evaluating the rate of caesarean statistics over ten years (1989 to 1998) and the factors reducing this rate. The statistics were divided into ten periods of one year, using the Chi-squared test with a factor of 2 at 10.

Using oxytocin and its injection under the supervision of a physician, examination of the condition and fetus of the fetus before the injection of oxytocin, implementation of the protocol for high-risk childbirth by experienced midwives, use of intravenous catheter by doctors if the dose of oxytocin is more than 20.

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</thead>
<tbody>
<tr>
<td>Naiden and Deshpande (2001) (46)</td>
<td>US</td>
<td>Using oxytocin and its injection under the supervision of a physician, examination of the condition and fetus of the fetus before the injection of oxytocin, implementation of the protocol for high-risk childbirth by experienced midwives, use of intravenous catheter by doctors if the dose of oxytocin is more than 20</td>
<td></td>
<td>The statistics were divided into ten periods of one year, using the Chi-squared test with a factor of 2 at 10</td>
<td>The study type was retrospective evaluating the rate of caesarean statistics over ten years (1989 to 1998) and the factors reducing this rate</td>
<td>The rate of caesarean section ranged from 16.59% to 10.92% and the initial caesarean was from 9.22 to 7.11 while the repeated caesarean section ranged from 7.37% to 3.81%. The rate of natural childbirth after caesarean section increased from 35.6 to 54.5 ((P &lt; 0.001)). The use of oxytocin increased from 38.8 to 63.4 ((P &lt; 0.001)).</td>
<td>The found that our working plan for management of labor and delivery yielded and maintained a successful decline in the caesarean delivery rates without any negative effect on neonatal or maternal mortality rates</td>
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| Peng et al. (2016) (47) | Taiwan | Evaluating the causes and the need for caesarean section by a team of 8 experts and presenting results at monthly conferences | 2,189 | Wilcoxon test, logistic regression | This study was a retrospective study. 3,781 individuals who were given treatment from January 2008 to January 2011 were studied. Mothers who had given birth from January 2008 to January 2009 were part of the pre-audit group (1,592) while those who had given birth after August 2009 were part of the post-audit group. Then, the rate of caesarean section was evaluated in two groups. | Caesarean section due to Dystocia 9.6 versus 2.6 (\(P < 0.001\)) was significantly less in the clinical audit group than in the pre-audit group. However, there was no significant difference in the vaginal delivery rate among the groups; of 995 cases, 16 audited caesarean sections did not require caesarean section. In non-delivered women (2148 cases), multivariate analysis indicated that clinical examination (OR = 0.78), maternal age at delivery (OR = 0.80), and embryo birth weight (OR = 0.005) were independent of caesarean section by default \(P < 0.005\). | Clinical audit is an effective strategy for reducing caesarean delivery |

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After implementing the health care reform plan, the rate of caesarean section decreased in comparison to before the implementation. 14.02% of the rate of caesarean section decreased after the implementation of the health system reform plan. The type of retrospective and longitudinal study was the study population of all hospitals in Kurdistan province having a maternity ward, research tool is check list. Frequency indices, percentage, mean and chi-square test were used for statistical analysis. The intervention setting was natural childbirth for free, the encouragement of natural childbirth with the spread of painless labor, the reconstruction of delivery blocks by creating special spaces for the pleasurable childbirth environment, rewarding the delivery team.

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<tr>
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</thead>
<tbody>
<tr>
<td>Piroozi et al. (2016) (48)</td>
<td>Iran</td>
<td>Natural childbirth for free, the encouragement of natural childbirth with the spread of painless labor, the reconstruction of delivery blocks by creating special spaces for the pleasurable childbirth environment, rewarding the delivery team</td>
<td>1,155</td>
<td>Frequency indices, percentage, mean and chi-square test</td>
<td>The type of retrospective and longitudinal study was the study population of all hospitals in Kurdistan province having a maternity ward, research tool is check list</td>
<td>14.02% of the rate of caesarean section decreased after the implementation of the health system reform plan</td>
<td>After implementing the health care reform plan, the rate of caesarean section 0.10 decreased in comparison to before the implementation</td>
</tr>
<tr>
<td>Khani (2004) (49)</td>
<td>Iran</td>
<td>Confidential correspondence with surgeons regarding the rate of caesarean section performed in the hospital and the rate of caesarean section performed by each surgeon</td>
<td>Descriptive statistics (frequency, mean, standard deviation) and inferential (mean comparisons and $X^2$)</td>
<td>Type of clinical trial, the research population including two selected hospitals in Mazandaran province (one hospital in case of a control hospital), 10-month intervention, comparison of data before and after intervention in each hospital</td>
<td>During the study, 2,171 childbirths were conducted in the case hospital and 980 childbirths were conducted in Shahed Hospital and 44.8% of childbirths were in the case group and 46.6% of the childbirths were in the control group by caesarean section. The test indicated that the intervention did not affect the rate of caesarean section, but the rate of caesarean section decreased in the case and control groups after intervention (P &lt; 0.001)</td>
<td>Supervision and control of the authorities is required for the rate of caesarean section, and it is better for other organisations to co-operate with the treatment department to reduce caesarean delivery</td>
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The design and implementation of systematic training programs by health workers has a significant role in encouraging pregnant mothers to undergo natural childbirth and reduce caesarean section.

### Table 2. (continued)

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</thead>
<tbody>
<tr>
<td>Safari et al. (2014) (50)</td>
<td>Iran</td>
<td>Training based on pre-test analysis on the maternal fear from natural childbirth, caesarean section disadvantages and natural childbirth advantages, in several 50-60 min training sessions (number of sessions depending on the characteristics of the target group), lecture, group discussion, question and answer, PowerPoint software for the intervention group. At the final session, the film on two types of natural childbirth and caesarean section were shown to the participants</td>
<td>70 (35 subjects in the intervention group and 35 subjects in the control group)</td>
<td>Descriptive statistics, inferential statistics (independent t-test and paired t-test)</td>
<td>The study type was interventional with two intervention and control groups. The study population included all pregnant women having their first child (with caesarean section intention) simple random sampling, inclusion criteria in both groups, the pregnant women having their first child wanted caesarean section during 25–30 weeks of gestation, no clear barriers to natural childbirth, exclusion criteria in both intervention and control groups, including the absence of pregnant women during training sessions (absence more than two sessions), the unavailability of pregnant women, incomplete questionnaire, and termination of pregnancy for any reason, data collection is a structured questionnaire based on the research objectives and the use of scientific sources.</td>
<td>A significant difference was observed between the awareness scores (P &lt; 0.001) and self-efficacy (P &lt; 0.001) after educational intervention in the two groups. After educational intervention in the intervention group, 16 (4.45%) women selected natural childbirth as the preferred method. After telephone follow-ups, 11 (42.31%) women selected natural childbirth</td>
<td>The study type was interventional with two intervention and control groups. The study population included all pregnant women having their first child (with caesarean section intention) simple random sampling, inclusion criteria in both groups, the pregnant women having their first child wanted caesarean section during 25–30 weeks of gestation, no clear barriers to natural childbirth, exclusion criteria in both intervention and control groups, including the absence of pregnant women during training sessions (absence more than two sessions), the unavailability of pregnant women, incomplete questionnaire, and termination of pregnancy for any reason, data collection is a structured questionnaire based on the research objectives and the use of scientific sources.</td>
<td>The design and implementation of systematic training programs by health workers has a significant role in encouraging pregnant mothers to undergo natural childbirth and reduce caesarean section.</td>
</tr>
<tr>
<td>Sharifrad et al. (2013) (51)</td>
<td>Iran</td>
<td>Dividing the husbands of the case group into three groups of 13–15 subjects, duration of training for 90 minutes, educational content of the mechanism of natural childbirth and caesarean section, their disadvantages and advantages, training method (lecture and Q &amp; A sessions)</td>
<td>88 pregnant women</td>
<td>independent t-test, paired t-test, chi-square test, ANOVA</td>
<td>The study type was experimental and the research population included the pregnant women at 28–32 weeks and 4 weeks after training, the knowledge and awareness of the studied group (case and control group) was evaluated.</td>
<td>Caesarean section in the case group was much less than the control group (29.3% versus 39%)</td>
<td>Training the husband of pregnant women can be effective in the knowledge and positive attitude of spouses for natural childbirth and reduction of selective caesarean section.</td>
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<tr>
<td>Sheikh et al. (2008) (52)</td>
<td>Pakistan</td>
<td>Evaluation of caesarean section and presentation of results in form of instructions to relevant departments. Evaluation checklist in duding maternal age, delivery status, delivery period [beginning of delivery, emergency level, necessity and need for postoperative monitoring, postoperative complications, etc.]</td>
<td>No sampling was conducted.</td>
<td>No statistical test was performed</td>
<td>This study was a comprehensive evaluation of 8 primary caesarean sections from January 1 to March 31 during 2003–2004 and the results of the evaluation were presented in the form of a guideline. Then, the rate of caesarean section and maternal and fetal status were checked before and after the implementation of the guideline.</td>
<td>The rate of caesarean section decreased from 16% to 12%. The exercise of examining the fetal cord blood and maintenance of parameters improved and there was no maternal and perinatal consequence.</td>
<td>Implementing the standard childbirth management can reduce primary caesarean sections without hurting the maternal and fetal safety.</td>
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</table>

(continued on next page)
Changing the protocol resulted in a decrease in caesarean section without any complication in the infants.

The rate of caesarean section decreased significantly from 9.4% to 6.9%. In the period after the change in the guidelines ($P < 0.01$), the rate of caesarean section in the first stage was less than half, 1.8 to 0.09. It decreased in the second phase but was not significant between periods. In addition, the duration of the decision to perform caesarean section with regard to the cervical position was significantly longer in the first childbirth.

The study type was before-and-after cohort. The study population included the pregnant women having their first child with a gestational age of more than 37 weeks. The study place was one of the university affiliated hospitals.

Statistical analysis using R studio version 0.99.896 (CRAN) software, $X^2$ tests, Fisher test, odds ratio and independent T.

Table 2. (continued)

<table>
<thead>
<tr>
<th>Authors &amp; Year</th>
<th>setting</th>
<th>Intervention</th>
<th>Sample size</th>
<th>Statistical analysis</th>
<th>Methods</th>
<th>Result</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thuillier et al. (16)</td>
<td>France</td>
<td>Changing the guidelines or changing the definition of the various stages of natural childbirth</td>
<td>The participants were 3,283 people before intervention and 3,068 people were after intervention</td>
<td>Statistical analysis using R studio version 0.99.896 (CRAN) software, $X^2$ tests, Fisher test, odds ratio and independent T</td>
<td>The study type was before-and-after cohort. The study population included the pregnant women having their first child with a gestational age of more than 37 weeks. The study place was one of the university affiliated hospitals</td>
<td>The rate of caesarean section decreased significantly from 9.4% to 6.9%. In the period after the change in the guidelines ($P &lt; 0.01$), the rate of caesarean section in the first stage was less than half, 1.8 to 0.09. It decreased in the second phase but was not significant between periods. In addition, the duration of the decision to perform caesarean section with regard to the cervical position was significantly longer in the first childbirth</td>
<td>Changing the protocol resulted in a decrease in caesarean section without any complication in the infants</td>
</tr>
<tr>
<td>Yu et al. (2017) (53)</td>
<td>China</td>
<td>Policy interventions including the Implementation of evaluation programs such as the indicators of control and quality management for comprehensive hospitals, and ultimately the impact of these policies on encouraging mothers to carry out natural childbirth by the health care team. Organisational interventions include education for mothers and their families by physicians and nutritionists once or twice a week, training through billboards, caesarean section by specialist teams, participation of midwives in educational classes annually, use of painless childbirth in the hospital</td>
<td>312,131</td>
<td>Chi-square test and predicted model</td>
<td>A before-and-after study that was conducted during 2006–2014 in three clinical clinics in China</td>
<td>After applying organisational interventions, the rate of caesarean section decreased by 12%. The average annual growth of this index decreased from 20.11 to -4.30. After policy interventions, the overall caesarean section rate and annual probability decreased</td>
<td>Organisational and policy interventions can reduce the amount of proposed caesarean section and this index should be considered as one of the indicators for assessing the hospitals</td>
</tr>
</tbody>
</table>
Discussion

The results of this study indicated that education is effective in reducing caesarean section. The results of this study are consistent with studies of Spinelli et al. (18) and Ferguson et al. (19) but inconsistent with the studies of Artieta-Pinedo et al. (20) and, Bostani and Rafat (21).

It seems that the differences in the studied population such as the level of education, attitude of people and the readiness of people to attend educational classes are not affected by the difference between the results obtained from these studies. Other factors affecting the outcomes of education includes the skills and experiences of the trainer, the extent he addressed all the aspects of the subject and whether he was able to transfer it to the learners. In addition, the number of learners and their interest in learning, the time and number of hours spent in the classroom are influential in this regard.

The findings of this study indicated that training the husbands is effective in reducing caesarean section. Noghaee and Hadizadeh indicated that implementing the educational programme and raising the awareness of men can be effective in social protection of women (22).

Considering that men are one of the important pillars of reproductive health services, their role as the closest person to their spouse was confirmed in supporting the women and running family planning programmes. Thus, it is suggested that men should be trained and justified to transfer the learned knowledge to their spouses, which results in increasing women’s awareness and reducing caesarean section.

Sharghi et al. indicated a significant relationship between the opinion of the spouse and the desire to choose caesarean section (23). In another study, Faraji Darkhaneh and Farjad Bastani indicated that 64% of women considered the role of the spouse in choosing the method of childbirth (24).

The results of this study indicated that using a midwife is effective in reducing caesarean section (25).

Physician-patient relationship culture in Iran indicates that medical team can play an important role in controlling or stimulating caesarean statistics. It is suggested that physicians should always be given the necessary feedback in this regard. Obviously, this control has a moral value physically and economically. The findings of this study stated the level of tariffs on caesarean section reduction. The results of the study by Fabri and Murta confirmed this finding (35).
Interventions in the developed countries (change in guidelines) were more systematic in this study and involved a wide range of women, leading to the better process of natural childbirth and caesarean section reduction. However, the interventions in developing countries including Iran had a personal dimension including only a few people who are learners. The lack of transparency in the research method in a limited number of studies was one of the limitations encountered by the researchers in this study. It is suggested that future studies should include the interventions, which are more systematic and functional.

**Conclusion**

Finally, the researcher believed that modifying the referral system for childbirth is considered as the most important method for reducing the caesarean section. All the patients should first be examined by midwife and referred to a specialist in case of necessity and the need for the indications of caesarean section. Further, training the pregnant women and their husbands, performing natural childbirth as free, studying and making decision for caesarean section by experienced physicians in the hospital, encouraging natural childbirth with the spread of painless childbirth are considered as effective.

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**Conflict of Interest**

None.

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**Authors’ Contributions**

Conception and design: FM  
Analysis and interpretation of the data: FM, AS  
Drafting of the article: FM, MH  
Critical revision of the article for important intellectual content: MH  
Final approval of the article: FM, AS, MH  
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Obtaining of funding: FM  
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Collection and assembly of data: FM, AA, AS, MH, SRS

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**References**


