Introduction
Cervical cancer is one of the major causes of disability adjustment years of women in developing countries (1). Approximately 87% of deaths from cervical cancer occur in less-developed countries. Among all malignant tumors, cervical cancer is one of the cancers that can be effectively controlled by organized screening programs. In this regard, Pap smear is a simple and cost-effective test for cervical cancer screening (2,3). It is reported that a regular Pap smear can reduce mortality by up to 80% (4). A study in Iran demonstrated that only 20% of women have never had this test, about two-thirds (68.7%) of them had this test only once in their life, and only 11.3% of them had taken a Pap test at standard intervals (5).

People may indicate an unwillingness to take screening tests when they are healthy, and performing regular screening tests largely depends on motivational factors. Accordingly, the present study aimed to investigate the effectiveness of motivationally tailored interventions on women’s cervical cancer screening.

Materials and Methods
In this systematic review, the electronic databases of the Cochrane Library, Web of Science, PubMed, Scopus, Embase, and Google Scholar were searched for all interventional studies (i.e., trials, pre- and post-test, or quasi-experimental ones) published before 2019. Then, the Cochrane tool was implemented to evaluate the quality of trial studies (7 articles).

Results
This systematic review study included 7 articles with 1337 female participants. The result of our study showed that different motivational interventions (MIs) (i.e., face-to-face interviews, consultation sessions or calls, and educational programs) can effectively improve cervical cancer screening behavior in women.

Conclusions
Overall, motivational interventions (MIs) seem to be effective in cervical cancer screening.

Keywords: Motivational intervention, Counseling, Motivational interview, Cervical cancer screening, Pap smear, Protection motivation theory
The search terms were ‘motivational interviewing’, ‘counseling’, ‘cervical cancer screening’, ‘Pap test’, ‘randomized clinical trial’, ‘protection motivation theory’, and the ‘experimental and quasi-experimental study’. The search was limited by language (English) and method (i.e., clinical trial, randomized controlled clinical trial, and experimental and quasi-experimental studies). Further searches were carried out with the same strategy among dissertations, books, and available unpublished articles. Furthermore, resources were managed using Endnote software. Then, the title and abstract of the related articles were studied for selecting the corpus. This search yielded 216 abstracts, and finally, 7 articles were selected and assessed based on the aim of the study. The Cochrane tool was used to evaluate the quality of trial studies. This tool examines studies in six steps, the details of which are shown in Table 1 and Figure 1. Additionally, the characteristics and the judgment methods of the articles are presented in Table S1 (See Supplementary file 1). Eventually, the risk of bias rating for the included studies is displayed in Figures 2 and 3.

### Results

This systematic review included 7 articles with 1337 female participants. Table S1 summarizes the characteristics and the intervention, judgment methods of the 7 articles. The result of our study demonstrated that different MI methods (i.e., face to face interviews, consultation sessions or calls, and educational programs) can effectively improve cervical cancer screening behavior in women. MIs in the assessed articles were categorized into two groups. Some studies were conducted using motivational interviewing and motivational phone calls. For example, Mahmoudi Majd Abadi et al reported that 77.8% of women took a Pap smear test after five group motivational interviewing sessions compared to vs. 11% of the control group (11). According to Pourebrahim et al, 32% and 22% of women performed a Pap smear test after three group motivational interviewing sessions, three motivational phone calls, and 4% of women in the control group (12). In a study conducted by Zolfaghari et al, 20.9% of participants in the intervention group vs. 9% in the control group performed a Pap smear after three motivational

### Key Messages

- This review prepared enough evidence to support or refute that implementation MI can improve women’s cervical cancer prevention behaviors.
- The MI strategies can improve and facilitate making decisions on change among women and result in an increase in the regulated cervical cancer screening uptake.
- Further randomized controlled trials are needed to study the effect of different strategies that can be more effective on health-related preventive behaviors.
Other types of MI studies were educational interventions based on the protection motivation theory (PMT). For instance, Dehdari et al. reported that 60% of women uptake Pap smear vs 10% of the control group after receiving education based on PMT (14). According to Malmir et al., 48.6% of women underwent a Pap smear test vs. 32.4% of the control group after the PMT-based intervention (15). In another study by Ghahremani et al., the rate of the Pap smear test in the intervention and control group was 62.85% vs. 5.7% after the PMT-based intervention (16). Similarly, Khiyali et al. showed a significant difference in the rate of performing Pap smear in the experimental group (58%) compared to the control group (3%). Table 3 presents the difference between motivational-based intervention and control groups.

The results of this systematic review, the motivationally tailored interventions are effective methods for boosting motivation regarding performing a Pap smear test. The evidence indicated that MIs could help reduce the barriers of cervical cancer screening and thus could help increase the cervical cancer screening rate.

The result of our study further showed that different MI methods (i.e., face-to-face interviews, consultation sessions or calls, and educational programs) are effective in cervical cancer screening uptake in women. In their systematic review, Lu et al reported that the combination of workplace-based educational programs with mobile screening services is effective in promoting breast and cervical cancer screening uptake in Asian women (18). In addition, Soares and Silva found that the use of media, telephone call, and invitation letter could increase women’s knowledge about cervical cancer screening (19).

Two other systematic reviews reported that one-to-one education and a reduction in constructive barriers could improve cervical cancer screening behavior (20, 21).

**Discussion**

Cervical cancer is a common women cancer, and our study systematically assessed the effect of MIs on improving cervical cancer screening in women. A review of the literature revealed that few studies have focused on the effect of MIs on cancer screening behaviors. Based on the results of this systematic review, the motivationally tailored interventions are effective methods for boosting motivation regarding performing a Pap smear test. The evidence indicated that MIs could help reduce the barriers of cervical cancer screening and thus could help increase the cervical cancer screening rate.

The result of our study further showed that different MI methods (i.e., face-to-face interviews, consultation sessions or calls, and educational programs) are effective in cervical cancer screening uptake in women. In their systematic review, Lu et al reported that the combination of workplace-based educational programs with mobile screening services is effective in promoting breast and cervical cancer screening uptake in Asian women (18). In addition, Soares and Silva found that the use of media, telephone call, and invitation letter could increase women’s knowledge about cervical cancer screening (19).

Two other systematic reviews reported that one-to-one education and a reduction in constructive barriers could improve cervical cancer screening behavior (20, 21).

**Conclusions**

In conclusion, according to our systematic review, MI-based interventions were effective for improving cervical cancer screening and most relevant studies recommended using this type of interventions to increase the frequency of regular screening. It is noteworthy that MIs involve...
strategies that increase one's motivation to move from the pre-contemplation and contemplation stages toward action and maintenance stages. Therefore, the use of MI strategies facilitates making decisions on change by taking into account the positive and negative aspects of a change (22, 23).

**Authors' Contribution**
The first, second, and third authors performed an initial search of databases and were major contributors in writing the manuscript. Fourth and fifth authors reviewed studies to investigate eligibility criteria. The sixth author regulated methods and performed a meta-analysis. All authors read and approved the final manuscript.

**Conflict of Interests**
Authors declare that they have no conflict of interests.

**Ethical Issues**
Not applicable.

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### Supplementary Materials
Supplementary file 1 contains Table S1.

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### Table 3. Frequency of Pap Smear in Study Participants

| Author                        | Applied Motivational Strategy                                      | Participants                                                                 | Frequency of Pap Smear in the Intervention Group | Frequency of Pap Smear in the Control Group | P Value |
|-------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------|---------|
| Mahmoudi Majd Abadi (2018)    | Counseling based on motivational interviewing                       | 90 women (between 30 and 59 years) in two groups (control and intervention) each including 45 subjects | 77.8%                                           | 11.1%                                      | 0.004   |
| Zolfaghari et al              | Motivational interviewing based counseling                          | 134 teachers (aged 30-60 years) in two groups (control and intervention) each including 67 subjects | 20.9%                                           | 9%                                         | <0.001  |
| Pourebrahim et al             | Motivational interviewing based counseling                          | 150 female (aged 30-59 years) in three groups (i.e., motivational interviewing, motivational phone call, and control) each containing 50 subjects | 32% in the motivational interviewing group and 22% in the motivational phone call group | 4%                                         | 0.002   |
| Dehdari et al                 | Educational intervention based on the protection motivation theory    | 200 women in control (n= 101 with a mean age of 37.9 years) and intervention (n= 97 with a mean age of 38.8 years) groups | 60%                                             | 10%                                        | <0.001  |
| Gahremani et al               | Educational intervention based on the protection motivation theory    | 420 women in control (n= 210 with a mean age of 37.09 years) and intervention (n= 210 with a mean age of 38 years) groups | 62.85%                                          | 5.7%                                       | <0.001  |
| Khiyali et al                 | Educational program based on the protection motivation theory        | 200 women in control (n= 100 with a mean age 36.76 years) and intervention (n= 100 with a mean age of 37.82 years) groups | 58%                                             | 3%                                         | <0.001  |
| Malmir et al                  | Educational intervention based on the protection motivation theory    | 143 women (20-50 years) in intervention (n= 72) and control (n= 71) groups    | 48.6%                                           | 32.4%                                      | 0.048   |
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