



## Review Article

## Effect of pelvic floor muscle training on postpartum sexual function and quality of life: A systematic review and meta-analysis of clinical trials

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## ABSTRACT

There are a weakness and laxity in pubourethral and external urethral ligaments during postpartum which has an important role in the females' sexual function and quality of life. Some evidences showed that pelvic floor muscle training can strength pelvic muscles and prevent sexual dysfunction. Therefore, current study aimed to review the effect of pelvic floor exercise on female sexual function and quality of life in the postpartum period.

PubMed, CINAHL, Medline, Scopus, Google scholar citations, Persian databases including SID and Iran Medex were searched using MeSH-based keywords to find published articles. Experimental and quasi-experimental studies in Persian and English were included. Data extracted was done in pre-defined checklist by two independent researchers. Risk of bias was assessed using the Cochrane Risk of Bias tool. Meta-Analysis of the data was carried out by "Comprehensive Meta-analysis Version 2" (CAM).

The search resulted in 347 titles and abstracts, which were narrowed down to 12 potentially eligible articles. Pooled standardized differences in means (SMD) of sexual function in both pelvic floor exercise and control group were 0.462 [0.117 to 0.806],  $p = 0.009$ . The pooled SMD was 1.294 [0.926 to 1.663],  $p < 0.001$  for sexual quality of life. The pooled SMD was 0.232 [0.038–0.426],  $p = 0.019$  for general quality of life.

Evidences showed that pelvic floor muscle training in primi or multi-parous women can boost sexual function and quality of life in postpartum. Although the majority of studies and the result of meta-analysis reported positive results, more high-quality RCTs are needed in this area. One limitation of our study is significant heterogeneity because of different intervention method.

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## Introduction

Although pregnancy and childbirth are a physiological process, they may be associated with potentially dangerous factors that can put women at risk. One of the most common and inevitable complications of labor is its effect on pelvic muscle structure, and this effect may cause some problems [1,2]. It has been reported that about 50% of pelvic organ prolapse (POP) happen due to childbirth [3], and researches by using MRI reported 20–26% of major injuries happen following vaginal childbirth [4]. Vaginal delivery can cause weakness and laxity in pubourethral and external urethral

ligaments [5]. POP has negative effects on many aspects of women's quality of life (QOL), such as personal, psychological, social, economic, occupational, physical, and sexual life [6,7].

The pelvic floor has an important role in female sexual function (SF) [8]. Rezaei et al. (2017) reported that the majority of postpartum women (76.3%) had sexual dysfunction [9]. Also Khajehei et al. (2015) declared that two-thirds of participants (64.3%) reported sexual dysfunction during the first year after delivery [10]. Urinary leakage during intercourse, bulging into the vagina, dryness, and dyspareunia decrease enjoyment of both partners sexual activity [11,12]. Weak muscles cannot provide sufficient blood flow to the clitoris for attaining orgasm. Strong pelvic floor muscles, especially ischiocavernosus muscle are important for satisfactory arousal and achievement of orgasm.

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For both partners, sexual enjoyment increase by genital contraction in Levator ani, involving of the pubococcygeus and iliococcygeus muscles. Therefore, sexual functions maybe ameliorate by strengthening pelvic floor muscles [8,13]. There are some options for treatment, which choosing one of them depends on the severity of the symptoms [3]. There is an agreement in many studies that pelvic floor muscle training is a first-line treatment of pelvic floor dysfunction [14], and pelvic floor muscle training can prevent postpartum pelvic muscles impair and sexual dysfunction [15,16].

Studies that evaluated the effect of pelvic floor exercise on female sexual function during postpartum period reported contradictory results [1,14,17]. Although performing a systematic review and meta-analysis are the best way to summarize the evidences, to date a comprehensive systematic review which evaluates the impact of pelvic floor exercises on sexual function and quality of life of women in postpartum period is lacking. Previous reviews assessed the role of exercise in sexual function in the general population [13,18], in urinary incontinence population [19], on the Quality of Life in Pregnant women [20], on POP stages or Symptoms [21], and one study was done on pregnant and Postpartum women [22], but none of them run a meta-analysis. So, the purpose of this study was to review the Interventional studies, which determine the effect of pelvic floor exercise on female sexual function and quality of life in the postpartum period.

## Materials and methods

### Literature search strategy and study selection

A systematic literature review was done through electronic sources such as: ISI Web of Knowledge, PubMed central, MEDLINE and EMBASE and Scopus, Iran Medex, SID to identify relevant articles. Two researchers independently searched Persian and English language articles published in electronic databases, and searching for articles was done using MeSH-based keywords. Employed terms were shown in Table 1. MeSH terms selected according to components of PICOT. P (Population): women with pelvic organ prolapse, I (Intervention): pelvic floor exercise, C (Comparison group): watchful or other types of therapies, O (Outcome): Sexual function, T (Time or duration): Pregnancy or postpartum.

No limitation was applied on the publication date and place of studies in searching process, but we had language limitation, and Persian and English articles were searched. At first, articles were selected by screening the titles and abstracts, then in cases eligibility was unclear from the abstracts, full text of the articles reviewed. Researchers also perform hand searching by probing in references of previous review articles and citations of selected articles in Google scholar. The process of searching and selecting articles was directed by (PRISMA) guideline (Fig. 1). The review included studies undertaken up to Oct 2018, because the writing process, reading by all authors took some time, re-searching for new published articles was done in December.

Inclusion criteria were interventional trials in English or Persian languages for systematic review, and quasi-experimental and randomized controlled trials (RCTs) for meta-analysis. The search was

limited to studies that perform pelvic floor exercise in pregnancy and postpartum, but evaluation of Sexual Function and quality of life was in postpartum period after vaginal delivery. Totally, our primary outcome of interest was Sexual Function, our secondary outcome was sexual quality of life and the third one was quality of life. Studies enter to our meta-analysis which using FSFI, SQoL, King and SF-36 questionnaires as an outcome. Studies that conducted pelvic floor exercise in general population, post-menopause and male were excluded. Also, Studies that conducted exercise program on women after cesarean delivery was not in the scope of this study.

### Definition of sexual function

‘Appropriate function in any stage of the sexual function: desire (or libido), excitement, lubrication, orgasm, satisfaction, and pain (or dyspareunia)’ [23].

### Definition of quality of life

‘It is a broad ranging concept includes: person’s physical health, psychological well-being, social relationships, and sexual satisfaction’ [24].

### Definition of exercise

‘A structured series of repeated tensing and relaxing of the pelvic floor muscles’ [25].

### Data extraction and quality assessment

Two authors separately extracted data and checked the articles quality. If there was a contradiction between the researchers, the third person was assisted to reach an agreement. For extracting data researchers designed a form and two authors individually extracted the required data. Following information extracted: 1st author name, year of publication, country of study, sample size, Training protocol, Outcome measure tools, Results, Losses to follow-up. To obtain more information that was not included in the article, authors were requested by email and only two authors replied [2,5]. The quality of the selected articles was evaluated by Oxford Center for Evidence Based Medicine checklist.

### Risk of bias assessment

Evaluation the risk of bias of all selected articles was done by two authors independently using modified Cochrane tool for assessing risk of bias; the criteria outlined in the Cochrane Handbook for Systematic Reviews of Interventions. Risk of bias was classified as (high risk, low risk, or unclear risk) for each following six domains: ((random sequence generation (selection bias), allocation concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment (detection bias), handling of incomplete outcome data (attrition bias), selective outcome reporting (reporting bias), and other potential source of bias)) [26].

**Table 1**  
Search terms.

pelvic floor exercise OR (PFE) OR pelvic floor muscle training OR (PFMT) OR pelvic floor muscle exercise OR (PFME) OR Kegel exercise Pelvic Floor Muscle Strength	AND	Sexual function OR Sexual dysfunction OR Dyspareunia Quality of life OR Sexual quality of life	AND	postnatal OR after delivery OR postpartum OR childbirth OR puerperium
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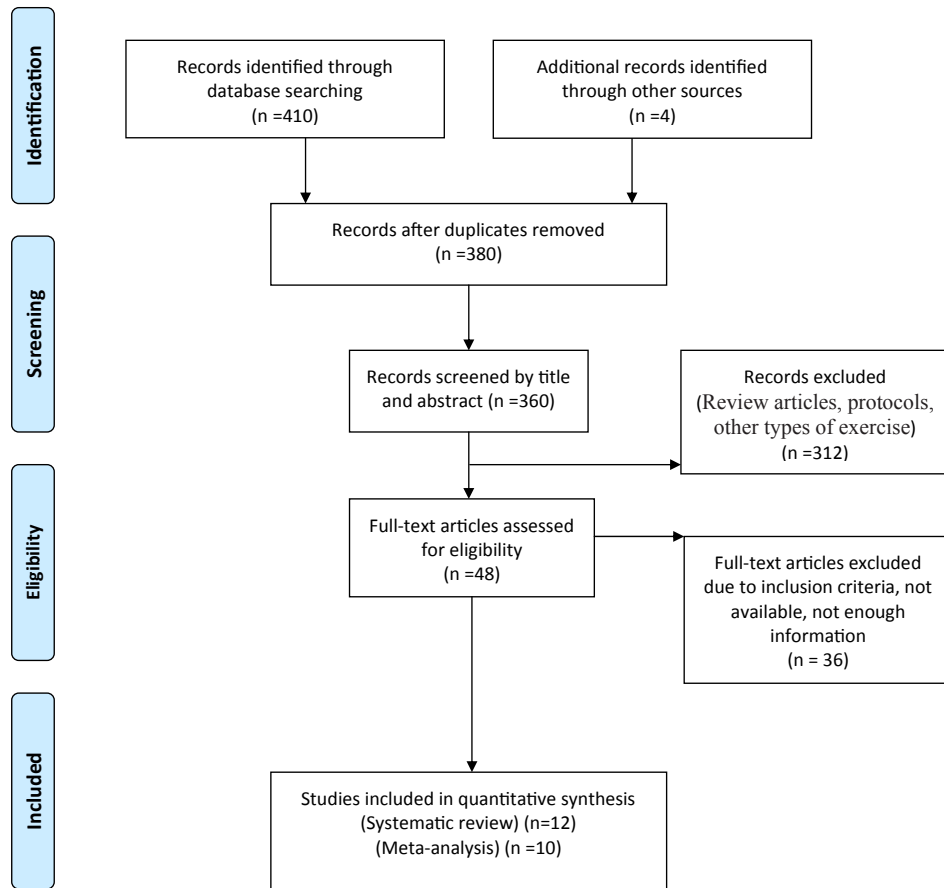


Fig. 1. PRISMA flow diagram of selection of study process.

### Statistical analysis

Comprehensive Meta-analysis Version 2 software (Biostat, Englewood, NJ, USA) was used to do meta-analysis. We pooled results of all the studies, regardless the type of exercise intervention. The main measure of effect for the meta-analysis was means difference. We estimated the differences between means by standardized difference in means (SMD). According to studies difference, random effects models of analysis were used to synthesize. Most studies reported pre-intervention and post-intervention MDs. Differences between the intervention and control groups were calculated and assessed. Heterogeneity was evaluated by Cochrane Q test and I-squared index ( $I^2$  index). The level of statistical significance was set at  $p < 0.05$ . For publication bias funnel plots were drawn.

### Results

The PRISMA flowchart of searching and selecting literatures is outlined in Fig. 1. In first searching 410 articles were found through database searching. Titles and abstracts were read to identify related articles, 312 articles were excluded because they were review articles, protocols, duplicated, different population and didn't meet inclusion criteria. One study exclude because of plagiarism, it has exactly the same results of Golmakani's study [27]. Finally, 12 articles were eligible to enter in our review. In meta-analysis part five studies analyzed for sexual function, two studies analyzed for sexual quality of life and three studies analyzed for general quality of life. Two articles were excluded

from meta-analysis, because they are Pre-post Clinical Trial and they do not have control group [28,29]. Decisions for inclusion of articles were made by agreement between the two reviewers. Table 2 shows an outline of the 12 included interventional studies. They were arranged by publication date, from newest to oldest. Duration of intervention ranged from a total of 4 weeks–9 months. For the comparison group, control subjects in most of studies received routine care, just one study receive other type of pelvic exercises and two studies because of before-after design did not have control group and used each woman as her own control. Nine studies recruited only primiparous women [1,2,14,17,30–34]; one study included multiparous [28]; two studies included both primiparous and multiparous women [5,29] and in one study parity was not mentioned [35].

Six articles reported outcomes on sexual function; one of them was excluded because it didn't have RCT design. Five studies were included in the meta-analysis to assessed sexual function [2,14,17,31,32]. Fig. 2 presented a forest plot of the meta-analysis. Pooled standardized differences in means (SMD) of sexual function in both pelvic floor exercise and control group were 0.462 [0.117 to 0.806],  $p = 0.009$ . The Cochrane Q value was 12.63,  $p = 0.013$ ,  $I^2 = 68.3\%$ . Meta-analysis of this trials revealed that pelvic floor exercise can mildly improve sexual function. The funnel plot is shown in Fig. 3.

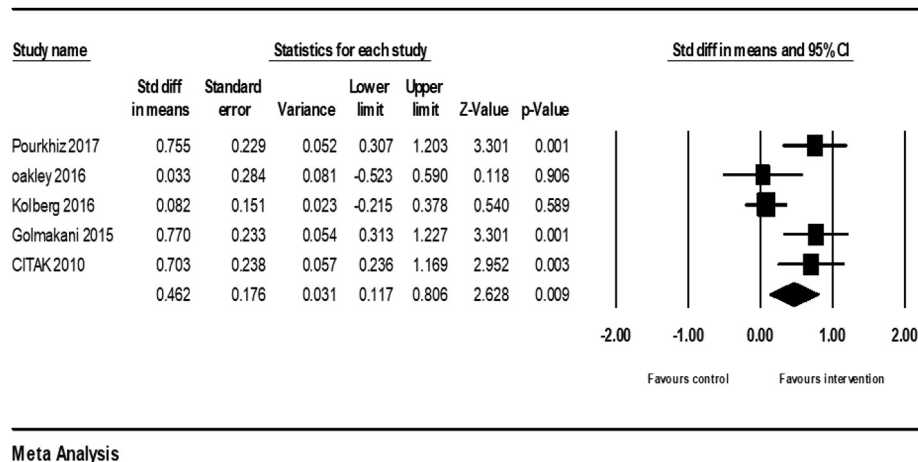
Two studies provided sufficient statistical information to be included in meta-analysis for sexual quality of life [17,30]. The pooled SMD was 1.294 [0.926 to 1.663],  $p < 0.001$ . The heterogeneity of the included trials was high; ( $I^2 = 97.2\%$ ,  $p < 0.001$ ). To evaluate the sources of heterogeneity we should perform the meta-

**Table 2**  
Characteristics of included studies.

Author (reference)	Publication date	Country	Study type	population	Training protocol	Outcome measures	Results	drop out
Hoseinkhani [1]	2018	Najafabad-Iran	3-arm RCT	1-Kegel exercises (N = 12) 2-central stability training (N = 12) 3-combined exercises (N = 12)	Subjects in each group conducted the training program for six weeks (three sessions in each week). Contract their muscles for 10 s and relax for 10 s, 6–8 times per day. 1-in bath in sitting position conduct contraction 2-in central stability group, subjects did contractions in Sleeping to the abdomen and sleeping to the side position 3-mix of 2 group above	<b>SF-36</b>	However, no significant differences between the three methods ( $P > 0.05$ ). Combined exercises had higher effect.	Not mentioned
Pourkhiz [17]	2017	Sari-Iran	2-arm RCT	1-PFM training group (N = 41) 2-usual care group (N = 41)	<b>1-PFM:</b> at least twice a day, 8–12 contractions at each time, holding for 6–8 s. Start from 36 to 37 weeks and after giving birth as soon as one can <b>2-Control:</b> routine care 1-The intervention group did PFPT with biofeedback and received Behavioral therapy. The intervention arm completed four 60-min PFPT sessions which beginning at week 6 after delivery. Both groups completed questionnaires as well at baseline (week 2) and weeks 12 postpartum. <b>2-Control:</b> routine care	FSFI SQOL-F	the mean total sexual function and sexual quality of life score was greater in the PFM training group; ( $P < 0.001$ )	One in each group
Oakley [31]	2016	Ohio	2-arm RCT	1-PFPT group (N = 27), 2-control group (n = 23)	1-The intervention group did PFPT with biofeedback and received Behavioral therapy. The intervention arm completed four 60-min PFPT sessions which beginning at week 6 after delivery. Both groups completed questionnaires as well at baseline (week 2) and weeks 12 postpartum. <b>2-Control:</b> routine care	<b>FSFI, FIQOL, SF-12, UDI-6, IIQ-7, FISI</b>	Both groups significantly improved in physical health ( $P < 0.000$ ) and sexual function ( $P < 0.000$ ) after 12 weeks of postpartum, but there was no difference between two groups.	4 from the study group, 4 from the control group
Kolberg [14]	2016	Norway	2-arm RCT	1-PFMT training group (n = 87) 2-control group (n = 88)	1- The training group attended a weekly PFMT class for 4 months, starting 6 weeks postpartum. Also they did daily three sets of 8–12 PFM contractions at home. At 6 weeks (baseline) and 6 months postpartum women answered an electronic questionnaire. <b>2-Control:</b> routine care	ICIQ-FLUTSsex	No difference was seen between case and control groups in symptoms related to sexual dysfunction during 6 months of postpartum.	(n = 3) from the study group, (n = 10) from the control group
Golmakani [2]	2015	Iran	2-arm RCT	1-PFMT training group (n = 40) 2-control group (n = 39)	1-after 8 week of delivery women were trained to Contract their pelvic floor muscles for 5–10 s and relax for 5–10 s and repeating this exercise for 20 times (for 5 min). After 2 min of rest, they again had to perform this exercise for 3 times of 5 min. so that a total of 20 min of exercise is performed at each time. Twice daily, each time 15–20 times depending on their ability. 4 and 8 weeks after the beginning of the study compared in both group <b>2-Control:</b> routine care	Brink scale, Bailes sexual self-efficacy	Comparison of the two groups presented a significant difference in sexual self-efficacy after performing these exercises ( $P = 0.001$ ).	(n = 12) from the study group, (n = 13) from the control group
Mahishale [29]	2014	India	Pre-post Clinical Trial	(N = 33)	pelvic floor muscle exercises were given from second to fourth day postpartum, twice per day and each session lasting for 30 min.	<b>SF-36</b>	The results showed statistically significant difference in quality of life on 4th day post intervention as compared to 2nd day pre-intervention in all domains ( $p < 0.001$ )	3 drop out
Zare [30]	2014	Iran	2-arm RCT	1-PFMT training group (n = 40) 2-control group (n = 39)	<b>1-The intervention group</b> was performed pelvic floor muscles exercises for eight weeks. Both groups were evaluated at weeks 4 and 8 after start of the study. <b>2-Control:</b> routine care	SQOL-F,	8 weeks after start of the study, sexual quality of life between intervention and control groups showed significant difference ( $p = 0.001$ ). There was a significant increase in sexual satisfactions, 8 weeks after the start of the study in the intervention group ( $p < 0.001$ ).	(n = 12) from the study group, (n = 13) from the control group

Haruna [35]	2013	Tokyo	2-arm RCT	Intervention group; (n = 48), control group; (n = 47)	1-Exercise classes were held 4 times weekly for 4 weeks, 90 min each, at three months postpartum. The exercise class included: aerobic exercise (50–60 min) where the participant sits and bounces on an exercise ball. The outcome measures were assessed at two months postpartum (baseline) and at four months postpartum (outcome). 2-Control: routine care	SF-36v2	The postpartum exercise class improved health-related QOL in the training group compared to the control group, although there were no significant differences in the Physical and Mental component of quality of life between the groups.	2 from the study group, 4 from the control group
EL-BEGWAY [28]	2010	Cairo	Pre-post Clinical Trial	(N = 30)	Pelvic floor exercises were performed for 3-months, 3-sessions per week. Evaluation were done before starting and after 3 months of treatment	FSFI	Sexual function improved significantly ( $p < 0.05$ )	Not mentioned
Citak [32]	2010	Istanbul, Turkey	2-arm RCT	1-PFM training group (n = 37) 2-control group (n = 38)	1-In the 4th postpartum month women were trained to do PFM contraction. 2–3 s contraction and relaxation, ten times a day in the first 15 days. Thereafter, the duration of contraction and relaxation was changed to five seconds. Then increase the durations to 10seconds and the number of workouts to 15 sessions/day up to the end of the study. The results of both groups, obtained in the 4th and 7th postpartum months, were compared	FSFI	All domains except satisfaction were significantly higher in the training group compared with the controls. sexual arousal, lubrication, orgasm, and satisfaction scores were improved in the 7th month in the training group;(P < 0.001)	21 from the study group, 22 from the control group
Bahadoran [5]	2006	Iran	semi-experimental	1- training group (n = 31) 2-control group (n = 31)	They were advised to take the exercise from the second to forth postpartum day, twice daily, for 10–15 min. Fortieth day of postpartum the participants filled the questionnaire for second time. 2-Control: routine care	SF-36	Findings showed that the intervention group scored statistically significant higher in all domains of quality of life except physical health.	Not mentioned
Reilly [34]	2002	UK	2-arm RCT	1-PFE training group (n = 120) 2-control group (n = 110)	1-The exercises comprised three repetitions of eight contractions each held for six seconds, with two minutes rest between repetitions. These were repeated twice daily. At 34 weeks of gestation the number of contractions per repetition was increased to 12. 2-Control: routine care	King's Health Questionnaire, SF-36	At 3 months, there was no difference between the intervention groups on any of the eight scales of the Kings Health Questionnaire. higher score for the general health measure in the Short Form-36 in those in the exercise group compared with the control group	(n = 52) from the study group, (n = 47) from the control group

FSFI female sexual function index, SQOL-F Sexual quality of life-female, PFMT pelvic floor muscle training, ICIQ-FLUTSsex Incontinence Modular Questionnaire-sexual matters module, PFE pelvic floor exercise, PFPT pelvic floor physical therapy, FISI Fecal Incontinence Severity Index, UDI-6 Urogenital Distress Inventory-6, IIQ-7 Incontinence Impact Questionnaire-7.



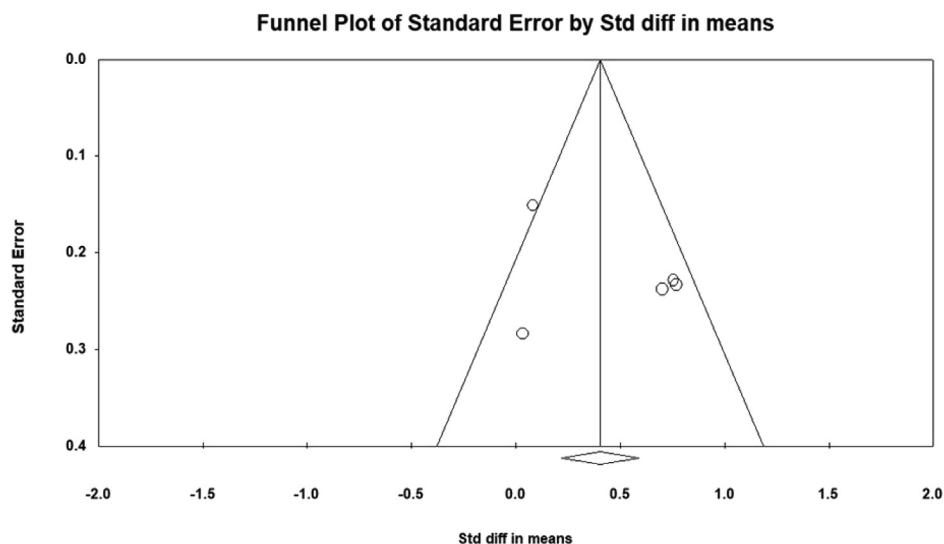
#### Meta Analysis

**Fig. 2.** Forest plot of the meta-analysis. The effect of pelvic floor muscle exercises on sexual function based on standard difference in means (SMD). The horizontal lines denote the 95% CI, ■ point estimate(size of the square related to its weight), ◇ combined overall effect of treatment.

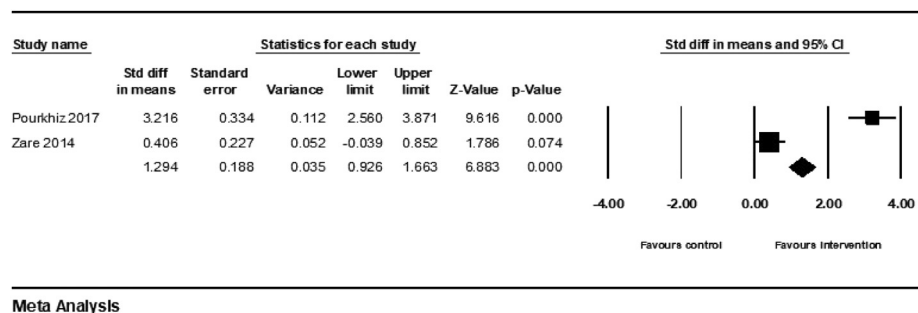
regression analysis, but with these few number of studies which include in our meta-analysis was not suitable to run statistical subgroup analysis. Forest plot of the meta-analysis was shown in Fig. 4.

Six articles reported outcomes on general quality of life, but three of them entered in meta-analysis [1,5,29,31,34,35]. The

pooled SMD was 0.232 [0.038–0.426],  $p = 0.019$ . Subgroup analyses showed there were no significant relationship between pelvic floor exercise and general quality of life. Pooling of data demonstrated (SMD, 0.283 [-0.093, 0.660],  $p = 0.140$ ) for mental health and (SMD, 0.200 [-0.074, 0.473],  $p = 0.153$ ) for physical health. Heterogeneity across all studies in this outcome is not significant



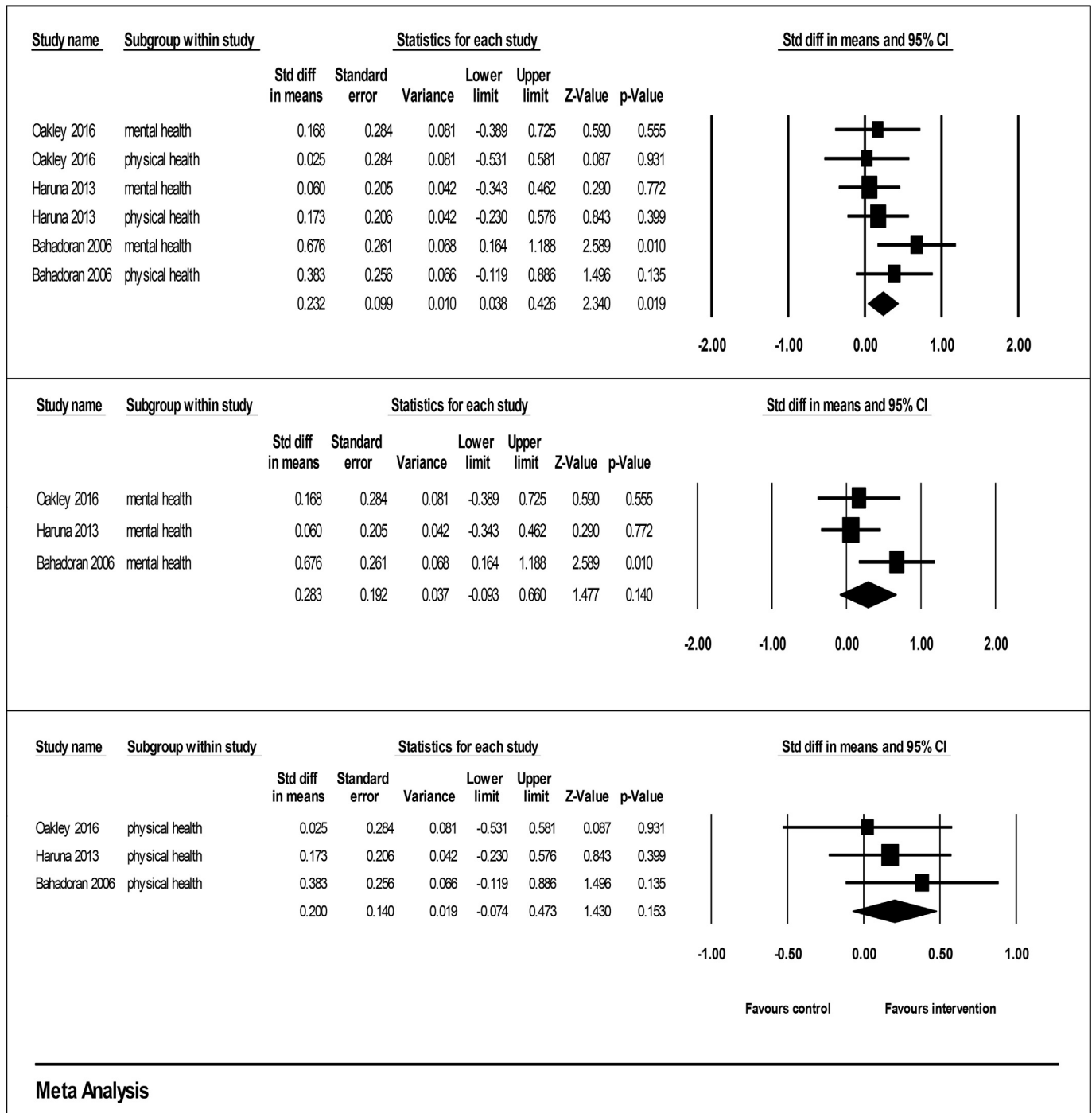
**Fig. 3.** Funnel plot of results from included studies on the effects of pelvic floor muscle exercises on sexual function.



#### Meta Analysis

**Fig. 4.** Forest plot of the meta-analysis. The effect of pelvic floor muscle exercises on sexual quality of life based on standard difference in means (SMD). The horizontal lines denote the 95% CI, ■ point estimate(size of the square related to its weight), ◇ combined overall effect of treatment.





**Fig. 5.** Forest plot of the meta-analysis. The effect of pelvic floor muscle exercises on quality of life based on standard difference in means (SMD). The horizontal lines denote the 95% CI, ■ point estimate (size of the square related to its weight), ◇ combined overall effect of treatment.

( $I^2 = 0$ ;  $P = 0.465$ ), because they all use same standard questionnaire. Forest plot of the meta-analysis was shown in Fig. 5. Funnel plot of results from included studies on the effects of pelvic floor muscle exercises on quality of life was shown in Fig. 6.

#### Description of risk of bias

Results for risk of bias assessments of each study are shown in Fig. 7. Eight studies were judged to have unclear risk of selection bias because of insufficient information provided on random

sequence generation or allocation concealment. Five studies reported adequate allocation concealment using sequentially numbered, sealed opaque envelopes [14,17,31,34,35]. In relation to pelvic floor exercise as an experiment, it was not feasible to consider blinding women or their health providers. So, all included studies exposed to a high risk of performance bias and this were kept in mind when interpreting the findings. Four studies was low risk in relation to Blinding of outcome assessment [14,17,31,34]. Three studies were judged to be at high risk for attrition bias because of an imbalance in lost to follow-up between structured

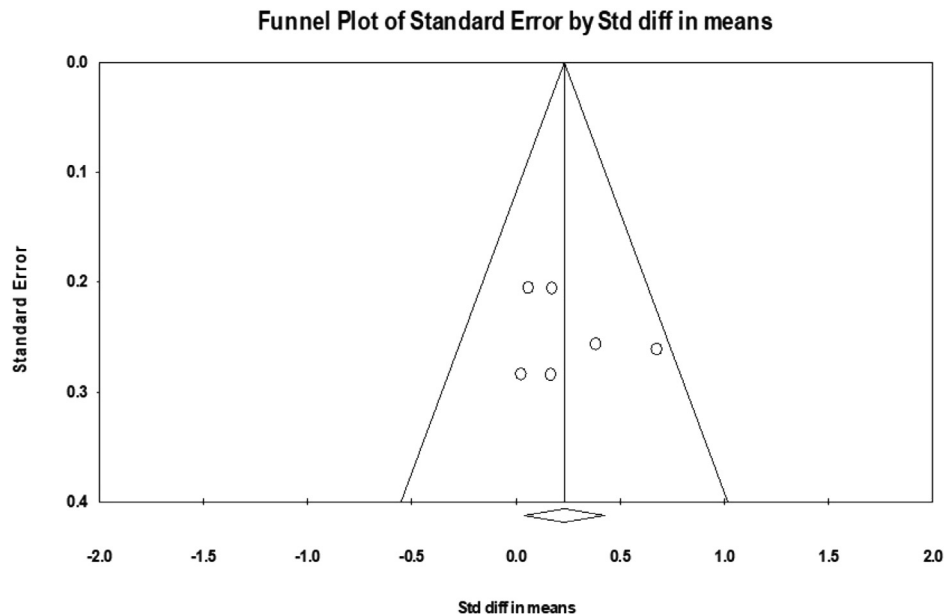


Fig. 6. Funnel plot of results from included studies on the effects of pelvic floor muscle exercises on quality of life.

pelvic floor training versus control groups, or a greater than 20% loss overall [1,5,32]. Four studies were judged as having unclear risks of selective reporting, because they didn't report results well, and it was uncertain whether their outcomes and measurements had been planned a priori [1,5,28,32].

## Discussion

According to aim of this review, we assessed the efficacy of Pelvic Floor Muscle Exercises on sexual function and quality of life in postpartum women. The quantitative pooling of the studies showed a statistically significant increase in sexual function when pelvic floor muscle exercises were used. In line with our result, Dean et al. (2008) in a cross-sectional study on post-partum women found that women who reported that they were doing pelvic floor exercise scored significantly higher on the majority of sexual function questions [16]. Also Wu et al. (2018) in a meta-analysis study reported a reduction in unsatisfactory sexual function. The difference between their study and our study was that they included combined studies (such as combination of pelvic floor muscle exercise with lifestyle or biofeedback and electrical stimulation), but we included just pelvic floor exercises studies [36]. There are some mechanisms to explain why using pelvic floor muscle exercises can ameliorate sexual function. Pelvic floor exercises strengthen levator-ani muscle through muscular hypertrophy. Stronger levator ani muscle enhances support and lessens the burden imposed on the ligament. Doing pelvic exercises lead to increase blood flow to the pelvic floor, help speed healing and revascularization of damaged cells and tissues [2,28].

Although most studies showed an improvement in sexual variable, results should be interpreted with caution because of methodological limitations of some studies. One study had a high rate of attrition [32]. One other study did not describe allocation concealment and their study may have a selection bias [2]. Two studies did not have control group [28,29]. The result of one study showed no significant difference in SF between two groups [14]. This controversial result in this study in comparison to other studies can be explained by outcome measurement tools. In this study, researchers used different tools to evaluate sexual function. In their study, they declared that, the questionnaires that they used

was not valid for postpartum women, and a more comprehensive questionnaire for evaluating orgasm, arousal and interest could better show the effect of exercise on SF. Other studies used FSFI questionnaire which is the best way to evaluate all domains of female sexuality (Desire, Arousal, Satisfaction, Lubrication, Orgasm and Pain). Golmakani et al. used Bailes sexual questionnaire which also consist these variables plus two more variables (communication, body acceptance).

For our secondary outcome in meta-analysis, significant improvement was seen in sexual quality of life following pelvic floor exercises. Studies on sexual issues revealed a clear link between sexual dysfunction and low quality of life [37]. Fatigue, insomnia, lactation, and hormonal changes are factors that associated with vaginal dryness, decreased lubrication, and libido, which may cause painful intercourse and decrease sexual quality of life. Although social and psychological factors play an important role in women's sexual dysfunction, the role of physical factors such as vascular, nervous and muscular factors in female sexual function is undeniable. Therefore postpartum sexual function can be affected by some physical and psychosocial problems [22]. Although both studies that measured this variable reported improvement in sexual quality of life, due to the low number of studies in this field, further studies are needed. In a study by Kian et al. (2010) aimed at investigating the effect of pelvic floor exercise on the quality of life of 80 women with stress incontinence in postpartum period, result showed quality of life in women who had eight weeks of pelvic floor exercise exercises significantly increased compared to control group [38]. Pelvic floor muscles play an important role in sexual function. Given that pregnancy and childbirth are factors in weakening the pelvic floor muscles, the best way to strengthen them is pelvic floor exercises. Certainly, better sexual function will subsequently improve the quality of sexual life [30,39].

For our third outcome in meta-analysis, significant improvement was seen in total quality of life following pelvic floor exercises. In line with our result Zarawski et al. (2017) found that pelvic floor training ameliorate quality of life of women with urinary incontinence in both pregnancy and the postpartum period [33]. Gagnon et al. (2016) in a prospective cohort study showed that performing pelvic floor muscle exercises related to significant



	Random sequence generation (Selection bias)	Allocation concealment (Selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other potential source of bias
oseinkhani et al. 2018	?	?	-	-	-	?	-
Pourkhiz et al. 2017	+	+	-	+	+	+	+
Kolberg et al. 2016	+	+	-	+	+	+	+
Oakley et al. 2016	+	+	-	+	+	+	+
Golmakani et al. 2015	+	?	-	-	+	+	+
Mahishale et al. 2014	?	?	?	?	+	+	+
Zare et al. 2014	+	?	-	-	+	+	+
Haruna et al. 2013	+	+	-	-	+	+	+
El-Begway et al. 2010	+	?	?	?	?	?	?
CITAK et al. 2010	+	?	-	-	-	?	-
Bahadoran et al. 2006	+	?	-	-	-	?	?
Reilly et al. 2002	+	+	-	+	+	+	+

Fig. 7. Risk of bias summary: Author's judgment of risk of bias items for each included study.

improvements in women's quality of life [40]. The results of the analysis of the quality of life in the physical and mental dimensions separately did not show any significant results. Bahadoran et al.(2006) demonstrated that mental aspect of life quality would be affected by postpartum physical exercise but not physical aspect [5]. Oakley et al. (2016) showed significantly improvement in physical health but not in mental health of quality of life [31]. The

reason for the difference in the results of these two studies can be explain by different inclusion criteria. In Oakley study primiparous women undergoing a vaginal delivery complicated by a 3rd- or 4th-degree laceration entered and they had worse physical health at baseline, but in Bahadoran study women undergoing normal delivery for the first, second or third time entered. In Haruna et al. study (2013) the postpartum exercise class successfully improved

health-related QOL in training group, but there were no significant differences between the groups in the Physical and Mental dimensions [35].

The strength of this review is its evaluation about the possibility of improving two important factors following pelvic floor muscle exercises in postpartum period. The meta-analysis part was restricted to RCTs to reduce the effect of confounders. Also, we tried to reduce bias during the review process by assessing the eligibility of studies, extracting data and evaluating the risk of bias by two researchers individually. But this study, like other studies, has some limitations. One limitation of our study was Heterogeneity in the design of studies. The included studies had a variety of intervention methods, and measurements tool, settings, which restricted subgroup analysis. Intervention methods were different because of different onset, different duration and rest of exercise. So, interpreting the results should be done with caution. There remains a lack of high-quality evidences regarding the effect of PFMT on SF during the postpartum period. Also a same and specific exercise protocol should be designed to teach to strengthen the pelvic floor muscles, because there was great variation between the PFMT regimes in studies, which range from individual and home exercise to different exercise classes.

## Conclusion

Evidences showed that pelvic floor muscle training in primi or multi-parous women can boost sexual function in postpartum and it's a safe strategy. The review of these studies has some implications for practice. It has been suggested that postpartum women who do Pelvic Floor Muscle Exercises may benefit from this procedure, increasing sexual health and quality of life. Therefore, health professionals should encourage women to do postnatal exercise. They should Pay more particular attention to women's sexual life in postpartum period and ask about symptoms of sexual dysfunction or impair quality of life. Education and follow up programs should be conducted to encourage adherence and continuation, rather than only supplying an information pamphlet.

## Conflict of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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