EUROX 15 (2022) 100155

Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology: X

journal homepage: www.journals.elsevier.com/european-journal-of-obstetrics-and-gynecology-and-reproductive-biology

Review article

Assessing the effects of exercise on post-partum fatigue symptoms: A systematic review and meta-analysis

Mohsen Kazeminia [a], Nader Salari [b], Shamarina Shohaimi [c], Hakimeh Akbari [d], Ali Asghar Khaleghi [d], Mohammad-Rafi Bazrafshan [e], Masoud Mohammadi [d,*]

[a] Student research committee, Kermanshah University of Medical Sciences, Kermanshah, Iran
[b] Department of Biostatistics, School of Health, Kermanshah University of Medical Sciences, Kermanshah, Iran
[c] Department of Biology, Faculty of Science, University Putra Malaysia, Serdang, Selangor, Malaysia
[d] Cellular and Molecular Research Center, Gerash University of Medical Sciences, Gerash, Iran
[e] Department of Nursing, School of Nursing, Larestan University of Medical Sciences, Larestan, Iran

ARTICLE INFO

Keywords:
Exercise
Fatigue
Postpartum
Systematic review
Meta-analysis

ABSTRACT

Background: The level of activity in women who have given birth is very low despite the great benefits of exercise on their physical and mental health. There are some contradictories between the results of several preliminary studies on the effects of exercise on post-partum fatigue reduction. Therefore, the aim of this study was to assess the effects of exercise on decreasing postpartum fatigue in general and, specifically, in Iran using meta-analysis.
Methods: In this study, the articles printed in international and national centres of SID, MagIran, IranMedex, IranDoc, Cochrane, Embase, ScienceDirect, Scopus, PubMed and Web of Science (WoS), were used to find the studies electronically published up to 2021. The studies' heterogeneity was examined using the I^2 index, and subsequently, a random-effects model was applied. Data analysis was performed within the Comprehensive Meta-Analysis software (version 2).
Results: Finally, nine articles met the inclusion criteria in this systematic and meta-analysis review. The included samples were 456 patients in the intervention group and 446 in the control group. The mean score of fatigue after the intervention was 8.1 ± 1.1 lower than before intervention in the experimental group, and this difference was statistically significant ($p \leq 0.001$).
Conclusion: The results of this study indicate that exercise reduces postpartum fatigue, which can be used for counseling and treatment by gynecologists. Reduce postpartum problems in women and increase the quality of life after childbirth.

1. Background

Mental imbalance in facing life transitions is a normal issue. Psychological changes in the prenatal period must be considered as a normal process according to diverse views [1]. the experience of childbirth may impact a mother's psychological condition and increase the chance to develop mental health disorders in subjects at risk [1,2], and some women may suffer from post-partum mental illnesses, including depression and fatigue [3–6].

Fatigue is an exhaustion sense that can be accompanied with reduced physical and mental power in doing jobs [7]. It can be apparent with a complex of mental and physical symptoms, and some people may experience just one of them [8]. postpartum fatigue symptoms may not be solved spontaneously and would benefit of competent midwifery support [9]. Western countries women classified fatigue as one of the five leading problems of the post-partum period [9]. The prevalence of severe and very severe fatigue in Tabriz women whose delivery had been six weeks earlier was 23.6% [10].

Postpartum fatigue can be accompanied with depression and its complications, lack of communication between the mother and the

Abbreviations: MESH, Medical Subject Headings; WoS, Web of Science; CONSORT, Consolidated Standards of Reporting Trials; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analysis.

* Corresponding author.
E-mail addresses: mkazeminia69@gmail.com (M. Kazeminia), n_s_514@yahoo.com (N. Salari), shamarina@upm.edu.my (S. Shohaimi), anaakbari91@gmail.com (H. Akbari), ali_iran6346@yahoo.com (A.A. Khaleghi), seeder2007@gmail.com (M.-R. Bazrafshan), Masoud.mohammadi1989@yahoo.com (M. Mohammadi).

https://doi.org/10.1016/j.eurox.2022.100155
Received 7 March 2022; Received in revised form 18 April 2022; Accepted 16 May 2022
Available online 20 May 2022

newborn, delay in infant development, early termination of lactation and delay in mother's operation and delay in the return of the mother's operation to prenatal and delivery status [11,12].

Limited studies had been done on post-partum recovery. Sleeping, resting, muscle relaxation, energy consumption reduction, and getting help from family members are solutions which are referred to in different studies. One of the ways to fatigue recovery in studies is doing exercise [13,14]. The treatment method of N-U-R-S-E was proposed to solve post-partum mental problems where N is Nourishment, U is Understanding, R is Rest and Relaxation, S is Spirituality and E is Exercise abbreviation [15].

Exercise leads to mutual interaction between different parts of the muscle. There is a proper movement domain in each joint which is essential for maximum operation. Flexibility is essential not only in doing physical works but also in preventing damage, also, flexibility is increased throughout the pregnancy and augmented close to the delivery time and in the immediate postpartum, due to the action of the hormone relaxing, For this reason joints can also be weak and it is mandatory that pre- and postpartum exercise is managed by a specialist in order to avoid inappropriate stretching [15,16]. Having no activity will lead joints to lose flexibility by shortening connective tissues [16]. Atashzadeand et al. showed that exercise leads to daily activities improvement [17]. The less active the person, the less energy they will have to operate, leading to loss of muscle mass and operation [18].

Several preliminary studies have been done to assess the effect of exercise on reducing post-partum fatigue, which there are some contradictions between the results of these studies. To respond to these assumptions and remove the inconsistencies, meta-analysis studies should be conducted. Therefore, this study aimed to determine the effects of exercise on post-partum fatigue in the world, specifically Iran, using meta-analysis.

2. Methods

2.1. Method of searching articles

The search of studies was done using the Persian databases of SID, MagIran, IranMedex and IranDoc and international databases of Cochrane, Embase, ScienceDirect, Scopus, PubMed and Web of Science (WoS) to find relevant sources, up to 2021. The list of resources used in all related articles and reports found in the electronic search was manually assessed to find other possible sources. The authors were contacted through email about the articles and information which could not be found and they were given at least two weeks to respond. The keywords used to search resources were selected from Medical Subject Headings (MESH) Database. The keywords were Exercise, Fatigue, Aerobic Exercise, Physical Activity, Lassitude, Childbirth, Parturition and Postpartum, Joint flexibility, Range of Motion, Articular, Joint weakness.

In this study the AND/OR operators, were used to provide more comprehensive access to all articles. Therefore, the AND/OR operator was used to check the common names for the disorder like by matching words (((((Exercise [Title/Abstract]) OR Aerobic Exercise [Title/Abstract]) OR Exercise Training [Title/Abstract]) OR Isometric Exercise [Title/Abstract]) OR Physical Activity [Title/Abstract]) AND Joint flexibility [Title/Abstract]) OR Range of Motion, Articular [Title/Abstract]) AND Fatigue [Title/Abstract]) OR Lassitude [Title/Abstract]) AND Childbirth [Title/Abstract]) OR Parturition [Title/Abstract] AND Postpartum [Title/Abstract]) OR Postpartum Period [Title/Abstract] OR Puerperium [Title/Abstract] OR Postpartum Women [Title/Abstract])))))).

2.2. Criteria for articles selection

Articles with the following features were selected for meta-analysis: (1) Original research articles, (2) Clinical trial studies, (3) Full-text availability, and (4) Studies that assessed the correlation between exercise and post-partum fatigue. Exercise was defined as any planned, structured, and repetitive physical activity in this study. Fatigue Identification Form was used as a validated tool to assess physical and mental symptoms of pregnancy and the post-partum period until two months after delivery, the mean score of post-partum fatigue in the study group was obtained at the beginning of the study and then after the intervention up to two months after the study [19,20]. All articles had a control group (who did not participate in the intervention group). Both intervention and control groups had the same clinical standard of care. It should be noted that all postpartum exercise was considered in this study and the type of exercise was not limited.

PICO criteria included: Participants: Pregnant women who had given birth. Intervention: physical exercises. Comparison: Evaluation of post-partum fatigue symptoms with non-intervention group. Outcome: Positive effect of physical exercises on post-partum fatigue symptoms.

2.3. Criteria for articles exclusion

The selected studies were examined more carefully. Review studies or those studies with samples of women who did not deliver a birth or had not a pregnancy period and also with previous data were excluded from the meta-analysis. Finally, 11 studies entered the third step, qualitative evaluation.

2.4. Data extracting

All final articles entered into the meta-analysis were prepared to extract through a pre-prepared checklist. The checklist included article title, first author's name, the publication year, place of study, the sample size of the intervention group, the sample size of the control group, the sample mean, post-intervention sample mean, pre-intervention sample standard deviation, post-intervention sample standard deviation and probability amount. Duplicate publications and multiple publications from the same population will be removed using citation management, software EndNote (version X7, for Windows, Thomson Reuters).

2.5. Quality assessment

The quality of the papers was evaluated based on the selected and relevant items of CONSORT checklist, which could be assessed in this study and already mentioned in previous studies including design of the study, background and review of literature, place and time of the study, consequence, inclusion criteria, sample size, and statistical analysis. The papers mentioning 6–7 criteria were considered as high quality, while those citing two or less than 2 of the seven mentioned items were considered as moderate and low-quality papers in terms of their methodology.

2.6. Statistical analysis

Regarding the effect of exercise on post-partum fatigue reduction as the studied index, frequency and percentage were used to combine different studies results and the standardized mean difference index in each study. I^2 index was used to assess homogeneity between studies and random-effects model to combine studies and conduct meta-analysis regarding heterogeneity in studies. I^2 index less than 25%, was considered as low heterogeneity, between 25% and 75% as mean inhomogeneity and more than 75% as high heterogeneity. P-value less than 0.05 was considered significant. The funnel diagram and Egger Test were also used to study the publication bias. Data analysis was performed within the Comprehensive Meta-Analysis software (version 2).

3. Results

All studies regarding the effect of exercise on fatigue reduction in the

post-partum period in Iran and the world were assessed systematically without time limit and based on PRISMA instruction. In the first research, 1102 articles were identified and finally, nine studies were entered the final analysis (Fig. 1).

The total participants were 902 individuals (446 control group and 456 intervention group). The features of the study entered the systematic review are shown in Table 1. All studies were clinical trials. Two articles were published in the Persian language, and seven articles were published in the English language.

Standard mean difference indices and relative risk were used for the studies' final result regarding the available data. In studies with ± mean, standard deviation, the index of standard mean difference was used in meta-analysis. The results showed heterogeneity between studies which the $I^2 = 98.7$ was for pre-intervention and $I^2 = 98.1$ was for post-intervention. Therefore, the random method was used to combine studies and final results. Egger test was also used to assess the existence of publication bias in the studies. The bias for before intervention was $P = 0.662$, and it was $P = 0.328$ for after intervention regarding Egger test.

Regarding meta-analysis, the standard mean difference was 9.9 ± 1.4 for pre-intervention, and it was 8.1 ± 1.1 for post-intervention. This statistical disagreement was significant ($p \leq 0.001$), which shows that exercise reduces post-partum fatigue. The accumulation graph shows the standardized mean difference index for each study and the final estimation of the index obtained from the combination of studies. In this graph, each study's weight in the final composite value showed that the size of each square is fitted with the weight of that study in the meta-analysis. (Figs. 2 and 3).

3.1. Meta-analysis of standardized mean difference before and after

Based on the meta-analysis results, the standardized mean difference between the before and after in intervention groups was 0.52 ± 0.11. The accumulation diagrams (Fig. 4) show the standardized mean

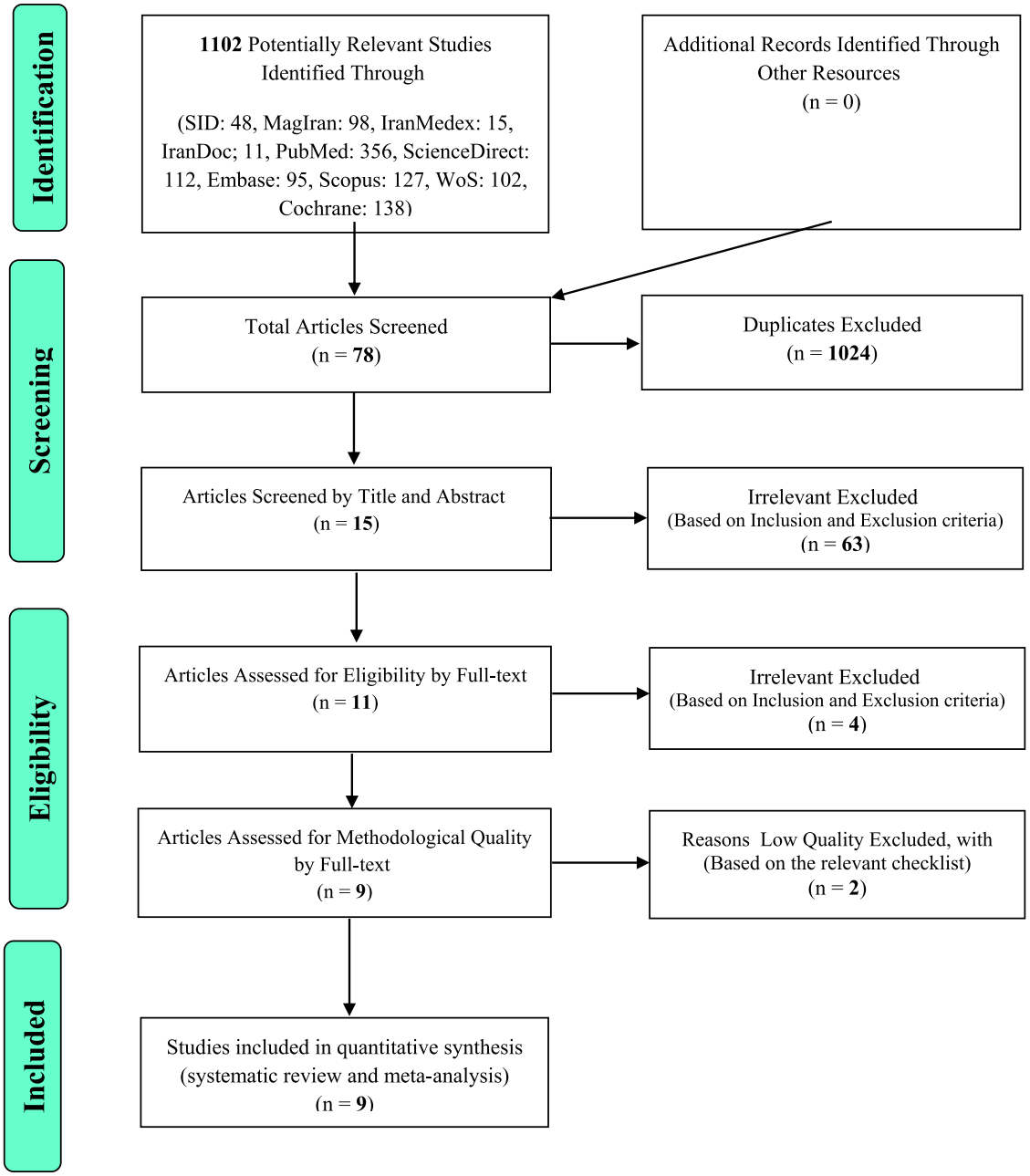

Fig. 1. Flow diagram of study selection.

Table 1
Specifications of studies entered into the meta-analysis.

Author, year, Reference	Country	Age (Year)	type of study	type of exercise	Method	Time to start the intervention	Review time	sample size Control group	sample size intervention group	Mean ± SD of Before	Mean ± SD of After	P-Value
Mohammadi, 2010,[21]	Iran	25.2 ± 4.7	Controlled randomized clinical trial	Pregnancy exercises 20–30 min per session, 3 times a week	Fatigue Identification Form	Third trimester of pregnancy	Two months after delivery	127	127	8.20 ± 3.56	6.80 ± 2.91	<0.05
Mohammadi et al., 2013, [22]	Iran	25.5 ± 4.6	Controlled randomized clinical trial	Pregnancy exercises 20–30 min per session, 3 times a week	Fatigue Identification Form	28–32 weeks of pregnancy	Two months after delivery	32	32	8.26 ± 5.19	7.61 ± 6.00	0.87
Mohammadi et al., 2015, [23]	Iran	25.3 ± 5.2	Controlled randomized clinical trial	Pregnancy exercises 20–30 min per session, 3 times a week	Fatigue Identification Form	28–32 weeks of pregnancy	Two months after delivery	36	42	8.14 ± 3.94	6.50 ± 5.14	<0.05
Ashrafinia et al., 2015,[24]	Iran	24.6 ± 3.6	Controlled randomized clinical trial	Pilates exercises five times a week (30 min per session) for eight consecutive week	Multidimensional Fatigue Inventory (MFI-20)	72 h after delivery	Two months after delivery	40	40	11.15 ± 2.17	7.80 ± 2.02	< 0.001
Ko et al., 2008, [25]	Taiwan	34.17 ± 3.20	Controlled randomized clinical trial	Six sessions a month and 30 min each session	Fatigue Symptom Checklist (FSC)	72 h after delivery	One months after delivery	30	31	3.97 ± 3.14	2.58 ± 2.54	<0.05
Dritsa et al., 2008,[26]	Canada	34.33 ± 3.36	Controlled randomized clinical trial	60–120 min of aerobic exercise per week for 12 weeks	Multidimensional Fatigue Inventory (MFI-20)	4–38 weeks of pregnancy	9 weeks after delivery	42	46	16.63 ± 2.89	15.36 ± 4.02	>0.05
Dritsa et al., 2009,[27]	Canada	34.57 ± 3.36	Controlled randomized clinical trial	60–120 min of aerobic exercise per week for 12 weeks	Multidimensional Fatigue Inventory (MFI-20)	4–38 weeks of pregnancy	9 weeks after delivery	39	38	14.52 ± 4.00	12.60 ± 4.54	>0.05
Yang et al., 2018, [28]	Taiwan	–	Controlled randomized clinical trial	Aerobic gymnastics three times a week and each session for 15 min for 2 months	Multidimensional Fatigue Inventory (MFI-20)	72 h after delivery	Two months after delivery	64	64	14.13 ± 7.19	10.43 ± 6.38	<0.05
Annesi, 2002, [29]	USA	36.3 ± 6.3	Controlled randomized clinical trial	Three practice sessions per week and each session 20–40 min for 4 weeks	Fatigue Identification Form	48 h after delivery	14 weeks after delivery	36	36	4.90 ± 2.20	3.70 ± 2.20	–

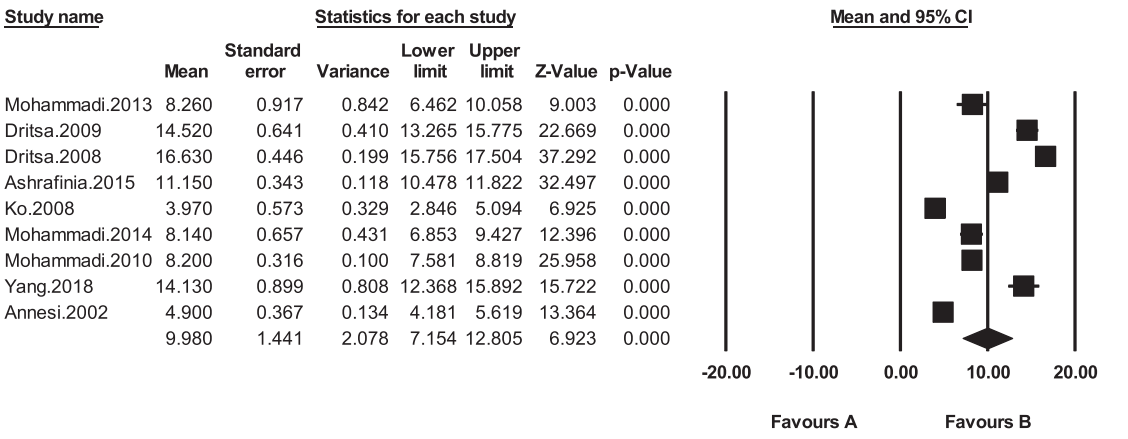

Fig. 2. Accumulation diagram of studies entered in a meta-analysis using standard mean difference index before the intervention.

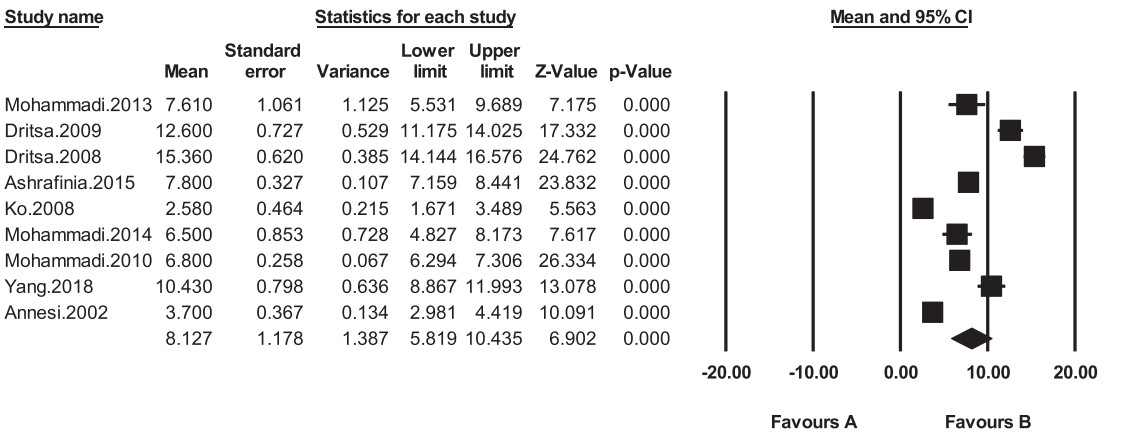

Fig. 3. Accumulation diagram of studies entered in a meta-analysis using standard mean difference index after the intervention.

difference in each study and the final estimate of the index obtained from the combination of the studies. In this figure, each study's weight in the final combined value is shown in which the size of each square is according to the weight of that study in the meta-analysis. Egger test was used to investigate the presence of publication bias in the studies. According to the Egger test results, there was no publication bias in the studies before and after the intervention, respectively ($P = 0.538$), (Fig. 5).

A significant difference was observed between standard mean differences before and after intervention regarding meta-regression based on pre-and post-intervention sample size ($p \leq 0.001$) (Figs. 6 and 7), and the year of study ($p \leq 0.001$) (Figs. 8 and 9), The standard means before the intervention decreased and then increased, respectively, with increasing the year and sample size and increased after the intervention.

4. Discussion

To determine the effect of exercise on decreasing post-partum fatigue in Iran and the world using meta-analysis was the purpose of the study. Fatigue is a common and irritating symptom, and different items lead to it, such as lack of physical activity, muscle weakness and neurological problems. The decrease in muscle resistance leads to early fatigue and decreased patients' activity level [30]. In general, the reason for post-partum fatigue is not clear and different studies have reported the reasons as immune and neuromuscular mechanisms, thermal sensitivity, respiratory muscle weakness, and increased respiratory muscle costs [31,32].

The results of this study indicate that the rate of fatigue is high before the test and this shows the importance of fatigue and its effect on all dimensions of life, especially as the majority of these individuals are young and part of the efficient forces of the society. The more sedentary life will provide less energy in doing work and decrease in physical activity will reduce muscle mass and more decrease in function [18].

The results of the present study show a significant difference in assessing the difference between the mean scores of pre-test and post-test of fatigue severity in the intervention group. The intervention group in the pre-test group showed a mean fatigue intensity of 9.9 ± 1.4, while it was significantly reduced to 8.1 ± 1.1 in the post-test.

Studies have shown that increased skeletal muscle activity while exercising is a factor in increasing blood flow to the muscles [33]. On the other hand, by opening arterioles in skeletal muscles, blood and oxygen transportation to muscle tissue will be increased, and this leads to

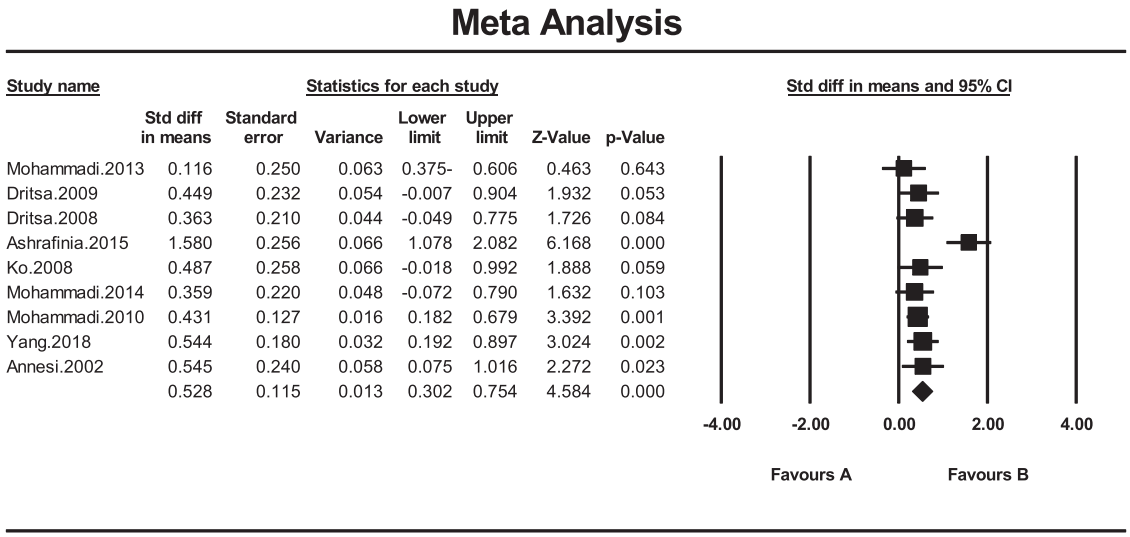

Fig. 4. . Forest plot of studies entered into the meta-analysis using the standardized mean difference before and after the intervention.

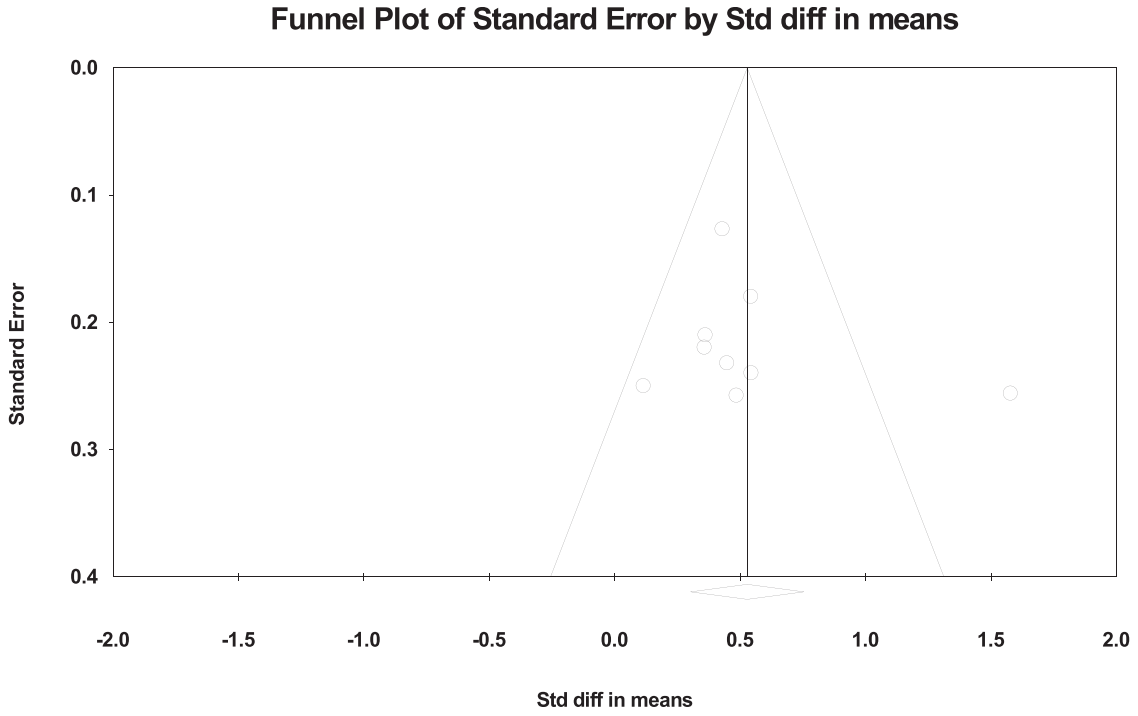

Fig. 5. . Funnel plot of studies entered into the meta-analysis using the standardized mean difference after the intervention.

eliminate the need for extra oxygen during physical activity through increasing respiratory rate, vital lung capacity, and alveolar ventilation [33]. The early benefits of regular exercise include: increased cardio-respiratory readiness, increased muscle strength and endurance, decreased physical fatigue, improved morale, and increased ability to conduct daily duties with more power which significantly control post-partum complications and affect health improvement [34]. Also, these people experience fatigue and weakness repeatedly (especially in the lower limb); they may be able to improve the weakness and significantly reduce the severity of fatigue after post-partum exercise [35,36] and [37].

Aerobic exercises induce significant metabolic changes such as metabolism improvement, epinephrine and norepinephrine, cholesterol and triglyceride level reduction and boost the immune system, endorphin secretion and mood improvement due to taking a considerable amount of oxygen [38]. The critical point in doing these kinds of exercises is making no change in the demilitarization process. When the musculoskeletal system is not activated, the duration of oxidation is decreased and leads to fatigue and slowness in doing daily jobs [38]. During exercise, the capacity of muscles oxidation will be increased, and so aerobic biochemical system is motivated to make conformity and increase of oxygen intake [38]. Another benefit of regular exercises is increased individual strength, body status improvement, fatigue reduction, mood improvement, confidence, and feeling good [38]. Body activities increase individual independence and not only lead to boost the quality of life but also affect individual balance, upper and lower limbs coordination and preventing of cardiovascular diseases, diabetes and others [38]. So, it is recommended that involved experts use regular

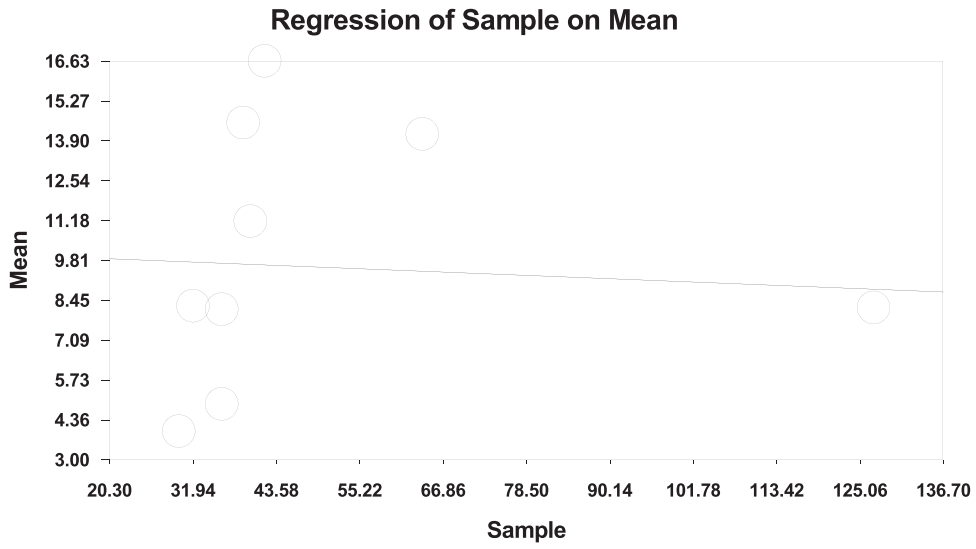

Fig. 6. Meta-regression correlation between sample size and studies included in a meta-analysis using standard mean difference index before the intervention.

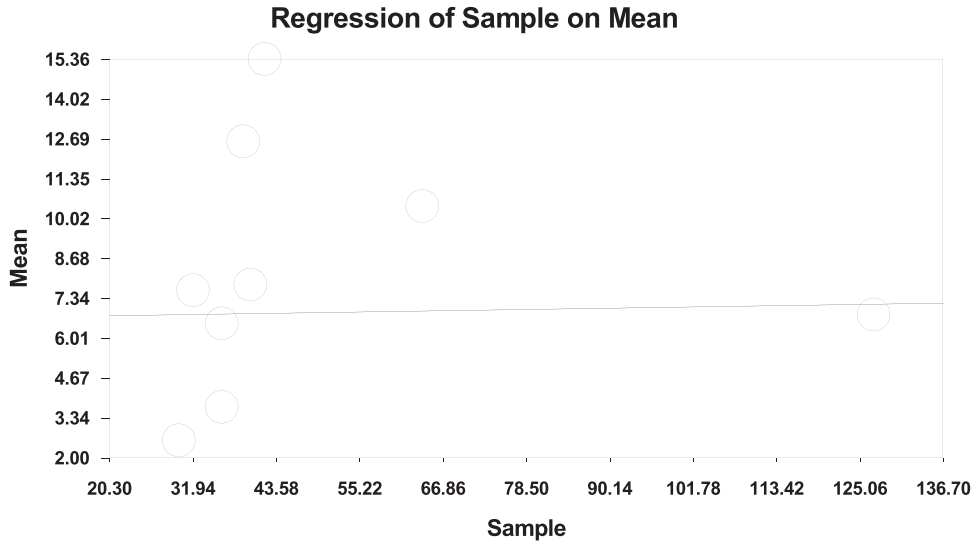

Fig. 7. Meta-regression correlation between sample size and studies included in a meta-analysis using standard mean difference index after the intervention.

exercises as a complementary treatment beside other treatments to help post-partum fatigue reduction.

Strengths and Limitation

One of the most important strengths of the present study is the use of quality articles in reviewing data and conducting review and meta-analysis of the intervention's standardized mean difference before and after, which shows the intervention's effect well. The most important limitation of the present study is inaccessibility to the full text of some articles and failure to provide the desired results.

Conclusion

The results of this study indicate that exercise reduces postpartum fatigue, which can be used for counseling and treatment by gynecologists. Reduce postpartum problems in women and increase the quality of life after childbirth.

Funding

By Student Research Committee of Kermanshah University of Medical Sciences, Deputy for Research and Technology, Kermanshah University of Medical Sciences (IR) (990363). The deputy of research and technology –Kermanshah University of Medical Sciences had no role in the design of the study and collection, analysis, and interpretation of data and in writing of the manuscript.

Ethics approval and consent to participate

Ethics approval was received from the ethics committee of deputy of research and technology, Kermanshah University of Medical Sciences (IR.KUMS.REC.1398.900).

CRediT authorship contribution statement

MM and MK and NS contributed to the design, MM statistical analysis, participated in most of the study steps. MM and MK prepared the manuscript. MRB and SHSH and HA and AAK assisted in designing the study, and helped in the, interpretation of the study. All authors have

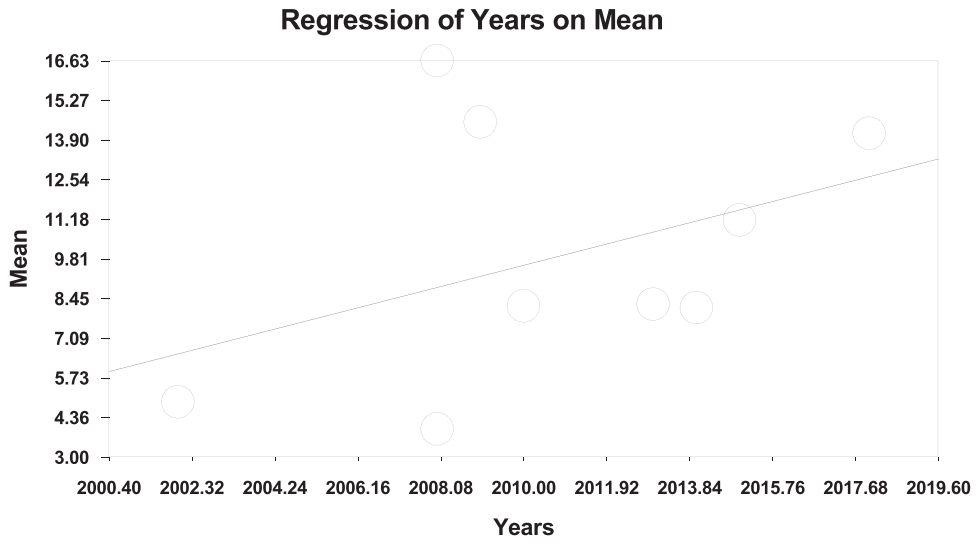

Fig. 8. Meta-regression correlation between the study year and the studies included in the meta-analysis using the standard mean difference index before the intervention.

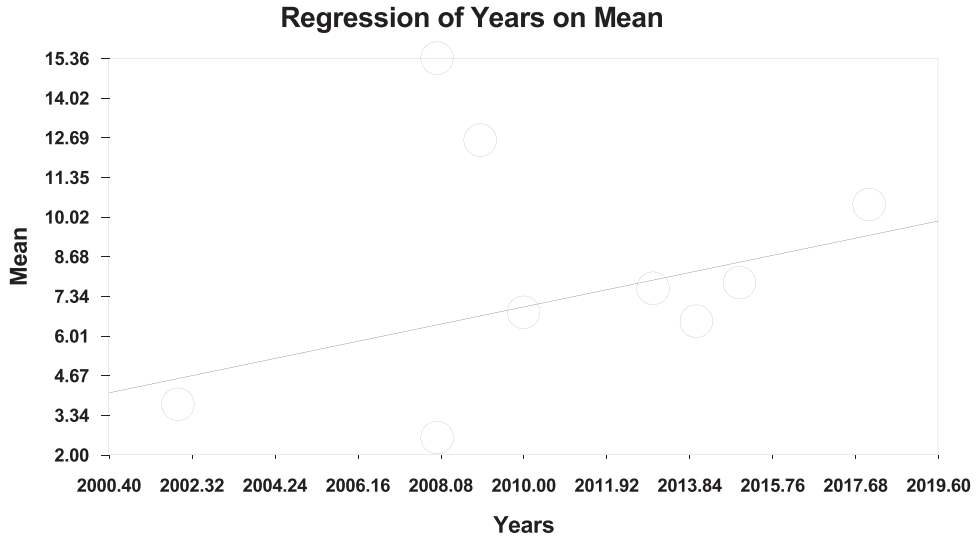

Fig. 9. Meta-regression correlation between the study year and the studies included in the meta-analysis using the standard mean difference index before and after the intervention.

read and approved the content of the manuscript.

Competing interest

The authors declare that they have no conflict of interest.

Acknowledgements

This study is the result of the research project with No. 990363 approved by the Student Research Committee of Kermanshah University of Medical Sciences. We hereby express our gratitude and appreciation to the respected authorities of that center for bearing the financial costs of this study.

Consent for publication

Not applicable.

References

[1] Fraser D, Cooper MA, Myles MF. Myles textbook for midwives. Edinburgh: Churchill Livingstone; 2003. p. 654. 14 T ed.
[2] Fisher J, Cabral de Mello M, Izutsu T. Pregnancy, childbirth and the post-partum period. WHO. World Health Organization, Mental Health Aspects of Women's Reproductive Health: A Global Review of the Literature. Genva: World Health Organization; 2009. p. 8–30.
[3] Choi E, Song E. Efficacy of a footbath for post-partum fatigue in South Korea: a quasi-experimental study. Jpn J Nurs Sci 2017;14(2):126–34.
[4] Cherif R, Feki I, Gassara H, Baati I, Sellami R, Feki H, et al. Post-partum depressive symptoms: Prevalence, risk factors and relationship with quality of life. ynecol Obstet Fertil Senol 2017;45(10):528–34.
[5] Giallo R, Gartland D, Woolhouse H, Brown S. Differentiating maternal fatigue and depressive symptoms at six months and four years post-partum: Considerations for assessment, diagnosis and intervention. Midwifery. 2015;31(2):316–22.
[6] Rychnovsky JD. Post-partum fatigue in the active-duty military woman. J Obstet Gynecol Neonatal Nurs 2007;36(1):38–46.
[7] Tsuchiya M, Mori E, Sakajo A, Maekawa T, Iwata H, Maehara K, et al. Age-specific determinants of post-partum fatigue in primiparous women. Jpn J Nurs Sci 2016; 13(1):83–94.
[8] Kim Jeung-Im, Lee Kyung-Jae. Bladder symptoms, fatigue and physical activity in postpartum women. Asian Nurs Res Korean Soc Nurs Sci 2017;11(1):50–5.
[9] Wilson N, Lee JJ, Bei B. Post-partum fatigue and depression: a systematic review and meta-analysis. J Affect Disord 2019;246:224–33.

[10] Rouhi M, Mohammad Alizadeh S, Usefi H, Rouhi N. Postpartum morbidity and help-seeking behaviours in Iran. Br J Midwifery 2011;19(3):178–84.
[11] Rouhi M, Mohammed-alizadeh S, Usefi H C, Rouhi N. Post-partum morbidity and help-seeking behaviours in Iran. Br J Midwifery 2011;19(3):178–84.
[12] Runquist JJ. A depressive symptoms responsiveness model for differentiating fatigue from depression in the postpartum period. Arch Womens Ment Health 2007;10(6):267–75.
[13] Iwata H, Mori E, Tsuchiya M, Sakajo A, Maehara K, Ozawa H, et al. Predicting early post-partum depressive symptoms among older primiparous Japanese mothers. Jpn J Nurs Sci 2015;12(4):297–308.
[14] Troy NW, Dalgas-Pelish P. The effectiveness of a self-care intervention for the management of post-partum fatigue. Appl Nurs Res 2003;16(1):38–45.
[15] Sichel D, Driscoll J. Care for women with post-partum depression:N* U* R* S* E" approach. J Midwifery Womens Health 2002;47(5). 392-392.
[16] Walker B. The Benefits of Stretching Improved Range of Movement Increased Power Reduced Post Exercise Muscle Soreness Reduced Fatigue. Walkerbout Health Pty Ltd; 2007. p. 12.
[17] Atashzade F, Shiri H, Moshtagh Z, Sanii M. [Effect of regular aerobic exercise on improving activity daily living]. Rafsanjan Med J 2003;2(3–4):164–71.
[18] Pazokian M, Shaban M, Zakeri M, Mehran A, Sangji B. The effect of aerobic exercise on fatigue in multiple sclerosis patients. Course Nurs Educ 2013;2(Number 2):64–73.
[19] Yang Chiu-Ling, Chen Chung-Hey. Effectiveness of aerobic gymnastic exercise on stress, fatigue, and sleep quality during postpartum: A pilot randomized controlled trial. Int J Nurs Stud 2018;77:1–7.
[20] Schulz KF, Altman DG, Moher D. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. BMC medicine 2010;8(1):18.
[21] Mohammadi F. (2010). The effect of exercise on post-partum depression and fatigue in women referred to Tabriz health centers,2010. Knowledge repository of Tabriz University of Medical Sciences using DSpace software. [In Persian].
[22] Mohammadi F, Malakoti J, Alizadeh S, Babapour J. The effect of exercise on post-partum fatigue: A controlled clinical trial. Iran J Midwif Infert 2013;Vol. 16(No. 71). 7-1. [In Persian].
[23] Mohammadi F, Malakooti J, Babapoor J, Mohammad-Alizadeh-Charandabi S. The effect of a home-based exercise intervention on postnatal depression and fatigue: a randomized controlled trial. Int J Nurs Pract 2015;21(5):478–85.
[24] Ashrafinia F, Mirmohammadali M, Rajabi H, Kazemnejad A, Haghighi KS, Amelvalizadeh M. Effect of Pilates exercises on post-partum maternal fatigue. Singap Med J 2015;56(3):169.
[25] Ko Y-L, Yang C-L, Chiang L-C. Effects of post-partum exercise program on fatigue and depression during “doing-the-month” period. J Nurs Res 2008;16(3):177–86.
[26] Dritsa M, Da Costa D, Dupuis G, Lowensteyn I, Khalifé S. Effects of a home-based exercise intervention on fatigue in post-partum depressed women: results of a randomized controlled trial. Ann Behav Med 2008;35(2):179–87.
[27] Dritsa M, Dupuis G, Lowensteyn I, Da Costa D. Effects of home-based exercise on fatigue in post-partum depressed women: who is more likely to benefit and why? J Psychosom Res 2009;67(2):159–63.
[28] Yang C-L, Chen C-H. Effectiveness of aerobic gymnastic exercise on stress, fatigue, and sleep quality during post-partum: a pilot randomized controlled trial. Int J Nurs Stud 2018;77:1–7.
[29] Annesi JJ. Relation of rated fatigue and changes in energy after exercise and over 14 weeks in previously sedentary exercisers. Percept Mot Skills 2002;95:719–27.
[30] Petajan JH, Whit AT. Recommendation for physical activity in patient hit multiple sclerosis. Sport Med 2000;27:179–80.
[31] Pariser G, Madras D, Weiss E. Outcomes of an aquatic exercise program including aerobic capacity, lactate threshold, and fatigue in two individuals with multiple sclerosis. J Neurol Phys Ther 2006;30(2):82–90.
[32] Heesen C, Romberg A, Gold S, Schulz K-H. Physical exercise in multiple sclerosis: supportive care or a putative disease-modifying treatment. Exp Rev Neurotherap 2006;6(3):347–55.
[33] Moradi B, Shojaeddin SS, Hadanezad M. Effect of eight week theraband resistance training on the fatigue severity, the quality of life, and muscular strengrh of the lower extremity in men with multiple sclerosis. J Rehab Med J Rehab Med Nurs 2015:147–58.
[34] Hoseini SH, Rajabi H. (2012). The effects of 8 weeks home - based yoga and resistance training on the power of leg extensors, motor capacity and balance in patient with multiple sclerosis. M A Thesis of Physical Education an Science Faculty of KHarazmi University. [In Persian].
[35] Giesser B, Beres-Jones J, Budovitch A, Herlihy E, Harkema S. Locomotor training using body weight support on a treadmill improves mobility in persons with multiple sclerosis: a pilot study. Mult Scler J 2007;13(2):224–31.
[36] Ghigiarelli JJ, Nagle EF, Gross FL, Robertson RJ, Irrgang JJ, Myslinski T. The effects of a 7-week heavy elastic band and weight chain program on upper-body strength and upper-body power in a sample of division 1-AA football players. J Strength Cond Res 2009;23(3):756–64.
[37] Han K, Ricard MD, Fellingham GW. Effects of a 4-week exercise program on balance using elastic tubing as a perturbation force for individuals with a history of ankle sprains. J Orthop Sports Phys Therap 2009;39(4):246–55.
[38] Randall T, Schapiro M. Managing symptoms of multiple sclerosis. Neurol Clin 2007;23:135–45.