EFFECT OF REGULAR EXERCISE DURING PREGNANCY ON DURATION OF LABOR: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Abstract

Background: Many women decide to focus on and improve their lifestyle when they discover that they are pregnant and exercise is an effective tool for preventing pregnancy-linked illnesses. This systematic review set out to investigate whether taking regular exercise during pregnancy impacts on the length of a woman's labor.

Method: Literature searches were undertaken; the following electronic databases were searched: PubMed, Cochrane, ProQuest Nursing, and MEDLINE. Also, the electronic database search was manual searching of reference lists in articles to locate any relevant related material that may not have been shown. The search was conducted from late 2018 through to 2022. The search was completed on 3rd of March 2022.

Results: A total of three studies were included in the final synthesis of evidence. In this analysis, data from various other subjective studies were pooled together using the standardized mean difference statistic (SMD). The overall effect of regular exercise during pregnancy on duration of labor demonstrates a statistically significant difference between the intervention and control group (n=548, standardized mean difference (SMD) -1.75, 95% confidence interval (CI) -3.40 to -0.09, p = 0.04).

Conclusion: This meta-analysis established that undertaking regular exercise throughout pregnancy has a positive effect on the duration of labor, and further clinical trials should be conducted to validate and replicate our findings.

Keywords: Exercise, Labor duration, pregnancy

Introduction

Giving birth is a tense and traumatic event in every woman's life, and each pregnancy and labor differs. However, getting ready for delivery can be a positive way of minimizing undesirable responses during labor itself. A number of studies have examined how exercise effects pregnancy and have reached mixed conclusions, in relation to premature labor, intrauterine growth restriction, gestational diabetes (GDM), pregnancy-induced hypertension (PIH), levels of pain during labor, the length of labor and the possibility of Caesarean section (1,2).

The World Health Organization (3) has stated that lack of physical activity is one of the main reasons for global mortality, since a sedentary lifestyle places individuals at risk of developing cardiovascular disease as well as diabetes mellitus (4). Physical exercise is defined as scheduled physical and mental activities undertaken to increase physical fitness, and is an important element of having a healthy lifestyle and becoming more robust and thus healthier (5).

Pregnancy is a good time to start exercising, because women normally re-evaluate their lifestyle at this point and resolve to be healthier. In addition, one of the benefits of exercise is that it can help to forestall illnesses which are linked to pregnancy, namely gestational diabetes, excessive weight gain during pregnancy, hypertensive conditions, urinary incontinence, fetal macrosomia, pain in the lumbo-pelvic region, stress and prenatal depression (6). Pregnant women should be advised and encouraged to take part in physical activities, and provided with information on both the benefits and the risks of exercise during pregnancy (7).

Duration of labor is a term which is used to describe Stage 1 and Stage 2 of the process of giving birth, with Stage 1 being defined as the period when the cervix dilates from three to ten centimeters and uterine contractions are regular. Stage 2 refers to the time between the cervix being fully dilated and the delivery of the baby. A number of studies have shown that labor is shorter and has fewer complications when women who have never given birth are aerobically fit and healthy. Exercise during pregnancy is therefore beneficial for the health of the mother (8).

To the best of the authors' knowledge, no researchers have studied whether regular exercise during pregnancy has a direct effect on the duration of labor, and this systematic review sets out to fill this knowledge gap. The main research question which this meta-analysis paper addresses is: What are the reported effects of regular exercise in pregnancy on the duration of labor?

Materials and Methods

The present study used the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) as a guideline for reporting the findings (9).

Search strategy

The literature review was conducted by extensive searching of multiple databases in health sciences and nursing. Literature searches were undertaken; the following electronic databases were searched: PubMed, Cochrane, ProQuest Nursing, and MEDLINE. Also, the electronic database search involved manual searching of reference lists in articles to locate any relevant related material that may not have been shown. Multiple keywords were used, including the terms: "Pregnant women," "Labor," "duration of labor," " physical activity, " and "physical Exercise, ". Each of the keywords were used independently and in combination. The search included the late 2018 through 2022. The date of completion of the search was 3rd of March 2022.

Inclusion criteria

Studies were included if they were published in a peer-reviewed journal, written in English, published within the last five years between 2018 and 2022, and focused on the effects of regular exercise in pregnancy on the duration of labor, studies about the pregnant women without contraindication to exercise, and RCT only.

Exclusion criteria

Studies were excluded if they met any of the following criteria:

- Studies not involving pregnant women practicing regular exercise and its effects on the duration of labor.
- Discussion papers, dissertations, narratives, opinion articles, and editorials.
- Studies published in any language rather than English.

Validity assessment

The principal outcome of this review was to report the effect of regular exercise during pregnancy on duration of labor. Two authors independently carried out a review of titles and abstracts based on the inclusion/exclusion criteria.

Data Abstraction

Two authors performed the initial data abstraction in duplicate. Any discrepancies regarding study eligibility were discussed with the other authors to reach a consensus. To standardize the data abstraction, the following variables that were taken out for data analysis included the author, the year of study, location, as well as labor duration, the number of participants in each group, and the mean and standard deviation of labor duration. Extracted data were entered into Microsoft Excel Sheet for analysis.

Study characteristics

Two authors performed the data analysis. The obtained data were analyzed by Review Manager software, version 5.4.1 (RevMan), and the mean difference (MD) of labor duration, along with its 95% CI, which was calculated as summary measures. Furthermore, the chi-square test was applied based on Q-test and I2 statistics with a significance level of <0.00001 to evaluate the potential heterogeneity among the studies. The I2 statistics ranged from 0%-100%, and the high value indicated high inconsistency among the studies. Consequently, the random-effects model was utilized to estimate the pooled effect based on the rejection of the homogeneity hypothesis. The Z test determined the significance of the overall mean difference, and P<0.05 was considered statistically significant.

Critical appraisal of studies (quality assessment)

Quality assessment was conducted using the items in the Consolidated Standards of Reporting Trials checklist, including participants' eligibility criteria, the interventions for each group with sufficient essential details, completely defined outcome measures, the type of randomization, allocation concealment mechanism, statistical methods of group comparison for the outcomes, and the results for each group, along with the estimated effect size and its precision. The studies were grouped as high-quality data if they met all the required criteria or failed to meet only 1 or 2 items; otherwise, they were included in the low-quality group when not meeting more than two items. Then two researchers independently performed the quality assessment. Finally, the guideline of the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement was used to report this study's findings which is presented in Table 1.

Results

Search strategy results

Figure 1 depicts the PRISMA flow diagram of the search strategy and the process of study selection. A total of 1,730 articles were retrieved from databases. After removing duplicate citation and screening for relevancy, 6 full-text articles were assessed for eligibility. Additionally, the three publications that reported the results separately were entered into meta-analysis as separate studies. The results of chi-square Q-test and I2 statistics revealed the heterogeneity between the studies (Tau2=2.08, Chi2=111.65, df=2 P<0.00001, and I2 =98.0%) duration of labor [Figures 2 and 3].

Literature search

One thousand, seven hundred and thirty articles were established through database searching via the following search engines—PubMed, yCochrane, ProQuest, and MEDLINE. Thirty-seven articles were removed due to duplication. The deleted records have the same title, author, and publication year. The remaining records (n=1693) were exported to an Excel file. The extensive screening by two independent reviewers using the inclusion and exclusion criteria resulted in the elimination of 1687 articles, leaving six full-text articles that were downloaded for consideration. Three articles were excluded for the following reasons: irrelevant to the aim of the study and lack of sufficient data.

Study characteristics and Risk of bias

The total number of participants in all of the studies was 548, with sample sizes ranging from 325 to 104. Two hundred and eighty-seven participants were included in the intervention groups, while 261 participants were enrolled in the control groups. The types of regular exercise included in the studies were moderate aerobic exercise programs throughout pregnancy (10), Pilates exercises (11), and Water Exercise during Pregnancy (12). One study provided aerobic exercise intervention from 9 weeks to the end of the third trimester (10). Another study provided the intervention of Pilates exercises from 26 to 28 weeks of gestation (11). Moreover, one study which provided the intervention of SWEP (Study of Water Exercise during Pregnancy) began in week 20 of gestation and ended in week 37 (12). The frequency of the regular exercise intervention ranged from two to three weekly sessions. One study performed a Pilates exercise program twice a week (11). Two studies performed an aerobic and Water Exercise of three sessions per week (10,12).

The Risk bias was conducted by using the Cochrane Collaboration's software RevMan 5.4. In terms of the randomization process, three studies described the process randomization. They assessed it as having a low risk of bias (10, 11, 12). One study did not provide the information on the allocation concealment and was judged to have a high risk of bias (18). In addition, one study failed to blind the participants and investigator with a detection bias considered a high risk (12); the remaining two studies had a low-risk bias (10,11). For attrition bias, all studies were rated as having a low risk of bias (10,11,12). Also, in terms of the reporting bias, all the studies were assessed as low risk (10, 11, 12). [Figure 4].

Quantitative data synthesis

In this analysis, data from various other subjective studies were pooled together using the standardized mean difference statistic (SMD). The overall effect of regular exercise during pregnancy on duration of labor demonstrates a statistically significant difference between the intervention and control group (n=548, standardized mean difference (SMD) -1.75, 95% confidence interval (CI) -3.40 to -0.09, p = 0.04) when compared to control group, with evidence of heterogeneity (p = 0.00001, I2 = 98%). The results of the meta-analysis in these subgroups show that regular exercise significantly reduces the duration of labor in the intervention group when compared to the control group among pregnant women.

Table 1: Characteristics of included studies in Meta- analysis regarding the effects of regular exercise on duration

Study	Year	Location	Intervention	Control	Quality
Barakat et al., 2018	2018	Madrid, Spain.	176	149	High
Rodríguez-Blanque et al., 2019	2019	Granada, Spain	60	60	High
Ghandali et al., 2021	2021	Iran	51	52	High

Figure 1: PRISMA Flow chart of the study. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta Analyses

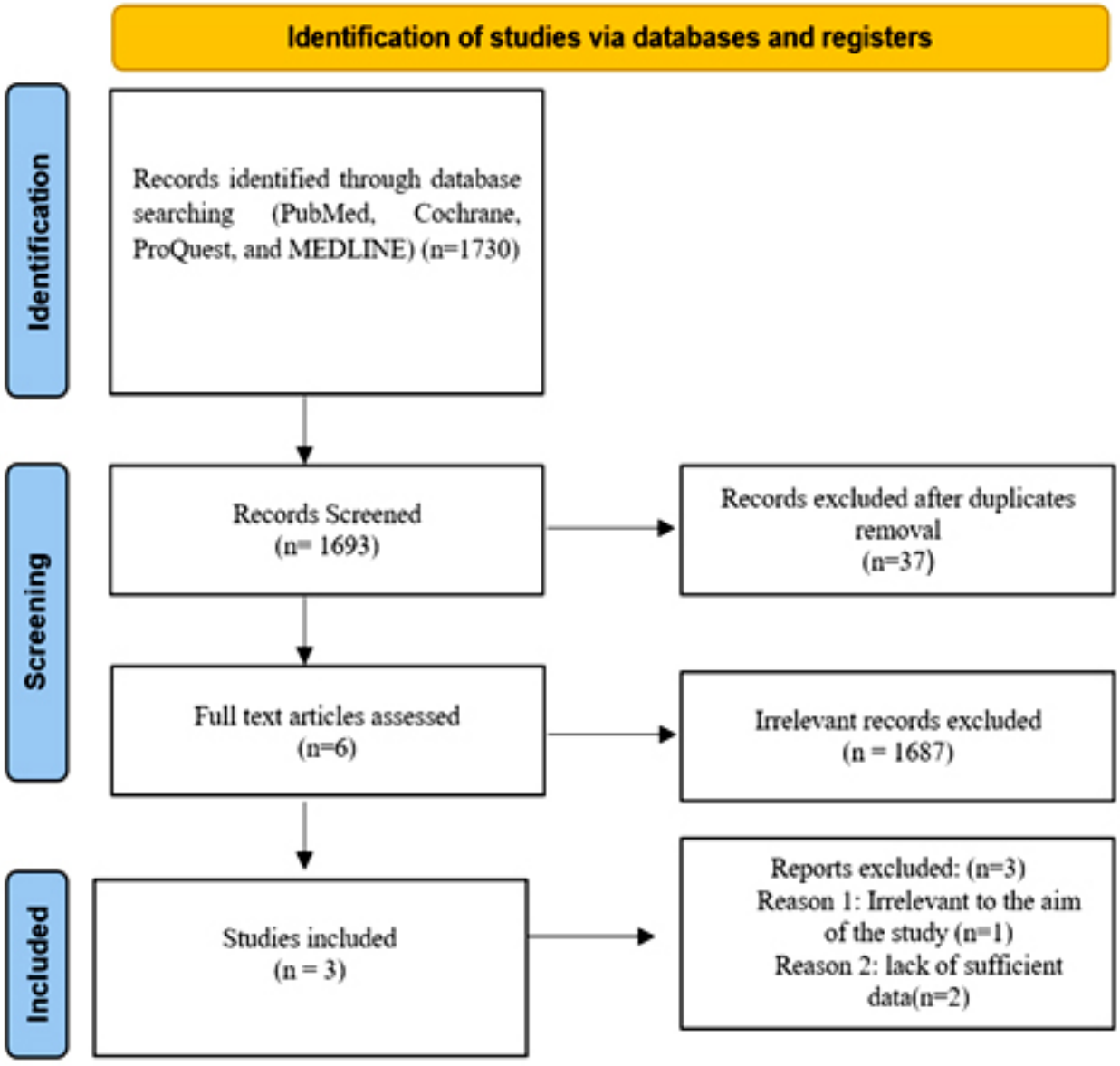


Figure 2: Forest plot depicting results from meta-analysis of three randomized controlled trials. Extensions from the boxes represent 95% confidence intervals. The sizes of the boxes represent the weight assigned to each study. The center diamond shows the pooled estimate of the effect size, and the width of the diamond indicates the 95% confidence interval for the pooled estimate.

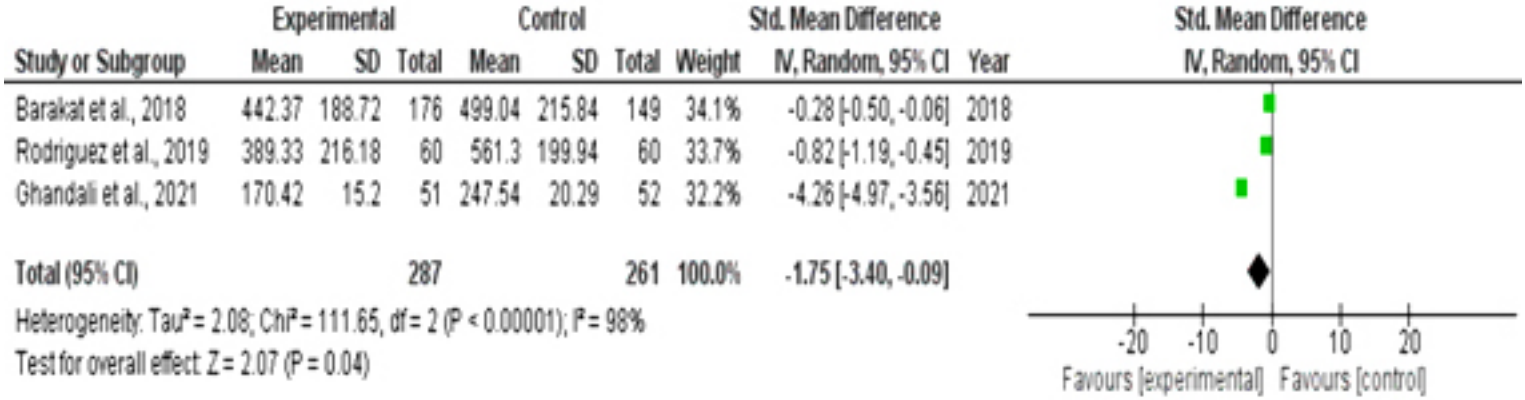


Figure 3: Funnel plot comparison of Physical Exercise on Duration of Labor.

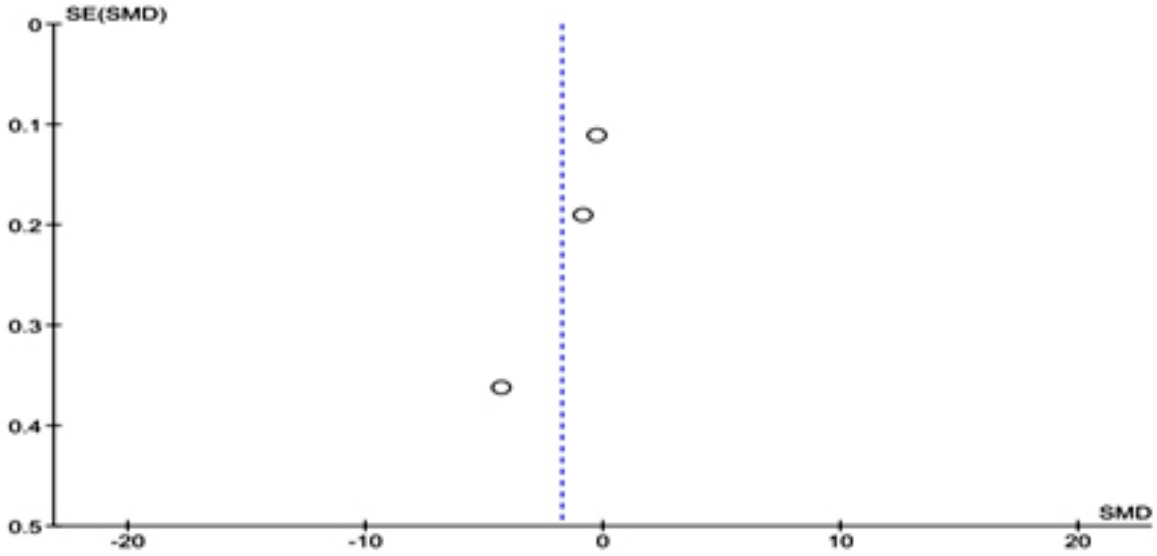
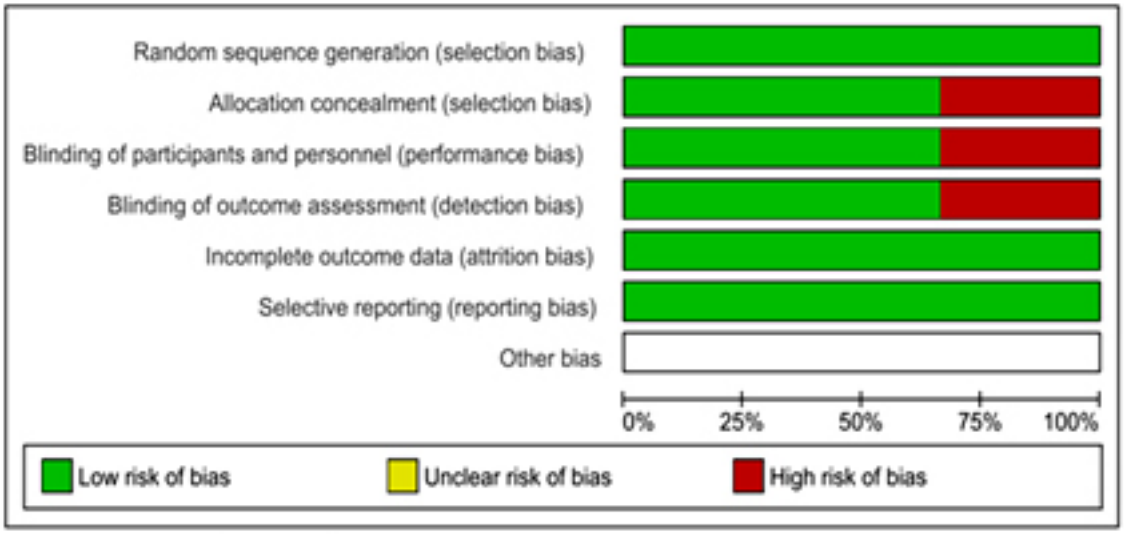
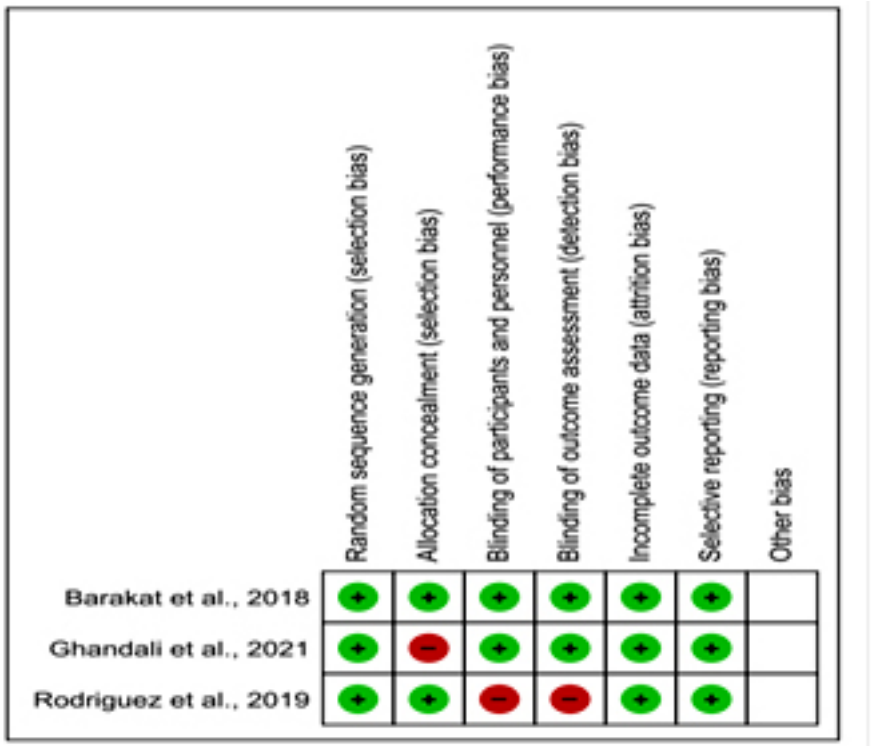


Figure 4. (a) Risk of bias graph: review authors' judgment about each item's risk of bias item presented as percentage across all included studies; (b) risk of bias summary: review authors' judgments about each item's risk of bias for each included study (+, low risk; ?, unclear; -, high risk)

(a) Risk of bias graph



(b) Risk of bias summary



Discussion

The findings of this meta-analysis, based on 548 participants in three RCTs, demonstrated that the intervention group, which took regular exercise during pregnancy, had statistically significant shorter labor than the control group, which did not exercise while pregnant. However, while the findings indicate that regular exercise during pregnancy has a major effect, there was a high degree of divergence in the results. This could be due to participants having different characteristics, ages, and their viewpoints, based on their geographical location. The exercises which were included in the studies were made up of: moderate aerobics throughout pregnancy (10), Pilates exercises (11) and water exercise during pregnancy (12). The conclusion mirrors those of Sandra et al. (13) in a combined analysis of 550 participants, which determined that women who were highly physically active in late pregnancy were less likely to have an emergency Caesarean delivery than women who had not been physically active. Makvandi et al. (14) added that it has been established that acupuncture shortens the length of the active phase of labor (95% CI –1.738 to –0.882; Pb0.001), as well as the second stage of labor (95% CI –1.615 to –0.807; Pb0.001).

A range of meta-analyses have established the positive effects of aquatic exercise programs, and found that they are helpful in controlling heart rate and blood glucose levels, preventing disproportionate weight gain, and improving balance and mobility in pregnant women. These exercise programs make it more likely that a healthy, pregnant woman will have a normal delivery (15,16).

Not all researchers agree, however, and Davenport et al. (17) for example, conducted a meta-analysis which concluded that there were no links between the regularity, intensity, volume and duration of exercise, and subsequent labor and delivery outcomes. Veisy et al. (18) also carried out a meta-analysis which found no statistically significant effect on a range of neonatal and maternal outcomes, including: the first, second and third stages of labor, gestational age at birth, Apgar scores taken at the first and fifth minute, the pH of the umbilical cord, neonatal weight, height and head circumference ($p > .05$). The current meta-analysis will have an effect on healthcare practice, since it argues that being physically active during pregnancy offers a number of key benefits. As a result, both nurses and nurse administrators should encourage pregnant women to be physically active, in order to improve both their own and their newborns' health outcomes. There are many benefits to exercising regularly during pregnancy, including the prevention of undesirable effects and complications during labor. Future research should focus on the long-term effects of regular exercise during pregnancy and determine how it impacts on the duration of labor.

This study has a number of limitations, since the search strategy only included studies which focused on singleton, low-risk, pregnant women. In addition, some of the studies had a clear selection and performance bias, which could have distorted or otherwise exaggerated the results. Finally, three of the included studies contained randomized control trials which met this meta-analysis' inclusion criteria.

In summary, our meta-analysis found that regular exercise during pregnancy has a positive effect on the duration of labor. Future clinical trials are now needed to establish the effects of taking regular exercise on the duration of labor.

References

1. Price BB, Amini SB, Kappeler K. Exercise in pregnancy: effect on fitness and obstetric outcomes-a randomized trial. Med Sci Sports Exerc. 2012 Dec 1;44(12):2263-9.

2. Wadhwa Y, Alghadir AH, Iqbal ZA. Effect of antenatal exercises, including yoga, on the course of labor, delivery and pregnancy: A retrospective study. International journal of environmental research and public health. 2020 Jan;17(15):5274.

3. WHO. WHO methods and data sources for life tables [Internet]. 2022 [cited 24 April 2022]. Available from: http://www.who.int/healthinfo/statistics/LT_method.

4. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1• 9 million participants. The lancet global health. 2018 Oct 1;6(10):e1077-86.

5. Oxford Advanced American Dictionary at OxfordLearnersDictionaries.com [Internet]. Oxfordlearnersdictionaries.com. 2022 [cited 24 April 2022]. Available from: https://www.oxfordlearnersdictionaries.com/definition/american_english/exercise.

6. Ribeiro MM, Andrade A, Nunes I. Physical exercise in pregnancy: Benefits, risks and prescription. Journal of Perinatal Medicine. 2022 Jan 1;50(1):4-17.

7. Türker H, Dağcıoğlu BF. The Association of Exercise during Pregnancy with Maternal and Infant Health. The Anatolian Journal of Family Medicine. 2021;4(3):207-12.

8. Kardel KR, Johansen B, Voldner N, Iversen PO, Henriksen T. Association between aerobic fitness in late pregnancy and duration of labor in nulliparous women. Acta obstetricia et gynecologica Scandinavica. 2009 Aug;88(8):948-52.

9. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group*. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of internal medicine. 2009 Aug 18;151(4):264-9.

10. Barakat R, Franco E, Perales M, López C, Mottola MF. Exercise during pregnancy is associated with a shorter duration of labor. A randomized clinical trial. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2018 May 1;224:33-40.

11. Ghandali NY, Iravani M, Habibi A, Cheraghian B. The effectiveness of a Pilates exercise program during pregnancy on childbirth outcomes: a randomised controlled clinical trial. BMC Pregnancy and Childbirth. 2021 Dec;21(1):1-1.

12. Rodríguez-Blanque R, Sánchez-García JC, Sánchez-López AM, Aguilar-Cordero MJ. Physical activity during pregnancy and its influence on delivery time: a randomized clinical trial. PeerJ. 2019 Feb 7;7:e6370.

13. Sanda B, Vistad I, Sagedal LR, Haakstad LA, Lohne-Seiler H, Torstveit MK. What is the effect of physical activity on duration and mode of delivery? Secondary analysis from the Norwegian Fit for Delivery trial. Acta obstetricia et gynecologica Scandinavica. 2018 Jul;97(7):861-71.

14. Makvandi S, Mirzaiinajmabadi K, Sadeghi R, Mahdavian M, Karimi L. Meta-analysis of the effect of acupressure on duration of labor and mode of delivery. International Journal of Gynecology & Obstetrics. 2016 Oct 1;135(1):5-10.

15. Cancela-Carral JM, Blanco B, López-Rodríguez A. Therapeutic Aquatic Exercise in Pregnancy: A Systematic Review and Meta-Analysis. Journal of Clinical Medicine. 2022 Jan;11(3):501.

16. Poyatos- León R, García- Hermoso A, Sanabria-Martínez G, Álvarez-Bueno C, Sánchez-López M, Martínez- Vizcaíno V. Effects of exercise during pregnancy on mode of delivery: a meta-analysis. Acta obstetricia et gynecologica Scandinavica. 2015 Oct;94(10):1039-47.

17. Davenport MH, Meah VL, Ruchat SM, Davies GA, Skow RJ, Barrowman N, Adamo KB, Poitras VJ, Gray CE, Garcia AJ, Sobierajski F. Impact of prenatal exercise on neonatal and childhood outcomes: a systematic review and meta-analysis. British journal of sports medicine. 2018 Nov 1;52(21):1386-96.

18. Veisy A, Mohammad Alizadeh Charandabi S, Hematzadeh S, Mirghafourvand M. Effect of prenatal aerobic exercises on maternal and neonatal outcomes: A systematic review and meta-analysis. Nursing open. 2021 Sep;8(5):2301-17.