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EFFECT OF MODERATE INTENSITY AQUATIC PHYSICAL EXERCISES DURING PREGNANCY ON POSTPARTUM DEPRESSION: A SYSTEMATIC REVIEW

Healthcare

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ABSTRACT

Pregnancy is a process characterized by a progression of physiological, and psychological changes in the body of woman that start when the ovum is fertilized and continue until several months after the birth of the baby. These progressions can be cardiovascular, respiratory, hematological, renal, urinary, gastrointestinal, metabolic, and dermatological. Hemodynamic changes seen during this period are increase in heart rate at rest and cardiac output, and decrease in the peripheral vascular resistance. Psychological disorders that might emerge in this period include anxiety, stress, instability, fear, and depression. Occurrence of major or minor depressive episodes are among the most common medical complications during pregnancy and after childbirth. **Method:** Records were identified using different search terms through database research and other resources. Studies were selected after the removal of duplicates across databases or with different search terms. Screening of records was done according to inclusion and exclusion criteria. **Result:** 5 randomized controlled trials were identified. Their characteristics, including a summary of their results and conclusions, are shown in Table 1. These randomized controlled trials are focusing on the effect of aquatic exercises during pregnancy on postpartum depression. Only limited data being available, studies concluded a heterogeneous result, and further research is required to confirm and extend its role. **Conclusion:** The evidence presented in this systematic review suggest that aquatic exercises are helpful in preventing symptoms of postpartum depression.

KEYWORDS

Aquatic Exercise, Physical Exercise, Pregnancy and Postpartum Depression

INTRODUCTION

Hormonal changes in women during labor and postpartum influences the development of postpartum depression which is a serious mental disorder that develops in or extends into the postnatal period.[1] Anxiety, a feeling of sadness, insomnia, consciousness and appetite problems, less attentiveness towards the child and the surroundings are the main indications of post pregnancy depression. Self-destructive musings may occur in extreme conditions.[2] Postpartum depression adversely affects women, their infants, and other members of their family. In particular, PPD can adversely influence the mother–infant relationship and the child's development and advancement, including cognitive and language development.[3] Although PPD is a significant medical problem for women from assorted societies, it frequently stays undiscovered and undiagnosed.[4,5,6] Many research have indicated the effectiveness of exercise in the treatment of major depression in adults and, in this manner, it could also be helpful during pregnancy and postpartum. Exercise helps in developing general mental prosperity, and mental health experts suggest physical exercises for treatment of depression. Physical exercise during pregnancy is prescribed as an important means to battle the physiologic impacts women may experience during pregnancy as they decrease the side effects of depression during pregnancy and postpartum period by enhancing the levels of noradrenalin, dopamine and serotonin.[7,8] When someone swim or participate in any water activity, endorphins and serotonin releases in the brain which are feel good hormones. These chemicals help in reducing the stress hormones and lift up general state of mind.[9]

With the progression of pregnancy, risk of injuries during exercise increases due to variations in center of gravity, weight gain and altered balance and coordination. Also, prolonged standing during pregnancy can interfere with the uteroplacental flow, may alter hormonal balance and intraabdominal pressure may also be increased.[10] So, to prevent these problems, many researches have shown the safety of aquatic exercises during pregnancy. For example, DiMascio, Magro-Malosso, Saccone, Marhefka, and Berghella (2016) highlighted the absence of risks for pregnant women when they perform appropriate aquatic exercises.[11] Brearley, Sherburn, Galea, and Clarke (2015) reported that when the moderate intensity aerobic aquatic exercises are performed, body temperature of healthy pregnant women remain within safer limits.[12] Also, Bacchi, Mottola, Perales, Refoyo, and Barakat (2018) concluded that three sessions of aquatic exercise per week during pregnancy are helpful in preventing unreasonable gain in maternal weight and also contribute in appropriate birth weight of neonates.[13] Gravity elimination and the cushioned resistance to movement are the primary distinctions observed while performing aquatic exercises.

The better control of weight gain and the ease of movement achieved by exercising in water enable a greater variety of exercises for the core musculature. Women can move in an aquatic environment in ways that are not otherwise possible. This allows them to strengthen the muscles involved in labor without increasing the intra-abdominal pressure that might injure the pelvic floor muscles.[14] With aquatic exercise, the capability to train the cardiovascular system can also be accomplished with less perceived stress and in a non-impact environment. The aquatic environment is ideal for pregnant ladies because of its non-weight-bearing impact, embracing and safe guarding her body from sports-related injuries, decompress the tensity on joints and tendons, and contributing to her overall fitness.[15]

When the cardiovascular responses of pregnant women to immersion and aquatic exercise were studied, it was observed that although the HR decreases in water, the cardiac output is greater during aquatic exercises than on land exercises related to the gestational age and is contributing in increased venous return and SV. In water exercises, effect of hydrostatic pressure on uterus forces the diaphragm, limiting its contracting ability and altering the tidal volume. This has been manifested by decline in peak oxygen consumption (VO2 peak) and peak ventilation (Vpeak) during an incremental maximum test, in comparison with cycling and postpartum by the same pregnant women.[16] Interestingly, maximal HRs were not impacted either in or out of the water or by the stage of pregnancy and postpartum. HR were lower in pregnant women during aquatic aerobic exercise when compared with land at submaximal intensities, at a given VO2 and this effect completely attributes to water immersion.[17] The blood pressure in the water at a given O2 is greater than expected, an effect specific to the effect of the aqueous environment. During pregnancy, the average systolic pressure lowers at the 25th week due to decreases in the total peripheral resistance (TPR) during mid-pregnancy, and so increases in the blood pressure are consequent to exercise. TPR during exercise was altogether lower during pregnancy than post pregnancy because of the increment in cardiac output and the lower systolic and diastolic pressure during pregnancy.[18] So, one of the significant advantages of aquatic exercise is improvement in cardiorespiratory fitness and exercise also seems to decrease the severity of symptoms of depression. Many studies have indicated the importance of regular exercise during pregnancy as well as in the postpartum period. However, there is a need for more studies in this important field. Therefore, the purpose of this study is to identify the effects of the aquatic exercise program provided to women on the postpartum depression.

MATERIALS AND METHODS

Search Strategy And Screening Procedures

A systematic search of published studies was conducted up to January 2022. Searches were carried out on the following electronic databases: PubMed (2012–present), Scopus (2012–present), and Google Scholar (2012–present). The following search criteria were applied: "aerobic aquatic exercise" OR "aquatic physical exercise" OR "aquatic exercise" OR "water exercise" AND "postpartum depression" OR "ppd" OR "postnatal depression.

Inclusion/Exclusion Criteria

The aim of this review was to analyze published studies that investigate the effects of aquatic therapy programs on the postpartum depression of women. On the basis of the titles of the articles and summaries, reports were prepared identifying inclusion/exclusion criteria. The inclusion criteria that the papers had to meet were (1) topics: pregnancy, (2) participants: pregnant women, with non-complicated pregnancies, (3) physical activity program: aquatic/water, (4) study design: randomized controlled clinical trial (RCT), (5) variables to study: postpartum depression.

Exclusion criteria included studies that were published in a language other than English and were not related to women in the postpartum period. Studies were also rejected that were carried out among pregnant and puerperal women, or only in the puerperium, but not describing the impact of aquatic physical activity on the occurrence of postnatal depression. Research other than RCT (Randomized Controlled Trial) has not been included in the review. Bachelor's theses, master's theses, doctoral theses, letters to the editor, conference reports, and research protocols were also rejected. Other exclusion criteria included a lack of clearly described results and access to the full version of articles, as well as the lack of standardized scales to assess postnatal depression.

Selection Process

Two reviewers (A.P. and N.K.) independently read all the summaries and classified them as excluded or potentially included. A third reviewer (J.G.) was asked for their opinion if there was a need to resolve any disagreement between the two reviewers. The studies were selected based on their titles and summaries. When the summaries were relevant for the purpose of the review, the entire article was read. The reviewers agreed to include 5 articles after reading them and rigorously applying the inclusion criteria.

Quality Assessment

The selected studies were subjected to an analysis and evaluation of their methodological quality by the interviewers independently (A.P. and N.K). The methodological quality of the tests was assessed using the PEDro scale.[19] The PEDro scale aims to evaluate four fundamental methodological aspects of a study such as randomized processing, blinding technique, group comparison, and data analysis process. The PEDro scale is based on the Delphi list developed by Verhagen et al.[20], which includes 11 items: specified eligibility criteria (this item is not used to calculate the PEDro score), random assignment, hidden location, reference comparability, blinded participants, blinded therapists, blinded evaluators, proper follow-up, intent-to-treat analysis, group-to-group comparisons and point estimates and variability. The reliability of this scale was assessed with acceptable results in intra-class correlation coefficients (ICF) equal to 0.56 (95% CI 0.47–0.65) for the ratings of individuals and BCIs for consensus ratings equal to 0.68 (95% CI 0.60–0.76). The test quality assessment in the PEDro database was conducted by two independent evaluators (A.p. and J.G.) and any disagreements were resolved by a third evaluator (J.G.). PEDro scale scores ranged from 1 to 10, with higher PEDro scores corresponding to higher study quality. The following criteria were used to rate the quality of the method: A PEDro score of less than 5 indicates low quality and a PEDro score of 5 or higher indicates high quality.[21]

RESULTS

The database search identified 2915 records. After the elimination of duplicates, 2500 records were selected for their relevant content. During the analysis of the title and summary, 2471 articles were excluded. Seven potentially relevant full-text articles were evaluated and two of them were excluded due to the lack of a clearly described result and one was out of scope. Therefore, a total of 5 studies were included in this revision. Data were collected ethically and in ways which addressed the research questions. All the studies produced valuable research with clear statements of findings

Description Of Studies Include In Review

From the selected studies, a total of 1108 pregnant women were studied (Table 1). Regarding the size of the samples used, the study of Aguilar Cordero et al. for being made up of 364 pregnant women and study of Araceli Navas et al. had studied 380 pregnant women. All the studies used different samples except for Rodríguez-Blanque and collaborators who contributed to the review with three articles in which different variables were studied with the same sample.[22] The average age of the pregnant women who participated in the studies was 31.30 ± 1.30 years. As for the number of weeks of gestation, all studies began the intervention in the 20th or subsequent week. The types of intervention undertaken by the experimental group were characterized by aerobic, resistance exercises, which were carried out in the aquatic environment. With regard to the activity performed by the control group, it should be indicated that in all studies routine prenatal care was undertaken. The aquatic programs had a minimum duration of 6 weeks and a maximum of 34 weeks. As for the duration of the sessions it should be noted that they were all in the 45–60 min time zone, with the most common weekly frequency being of three sessions. Only one study had a different intervention length, of 45 min The intensity of the aquatic exercise undertaken was measured using the Borg scale, with the most common effort value being Level 12. In other studies, the effort made by the pregnant women was quantified and measured via their heart rate. Other parameters analyzed in the selected studies were: BMI, through the Quetelet formula, the Global Physical Activity Questionnaire test (GPAQ) to measure the level of physical activity, maternal and baby weight measurements and gestational and postpartum weight and postpartum with epds scale.[23]

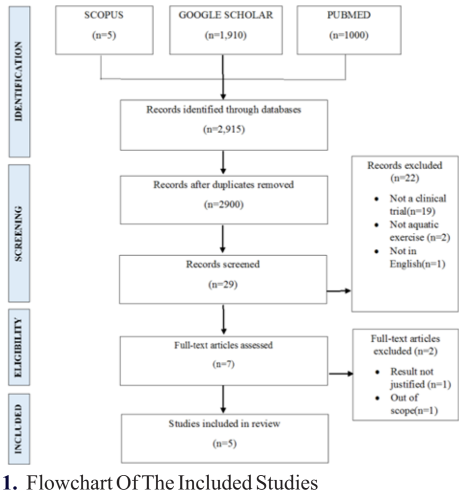

Figure 1. Flowchart Of The Included Studies

REFERENCE	PURPOSE	PARTICIPANTS	MEAN AGE ± SD (MEDIAN/ RANGE	GESTATIONAL AGE (WEEKS)	TYPE OF INTERVENTION (E/C)	MEASUREMENT TOOLS	FINDINGS
Araceli Navas et al, 2021	Determine if Aerobic Water Exercise during Pregnancy are effective in	EG = 148 CG = 146	EG = 31.1 ± 4.1 CG = 31.5 ± 4.2	14th–20th	EG = moderate aquatic aerobic exercise CG = Routine	Sleep Quality (MOS sleep) Quality of life (EQ-5D)	Aquatic aerobic exercise during pregnancy decreased postpartum an

	improving the Quality of Life and Postpartum Depression				prenatal care	Presence of anxiety or depression (EPDS)	depressive symptoms in mothers, and had no adverse effects on the mother or the newborn
Raquel Rodríguez-Blanque et al, 2020	Study the effect of Water Exercise on Quality of Life in Pregnancy	EG = 65 CG = 64	EG=32.12 ± 4.43 CG=30.58 ± 4.75	20th-37th	EG = moderate physical activity in water CG = Routine prenatal care	Global Physical Activity Questionnaire (GPAQ) Borg rating of perceived exertion (RPE) scale SF36v2)	Physical activity programmes in water, such as SWEP, enhance the HRQoL of pregnant women and they were not at risk of postpartum depression
RodríguezBlanque et al, 2019	Determine the effect of a water exercise program on the rate of perineum intact after delivery.	EG, n = 65 CG, n = 64	EG = 32.12 ± 4.43 CG = 30.58 ± 4.75	20th–37th	EG = Aerobic and resistance activities SWEP—(water) CG = Routine prenatal care	Physical activity level (Global Physical Activity Questionnaire, GPAQ)Perception of effort (Borg scale)	The women who followed the SWEP methodology were significantly more likely to have intact perinea after childbirth
AguilarCordero et al, 2018	Determine if physical activity in pregnancy relieves PPP	EG = 65 CG = 64	EG = 34.52 ± 4.50 CG = 33.67 ± 5.37	20th–37th	EG = Aerobic and resistance activities-SWEP CG = Routine prenatal care	Perception of effort (Borg scale) BMI (Formula QUETELET) Depression postpartum (Edinburgh Postnatal Depression Scale - EPDS)	Less at risk of Depression (EPDS) in EG. Overweight and obesity are closely associated with PPD.
RodríguezBlanque et al., 2017	Determine if there is an association between physical activity in the aquatic environment and sleep quality in pregnant women	EG = 65 CG = 64	EG = 32.12 ± 4.43 CG = 30.58 ± 4.75	20th–37th	EG = Aerobic and resistance activities (SWEP) CG = Routine prenatal care	BMI (Formula QUETELET) Perception of Effort (Borg scale)Evaluate self-perception (Pittsburgh Sleep Quality Index PSQI)	The SWEP methodology improves sleep quality, both subjectively and in terms of latency,duration and efficiency

(PRISMA)SWEP: study water exercise pregnant; BMI: body mass index; PPD: postpartum depression; EG: experimental group; CG: control group; PSQI: Pittsburgh Sleep Quality Index; GPAQ: global physical activity questionnaire; QOL: quality of life; EPDS: Edinburgh Postnatal Depression ScaleThe results obtained from the different studies analyzed show that the programs carried out in the aquatic environment generated greater improvements in the variables suited to objective comparison) (Table 1).

Quality Assessment

The selected studies were analysed and evaluated for their methodological quality by the interviewers independently (A.P. and J.G) and any disagreements were resolved by a third evaluator (N.K.). The methodological quality of the tests was assessed using the PEDro scale. PEDro scale scores ranged from 1 to 10, with higher PEDro scores corresponding to higher study quality. The following criteria were used to rate the quality of the method: A PEDro score of less than 5 indicates low quality and a PEDro score of 5 or higher indicates high quality.

Table 1. Rating of the PEDro Scale and Level of Evidence

S. NO.	ITEMS BASED ON PEDRO SCALE	ARTICLE 1 A. Navas et al, 2021	ARTICLE 2 R.Rodríguez et al, 2020	ARTICLE 3 R Rodríguez et al, 2019	ARTICLE 4 M J Aguilar et al, 2018	ARTICLE 5 R Rodriguez et al, 2017
1.	ELIGIBILITY CRITERIA	1	1	1	1	1
2.	RANDOM ALLOCATION	1	1	1	1	1
3.	CONCEALED ALLOCATION	1	1	1	1	1
4.	GROUPS SIMILAR AT BASELINE	1	1	1	1	1
5.	BLIND PARTICIPANT	1	0	0	0	0
6.	BLIND THERAPIST	1	0	0	0	0
7.	BLIND ASSESSOR	1	0	0	0	0
8.	FOLLOW-UP	1	1	1	1	1
9.	INTENTION TO TREAT ANALYSIS	1	0	0	0	0
10.	BETWEEN-GROUP COMPARISONS	1	1	1	1	1
11.	POINT MEASURE AND VARIABILITY	1	1	1	1	1
	PEDRO SCORE TOTAL	11	8	8	8	8

DISCUSSION

This systematic review aims to identify the effects of therapeutic aquatic exercise programs during pregnancy on the postpartum depression. The present study revealed that performing antenatal aquatic aerobic exercises of moderate intensity reduced PPD symptoms and increased the quality of life of mothers. Our findings partially supported the fact that aquatic exercises improve the risk of postpartum depression; the percentage of women identified as having a risk of depression (EPDS > 10) was also lower in the intervention group, but this difference did not reach statistical significance. Many physiological and psychosocial changes associated with pregnancy and delivery alter the performance of woman in her usual roles and also affect her perceived quality of life. There are many studies which recommend that physical exercises during pregnancy can improve the overall quality of life of women, and furthermore reduce the risk of post pregnancy depression.[24]

In our study, we found a reduction of the EQ-5D domains and this reduction were statistically significant in the anxiety and depression dimension. Also, we found reduction in the scoring of Edinburgh Postnatal Depression Scale (EPDS) which is specifically designed to check the prevalence of postpartum depression. Hormonal and mechanical alterations during pregnancy may also lead to fatigue and sleep disorders and some previous studies has shown the association between sleep problems and the increased risk of antenatal and postpartum depression.[25,26] We found reduction in sleeping problems that can be evaluated by MOS sleep questionnaire in the intervention group when compared with the control group. Previous studies showed the reduction in ppd with postpartum exercise.[27] Our study revealed that antenatal aquatic exercises are also beneficial in reducing the risk of ppd.

Vargas-Terrones et al. in a study found that women who performed exercise of moderate intensity for 60 minutes for 3 days in a week had the 15% reduction in PPD. Aguilar-Cordero et al.[28] performed a study in which women were doing aquatic exercise for 60 minutes 3 days per week and found the reduction the risk of ppd and its symptoms. Aquatic exercises are more beneficial than land exercises and have shown positive physiological effects that improves the circulation of blood and venous return. These exercises also alleviate that edema which is induced in pregnancy.[29] Aerobic exercises are also beneficial as all the major muscles, are involved in these exercises. Emotional and social interaction with other women while doing exercises in a group may also show the beneficial effects on ppd.

In contrast, three RCTs found no effect on PPD with exercise during pregnancy[30,31,32]. From these 3 rcts, 2 studies studied the effect of exercise with different number of sessions in a week. Coll et al.[33] studied the effect of three 1 h sessions per week and Songoygard et al.[34] examined the effect of one 1 h session per week However, Mohammadi et al.[35] Simply examined the effect of providing advice for performing three 20–30 min sessions per week. Different duration, intensity and frequency of exercise showed different effects on PPD.

One systematic review concluded that the women are required to accumulate 644 MET- min/week to reduce the depressions symptoms.[36] In our review, most of the studies has the intervention of performing exercises 3 days per week at moderate intensity. It has been proved by studies that depression and anxiety in the course of pregnancy are the most important risk factors associated with the development of PPD.[37,38] Different effects of antenatal exercises were shown as the evaluation of PPD was done at different timing after delivery.(after 1 month, 6 weeks (6,7), 8 weeks (11), and 12 weeks.

Weight gain and gestational diabetes can also be prevented by antenatal exercise and they also reduce hypertension. Antenatal exercises are safe for women with no contraindication for exercise and recently, WHO has recommended the pregnant women to do at least 150 min per week of moderate intensity aerobic physical activity. Importantly, a moderate-intensity aerobic exercise in aquatic environment are considered to be safe for the women when done under proper supervision. Water aerobics is a low-impact form of exercise which is safer than weight-bearing exercise on land.

CONCLUSION

Undertaking this systematic review has allowed us to conclude that the regular and systematic practice of aquatic exercise carried out during pregnancy leads to improvements at the cognitive level (depression, quality of life, body image) and physical level (low back pain, fitness, mobility) of the pregnant women. Aquatic aerobic exercise during pregnancy decreased postpartum anxiety and depressive symptoms in pregnant women, and had no adverse effects on the mother or the newborn. Aquatic exercise during pregnancy may therefore be considered for the prevention of Postpartum Depression in pregnant women.

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