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ORIGINAL PAPER

EFFECT OF PHYSIOTHERAPEUTIC PRENATAL PREPARATION ON PELVIC FLOOR DYSFUNCTION AND SEXUAL DYSFUNCTION IN POSTPARTUM WOMEN

Michaela Hroncová[1,2(A,B,E)], **Stanislav Machač**[3(C,D,F)], **Pavol Nechvátal**[4(A,C,D,E)]

[1]Department of Physiotherapy, Faculty of Health Sciences, University of Ss. Cyril and Methodius in Trnava, Slovakia

[2]Rehab Care s.r.o., Košice, Slovakia

[3]Clinic of Physical Medicine and Rehabilitation, Second Faculty of Medicine, Motol University Hospital, Charles University, Prague, Czech Republic

[4]Department of Physiotherapy, Faculty of Health Care, University of Prešov, Slovakia

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Address for correspondence: Pavol Nechvátal, Department of Physiotherapy, Faculty of Health Care, University of Prešov, Partizánska 1, 08001 Prešov, Slovakia, e-mail: pavol.nechvatal@unipo.sk, phone: +421517562452

ORCID: Stanislav Machač https://orcid.org/0009-0009-7131-3331, Pavol Nechvátal https://orcid.org/0000-0003-2387-6745

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Summary

Background. Pregnancy involves major physiological and hormonal changes essential for fetal development and maternal adaptation. Though natural, these changes can cause discomfort and complications, some lasting postpartum. This study examines the impact of prenatal physiotherapy on postpartum pelvic floor and sexual dysfunction.

Material and methods. The study sample included 200 primiparous women who had vaginal delivery. The experimental group (100) underwent physiotherapeutic preparation, while the control group (100) did not. The intervention included exercises, perineal massages, coccyx mobilization, and herbal vaginal steaming. Pelvic floor dysfunction was assessed using the PFDI-20 questionnaire and sexual dysfunction with the PISQ-12 before and after delivery. Results were processed using non-parametric tests (Wilcoxon and Mann-Whitney U-test).

Results. Results showed a significant difference in pelvic floor dysfunction between the groups; in particular, women in the experimental group exhibited a lower dysfunction score ($p<0.001$). The sexual dysfunction condition improved in both groups; however, the difference observed between the groups was not significant ($p=0.937$).

Conclusions. Prenatal physiotherapy positively affects pelvic floor dysfunction in postpartum women; however, its effect on sexual dysfunction was not statistically significant. Physiotherapeutic preparation should be included in the care provided to pregnant women in order to improve their postpartum recovery and prevent prolonged disability.

Keywords: pelvic floor disorders, motor activity, postpartum period, exercise therapy, women's health

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Introduction

The duration of pregnancy is a time of important physiological and hormonal changes in the female body. Such changes, albeit natural, often lead to various types of physical discomfort and health conditions that may persist after childbirth. Common negative changes include a weight gain, a shift of the center of gravity of the body, decreased muscle tone, backache, problems with joints and impaired body posture, as well as gestational diabetes mellitus and more [1-3]. However, epidemiological studies indicate that pelvic floor disorders are also often associated with childbirth, while they are significantly affected by parity, and their occurrence is more frequent after a vaginal delivery than after a caesarean section [4]. Equally frequent is the occurrence of sexual dysfunction. Khajehei et al. [5] stated that almost two thirds of postpartum women presented with sexual dysfunction throughout the first year after childbirth. The most frequent types of sexual dysfunction reported by the affected women included sexual desire disorder (81.2%), problems with orgasm (53.5%), and sexual arousal disorders (52.3%). These factors may impair women's well-being throughout pregnancy and even contribute to prolonged disability after childbirth. In this context, physiotherapy and prenatal preparation in pregnancy play a crucial role. Research indicates that regular physical activity may help mitigate many of the problems listed above [6-11]. Exercising strengthens muscles, improves flexibility and coordination, and thus contributes to improving body posture, reducing backache, and mitigating pelvic floor dysfunction and sexual dysfunction. Moreover, physical activity supports cardiovascular health, reduces the risk of excessive weight gain, and contributes to the overall mental health of women [12].

Physiotherapeutic prenatal preparation and physical activity offer targeted interventions that are adjusted to the individual needs of pregnant women. Such interventions may include exercises that strengthen the pelvic floor and improve stability and balance, as well as

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techniques that release tension in problematic areas. An important aspect of physiotherapy is also the education of women about correct ergonomics and preventive measures which may contribute to the minimization of the risk of postpartum disability.

Despite these findings, research on the effectiveness of multimodal prenatal physiotherapeutic interventions remains limited. Most studies focus on individual interventions, such as pelvic floor muscle training [9,13-15] or yoga [16-18], though few investigate the combined effect of multiple approaches.

Aim of the work

The aim of this study is to address this gap by evaluating a specific prenatal physiotherapy program that is systematically applied in many physiotherapy centers. The intervention includes a combination of targeted exercises, perineal massage, coccyx mobilization, and herbal vaginal steaming—methods designed to enhance pelvic floor function, promote relaxation, and facilitate an easier vaginal delivery. However, the effectiveness of this particular approach has not yet been systematically assessed.

This study seeks to evaluate the impact of this multimodal prenatal physiotherapy intervention on postpartum pelvic floor dysfunction and sexual function. By providing evidence on the benefits of a structured prenatal physiotherapy program, our findings may contribute to optimizing prenatal care strategies and improving postpartum health outcomes.

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Material and methods

Study design

This was a retrospective study comparing postpartum women who received physiotherapeutic prenatal preparation with those who did not undergo this intervention. The research was performed from September 2021 to May 2024.

Recruitment of participants and inclusion/exclusion criteria

Two to five months after childbirth, women who had received prenatal physiotherapeutic preparation (as documented in their medical records) underwent a postpartum assessment. Based on the inclusion (prenatal preparation, vaginal delivery) and exclusion criteria, suitable candidates were approached and, upon providing informed consent, were consecutively enrolled in the study. At this stage, they completed two questionnaires—the first retrospectively, focusing on the period three to six months prior to pregnancy, and the second reflecting their current condition. After completing these procedures, the women were offered postpartum physiotherapeutic care based on individual need and interest; however, this follow-up was not part of the present study.

The recruitment of women who had not undergone prenatal physiotherapeutic preparation was carried out through a Facebook forum focused on pregnancy and motherhood. At the beginning of the questionnaire, instructions for completion were provided, along with the inclusion criteria—being three to six months postpartum, having had a vaginal delivery, and no participation in any form of prenatal preparation or postpartum physiotherapy. The exclusion criteria were also specified (the exclusion criteria for both groups included a high-risk

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pregnancy, multiple pregnancies, and the presence of complications, such as eclampsia, hemorrhage, pathological discharge, etc.).

The questionnaire remained available on the social network for a period of four months. During this time, it was reposted multiple times whenever the response rate declined. Data collection was concluded after obtaining 100 correctly completed responses. In total, 104 questionnaires were submitted.

Prenatal preparation

The prenatal preparation was comprised of physiotherapy, perineal massages, coccyx mobilization, and application of herbal vaginal steaming.

The exercise was performed in the period from week 15 of pregnancy to childbirth, once a week, under the supervision of a physiotherapist. Participants paid for these sessions as part of private care, typically completing an average of 25 sessions. Subsequently, after being properly instructed, the pregnant women were doing the exercises at home on a daily basis. An hour exercise block included pregnancy yoga and elements of dynamic neuromuscular stabilization (DNS). The purpose of pregnancy yoga is to maintain flexibility and elasticity, strengthen the entire body, practice conscious breathing, improve breathing patterns, and promote psychic relaxation, which can contribute to positive effects on anxiety, depression, perceived stress, normal vaginal birth, and shorter labor duration [19]. The DNS method optimizes coordination and activation of muscles with the aim of achieving better postural stability and function [20].

Perineal massages were performed manually by a trained physiotherapist. They also included a technique aimed at pelvic floor relaxation through manually affecting the trigger points in the levator muscle area and the surrounding structures. The purpose of this approach

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was to relax the muscles of the pelvic floor and prepare them for labor. This was followed by per-rectal mobilization of the coccyx and sacroiliac joints, performed by applying the method developed by L. Mojžíšova [21], which is part of the prenatal physiotherapeutic preparation. Coccyx relaxation contributes to the prevention of a delayed delivery and reduces the duration of the second stage of labor. These procedures were performed in the period from week 38 to week 40, once a week, i.e. 2-3 times during pregnancy.

Practice of vaginal steaming of the perineum was undertaken by pregnant women at home, 2-3 times per week, from week 38 to week 40 of pregnancy. This procedure is a commonly recommended practice at our rehabilitation facility, and special steaming chairs (such as the Black Swan or its improved versions) are used for this. An herbal mixture (typically *Rubi idaei*, *herba Thymi serpylli*, and *flos Lavandulae angustifoliae*, *flos Calendulae officinalis*, or *folium Salviae rosmarini*) is used to prepare a steam bath that is placed under the chair and applied for 15 minutes. Hot steam containing herbal essences softens the perineal tissues, thus increasing the flexibility and elasticity of the perineum. This prevents birth canal injuries (ruptures) or episiotomy.

Measured variables

The respondents were evaluated for the status of their pelvic floor dysfunction using the Pelvic Floor Disability Index (PFDI-20) questionnaire [22]. The questionnaire is used to determine the degree of health-related pelvic floor disability. It consists of three sections that include the assessment of stress caused by pelvic organ prolapse, assessment of stress associated with colorectal and anal troubles, and assessment of stress associated with urination disorders. The questionnaire contains 20 questions, while the resulting score ranges from 0 to 80 points. Higher scores represent higher degrees of disability.

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Sexual dysfunction was evaluated using the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12) [23]. PISQ-12 deals with behavioral, emotional, physical, and partner-related aspects. It is a questionnaire which women fill out by themselves, and their answers are ranked on a 5-point Likert scale (from 0-never to 4-always). It contains 12 questions, and the resulting score ranges from 0 to 48 points. Higher scores represent lower degrees of sexual dysfunction.

Data analysis

The obtained results were statistically processed. Normality of data sets was determined using the Shapiro-Wilk's test for normality. Since the data sets were found not to be distributed normally ($p<0.05$), non-parametric tests were eventually used. Within-group changes in baseline and final results were statistically analyzed using the one-tailed Wilcoxon test. The two-tailed Mann-Whitney test was used to evaluate between-group differences in both baseline and final results. To account for multiple comparisons and control for Type I error rate inflation, Bonferroni correction was applied. STATISTICA statistical software, version 14, was used.

Results

The study sample included 200 primiparous women, and their age ranged from 27 to 33 years. They were divided into two groups based on their participation in prenatal preparation. The experimental group included 100 women (an average age of 30.3 years) who underwent prenatal preparation in a physiotherapy center. The control group consisted of other 100 respondents (an average age of 30.4 years) who did not participate in the prenatal preparation.

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Statistical analysis of the baseline and final results revealed a significant increase in the PFDI-20 questionnaire score in both groups (p<0.001). Participants in the experimental group exhibited an average increase by 4.72 point, while in the control group, this was 9.13 points (Table 1).

Table 1. Statistical evaluation of baseline and final results (average, standard deviation, min., max.) of pelvic floor dysfunction (PFDI-20) in the experimental and control groups

Group	Baseline	Final	*p*-value
Experimental	6.82±8.11 (0-27)	11.54±10.71(0-32)	0.000
Control	9.78±7.75 (0-43)	18.91±9.58 (0-45)	0.000

After statistical processing of the baseline results, a significant difference between the groups was observed (p<0.001), with an average difference of 2.96 points (Table 2), while the respondents in the experimental group exhibited a significantly lower degree of pelvic floor dysfunction.

Table 2. Statistical evaluation of baseline values (average, standard deviation, min., max.) of pelvic floor dysfunction (PFDI-20) and sexual dysfunction (PISQ-12) when comparing the experimental and control groups

Parameter	Experimental group	Control group	*p*-value
PFDI-20	6.82±8.11 (0-27)	9.78±7.75 (0-43)	0.000
PISQ-12	17.06±2.57 (11-24)	15.46±3.17 (0-22)	0.000

Likewise, the final assessment showed a statistically significant difference in the PFDI-20 questionnaire score (p<0.001) between the groups (Table 3), as the respondents in the

experimental group exhibited a significantly lower degree of pelvic floor dysfunction than that of control group respondents – by 7.46 points on average.

Table 3. Statistical evaluation of final results (average, standard deviation, min., max.) of pelvic floor dysfunction (PFDI-20) when comparing the experimental and control groups

Parameter	Experimental group	Control group	*p*-value	Sig.
1	0.63±0.85 (0-3)	1.11±0.99 (0-3)	0.001	yes
2	0.51±0.77 (0-3)	1.08±1.19 (0-4)	0.009	no
3	0.4±0.77 (0-3)	0.62±0.76 (0-2)	0.000	yes
4	0.44±0.70 (0-3)	1.17±1.01 (0-3)	0.000	yes
5	0.55±0.80 (0-3)	1.09±0.91 (0-3)	0.000	yes
6	0.34±0.47 (0-1)	0.58±0.69 (0-3)	0.016	no
7	0.49±0.76 (0-3)	0.99±0.99 (0-3)	0.000	yes
8	0.6±0.86 (0-3)	0.69±0.77 (0-3)	0.161	no
9	0.43±0.60 (0-2)	0.33±0.49 (0-2)	0.339	no
10	0.3±0.52 (0-2)	0.23±0.49 (0-2)	0.261	no
11	0.5±0.81 (0-3)	0.53±0.64 (0-2)	0.260	no
12	0.65±0.91 (0-4)	0.95±0.85 (0-3)	0.003	no
13	0.9±1.12 (0-5)	1.04±0.99 (0-4)	0.128	no
14	0.51±0.55 (0-2)	0.57±0.79 (0-3)	0.903	no
15	0.95±1.07 (0-3)	1.52±0.98 (0-3)	0.000	yes
16	0.68±0.83 (0-3)	1.44±0.89 (0-3)	0.000	yes
17	0.85±0.84 (0-3)	1.53±0.89 (0-4)	0.000	yes
18	0.79±0.87 (0-3)	1.35±0.96 (0-4)	0.000	yes
19	0.49±0.63 (0-3)	1.11±0.89 (0-3)	0.000	yes
20	0.53±0.77 (0-3)	0.98±1.01 (0-3)	0.001	yes
Score	11.54±10.71 (0-32)	18.91±9.58 (0-45)	0.000	yes

Notes: Sig. – statistically significant ($p<0.00238$ after Bonferroni correction), 1. Do you usually experience pressure in the lower abdomen? 2. Do you usually experience heaviness or dullness in the pelvic area? 3. Do you usually have a bulge or something falling out that you can see or feel in your vaginal area? 4. Do you ever feel pressure on the vagina or around the rectum when you have or complete

a bowel movement? 5. Do you usually experience a feeling of incomplete bladder emptying? 6. Do you ever have to push up on a bulge in the vaginal area with your fingers to start or complete urination? 7. Do you feel you need to strain too hard to have a bowel movement? 8. Do you feel you have not completely emptied your bowels at the end of a bowel movement? 9. Do you usually lose stool beyond your control if your stool is well formed? 10. Do you usually lose stool beyond your control if your stool is loose? 11. Do you usually lose gas from the rectum beyond your control? 12. Do you usually have pain when you pass your stool? 13. Do you experience a strong sense of urgency and have to rush to the bathroom to have a bowel movement? 14. Does part of your bowel ever pass through the rectum and bulge outside during or after a bowel movement? 15. Do you usually experience frequent urination? 16. Do you usually experience urine leakage associated with a feeling of urgency, that is, a strong sensation of needing to go to the bathroom? 17. Do you usually experience urine leakage related to coughing, sneezing, or laughing? 18. Do you usually experience small amounts of urine leakage (that is, drops)? 19. Do you usually experience difficulty emptying your bladder? 20. Do you usually experience pain or discomfort in the lower abdomen or genital region?

Statistical analysis of the baseline and final results revealed a significant increase in the PISQ-12 questionnaire score in both groups ($p<0.005$). Participants in the experimental group exhibited an average increase of 0.83 point, while in the control group, this was 1.89 points (Table 4).

Table 4. Statistical evaluation of the baseline and final values (average, standard deviation, min., max.) of sexual dysfunction (PISQ-12) in the experimental and control groups of respondents

Group	Baseline	Final	*p*-value
Experimental	17.06±2.57 (11-24)	17.89±3.36 (11-26)	0.026
Control	15.46±3.17 (0-22)	17.35±5.36 (2-26)	0.000

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Statistical processing of the baseline results of the PISQ-12 questionnaire indicated a notable distinction between the groups (p<0.001), with an average difference of 1.6 points (Table 2), while respondents in the experimental group exhibited a significantly lower degree of sexual dysfunction (Table 2). However, the final results did not reveal any difference in the achieved score of the PISQ-12 questionnaire (p=0.937) between the groups (Table 5).

Table 5. Statistical evaluation of final results (average, standard deviation, min., max.) of sexual dysfunction (PISQ-12) when comparing the experimental and control groups

Parameter	Experimental group	Control group	*p*-value	Sig.
1	2.96±0.75 (1-4)	1.52±0.98 (0-3)	0.000	yes
2	2.96±0.94 (0-4)	1.44±1.02 (0-3)	0.000	yes
3	3.22±0.69 (2-4)	1.55±1.18 (0-4)	0.000	yes
4	3.11± 0.97 (0-4)	1.45±1.02 (0-4)	0.000	yes
5	0.93±1.14 (0-4)	2.23±1.03 (0-4)	0.000	yes
6	0.63±0.92 (0-4)	1.78±1.32 (0-4)	0.000	yes
7	0.46±0.76 (0-4)	1.75±1.37 (0-4)	0.000	yes
8	0.24±0.71 (0-4)	1.54±1.27 (0-4)	0.000	yes
9	0.4±0.88 (0-4)	1.38±1.31 (0-4)	0.000	yes
10	0.08±0.27 (0-1)	0.59±0.71 (0-2)	0.000	yes
11	0.49±0.98 (0-4)	0.55±0.69 (0-2)	0.048	no
12	2.41±0.89 (0-4)	1.57±1.03 (0-4)	0.000	yes
Score	17.89±3.36 (11-26)	17.35±5.36 (2-26)	0.937	no

Notes: Sig. – statistically significant (p<0.00385 after Bonferroni), 1. How frequently do you feel sexual desire? 2. Do you climax (have an orgasm) when having sexual intercourse with your partner? 3. Do you feel sexually excited (turned on) when having sexual activity with your partner? 4. How satisfied are you with the variety of sexual activities in your current sex life? 5. Do you feel pain during sexual intercourse? 6. Are you incontinent (leak urine) during sexual activity? 7. Does fear of incontinence (either urine or stool) restrict your sexual activity? 8. Do you avoid sexual intercourse because of bulging in the vagina (either the bladder, rectum, or vagina)? 9. When you have sex with your partner, do you

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have negative emotional reactions such as fear, disgust, shame, or guilt? 10. Does your partner have a problem with erections that affects your sexual activity? 11. Does your partner have a problem with premature ejaculation that affects your sexual activity? 12. Compared to orgasms you have had in the past, how intense are the orgasms you have had in the past six months?

In both groups, respondents exhibited comparable degrees of sexual dysfunction, as assessed in the final examination.

Figure 1 shows that in the case of the PFDI-20 questionnaire, both groups experienced an increase in scores, which indicates a worsening of the condition. However, the mean change in scores was smaller in the experimental group (4.72 points) compared to the control group (9.13 points). Similarly, for the PISQ-12 questionnaire, the mean change in scores was 0.83 points in the experimental group versus 1.41 points in the control group.

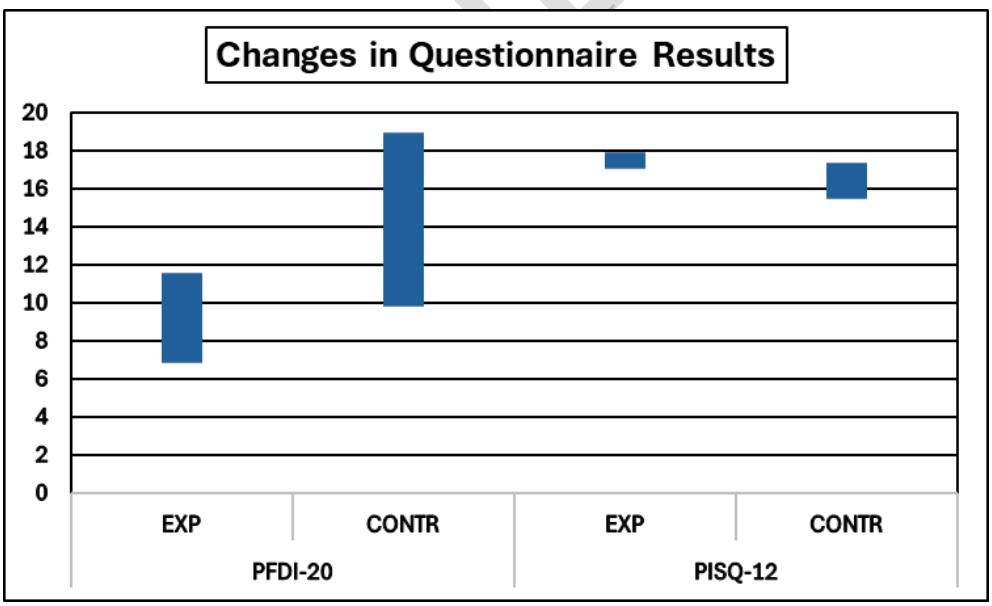

Figure 1. Inter-group comparison of changes in PFDI-20 and PISQ-12 scores

Notes: PFDI-20 – Pelvic Floor Disability Index, PISQ-12 – Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire, EXP – experimental group, CONTR – control group.

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Discussion

Physical activity in pregnancy provides important benefits, including a positive effect on the musculoskeletal system and prevention of pelvic floor dysfunction, and this may reduce the risk of postpartum sexual dysfunction. Prenatal physiotherapeutic preparation and regular exercise aimed at strengthening the pelvic floor muscles in pregnancy not only helps women cope with the increased burden imposed on the musculoskeletal system but also improves the ability of those muscles to recover after childbirth. This may significantly reduce the risk of complications such as incontinence, pelvic organ prolapse, and sexual dysfunction – thus generally improving the quality of life of postpartum women [23-25].

In this study, the effects of physiotherapeutic exercise and prenatal preparation on pelvic floor dysfunction and sexual dysfunction in postpartum women were studied. Results indicate that these interventions help mitigate the impairment of these conditions. In both groups, it was observed that pelvic floor dysfunction significantly increased after childbirth. However, there was also a difference between the groups; in particular, women who participated in physiotherapeutic prenatal preparation in the postnatal period exhibited a significantly lower degree of pelvic floor dysfunction compared to women who did not undergo prenatal preparation.

Similar results were obtained by Mørkved et al. [9] after a systematic review aimed at studying the effects of strength training of the pelvic floor muscles during pregnancy and after childbirth. Based on the review of 22 randomized, or quasi-experimental studies, they concluded that strength training of the pelvic floor muscles is efficient when performed under professional supervision and that it should be generally integrated in the exercise programs for women as a routine activity due to the prevalence of female urinary incontinence.

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Similarly, Kahyaoglu Sut et al. [13] conducted a randomized, placebo-controlled trial investigating the effects of exercise of pelvic floor muscles in 60 pregnant women. They observed a significant decrease in the strength of pelvic floor muscles during pregnancy (p<0.001). A similar negative effect was also observed for urinary symptoms, quality of life, and bowel movement functions. They concluded that strength training of pelvic floor muscles applied in pregnancy and in the postpartum period increases the strength of the pelvic floor muscles and prevents the intensification of the aforesaid symptoms.

As for sexual dysfunction, this was studied by Karaahmet et al. [14]. In a systematic review and meta-analysis of randomized, placebo-controlled trials, out of an initial number of 339 identified papers, they eventually reviewed 8 relevant studies (a total of 896 subjects). Relevant evidence showed that strength training of the pelvic floor muscles in pregnancy is a safe strategy for achieving beneficial effects on sexual dysfunction. The authors concluded that even though the study populations and the evidence quality was low, the majority of studies and results of meta-analyses presented positive results.

In contrast, Sobhgol et al. [15] stated that in their randomized, placebo-controlled trial, they did not observe any effect of strength training of the pelvic floor muscles on sexual functions or labor outcomes. However, they emphasized that these findings were not persuasive due to high non-adherence, i.e. the fact that approximately 50% of pregnant women failed to adhere to the prescribed training, and approximately 40% of women failed to engage in regular sexual intercourse after childbirth. However, considering the increasing evidence from meta-analyses highlighting the advantages of pelvic floor muscle strength training for labor outcomes, along with its established role in preventing and managing pelvic floor dysfunction, the authors suggested that women should engage in this training both before and after childbirth.

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The conclusions presented by these studies are not in full concordance with the findings of the present study, as the results of this study showed that subjects from both groups exhibited comparable degrees of sexual dysfunction in the postnatal period.

This study has several limitations, the most significant being that statistically significant differences were found in the baseline PFDI-20 questionnaire results between the experimental and control groups (Table 1). This implies that the groups were not comparable at the beginning of the study in this specific aspect.

Nevertheless, we proceeded with monitoring the changes due to a significant observation: as evident from Figure 1, for PFDI-20, which illustrates the range of changes (deterioration) in scores, the experimental group experienced a substantially smaller deterioration compared to the control group. While the range of deterioration in the control group had higher values (approx. 10-19), in the experimental group, this range was significantly lower (approx. 7-11). This finding strongly suggests that even though the condition worsened in both groups, therapeutic intervention in the experimental group played a key role in mitigating the progression of this deterioration. The intervention evidently influenced the trajectory of deterioration, thereby protecting the experimental group from as severe a decline, as was observed in the control group. This argument allows us to highlight the clinically relevant effect of the intervention.

Another limitation is the influence of respondents' lifestyles, in particular their prolonged engagement in exercise or sports in previous stages of their lives, was not taken into consideration. Women with a healthy lifestyle typically maintain a high degree of physical activity even in the late stage of their pregnancy, where the majority of pregnant women tend to reduce their overall physical activity [26]; this may contribute to better recovery and health in the postnatal period. It may be assumed that this was the reason why the respondents in the experimental group, who underwent prenatal physiotherapy and preparation, exhibited a lower

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degree of pelvic floor dysfunction and higher quality of sexual functions in the baseline examination.

One more limitation of this study is that respondents in the control group were recruited through social networks, which may have affected the reliability of their answers. It is also possible that they did not fill out the questionnaires with sufficient consistency, and this may have affected data accuracy.

Another limitation to consider is that adverse events were neither analyzed nor monitored during this study.

Conclusions

The findings of this study suggest that physiotherapeutic prenatal preparation can positively influence the reduction of pelvic floor dysfunction in postpartum women. Women who underwent regular physiotherapy and specific techniques exhibited a significantly lower degree of pelvic floor dysfunction after delivery compared to those who did not participate in such preparation. This indicates that the intervention played a crucial role in mitigating the deterioration of pelvic floor function after childbirth.

The study also revealed that the effects of prenatal physiotherapy on sexual dysfunction were not statistically significant, as both groups showed a comparable degree of sexual dysfunction in the postpartum period.

Despite certain limitations, such as initial baseline differences in pelvic floor dysfunction between the groups, the clinically relevant effect observed for pelvic floor dysfunction highlights the importance of such interventions. Integrating physiotherapeutic prenatal preparation into the routine care provided to pregnant women could significantly

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improve postpartum recovery and help prevent prolonged disability associated with pelvic floor dysfunction.

Disclosures and acknowledgements

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The participants in the experimental group chose to undergo prenatal physiotherapy preparation of their own initiative, independently of this study. This preparation is a routine practice in a private physiotherapy center and was not introduced specifically for research purposes. The primary motivation of the participants was to reduce the risk of complications during childbirth and the postpartum period. Since the study did not interfere with standard care or require any additional interventions, obtaining approval from an ethics committee was not necessary.

All participants were fully informed about the study's objectives, procedures, and data confidentiality. Verbal informed consent was obtained from each participant before their inclusion in the study, in accordance with ethical principles and the Declaration of Helsinki (1975, revised in 2000).

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Artificial intelligence (AI) was not used in the creation of the manuscript.

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