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ORIGINAL ARTICLE

Does group training during pregnancy prevent lumbopelvic pain? A randomized clinical trial

SIV MØRKVED[1,2], KJELL ÅSMUND SALVESEN[3,4], BERIT SCHEI[5], STIAN LYDERSEN[6] & KARI BØ[7]

[1]*Clinical Service and National Center for Fetal Medicine, Trondheim University Hospital, Norway,* [2]*Department of Community Medicine and General Practice, Norwegian University of Science and Technology, Trondheim, Norway,* [3]*National Center for Fetal Medicine, St. Olavs Hospital, Trondheim University Hospital St. Olav,* [4]*Institute of Laboratory Medicine, Women and Child Health, Norwegian University of Science and Technology,* [5]*Department of Obstetrics and Gynecology, St. Olavs Hospital, Trondheim University Hospital,* [6]*Unit for Applied Clinical Research, Department of Cancer Research and Molecular Medicine, Norwegian University of Science and Technology, and* [7]*Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway*

Abstract

Background. Prevention of lumbopelvic pain in pregnancy has been sparsely studied. One aim of this study was to assess if a 12-week training program during pregnancy can prevent and/or treat lumbopelvic pain. A randomized controlled trial was conducted at Trondheim University Hospital and three outpatient physiotherapy clinics. Three hundred and one healthy nulliparous women were included at 20 weeks of pregnancy and randomly allocated to a training group (148) or a control group (153). *Methods.* The outcome measures were self-reported symptoms of lumbopelvic pain (once per week or more), sick leave, and functional status. Pain drawing was used to document the painful area of the body. The intervention included daily pelvic floor muscle training at home, and weekly group training over 12 weeks including aerobic exercises, pelvic floor muscle and additional exercises, and information related to pregnancy. *Results.* At 36 weeks of gestation women in the training group were significantly less likely to report lumbopelvic pain: 65/148 (44%) versus 86/153 (56%) ($p = 0.03$). Three months after delivery the difference was 39/148 (26%) in the training group versus 56/153 (37%) in the control group ($p = 0.06$). There was no difference in sick leave during pregnancy, but women in the training group had significantly ($p = 0.01$) higher scores on functional status. *Conclusions.* A 12-week specially designed training program during pregnancy was effective in preventing lumbopelvic pain in pregnancy.

Key words: *Lumbopelvic pain, pregnancy, prevention, physiotherapy, group training*

A high percentage of women suffer from low back and pelvic girdle pain (lumbopelvic pain) during pregnancy and after delivery. The average prevalence from different studies of lumbopelvic pain in pregnancy is 45%, and of all women postpartum 25% (1). The condition may influence daily activities, cause withdrawal from social situations and physical activities, and lead to reduced quality of life (2–4). Lumbopelvic pain is the most common reason for sick leave during pregnancy in the Scandinavian countries (5).

The etiology and pathogenesis of lumbopelvic pain during pregnancy and after delivery is unclear. During the last ten years the role of coordinated muscle activity to secure stability of the lumbar and pelvic region has been highlighted (6). The importance of activation of muscle slings and activation and co-activation of specific muscles like the transversus abdominis (TrA), obliquus internus (OI), multifidus, pelvic floor muscles (PFM), and the respiratory diaphragm have been studied (7–11). However, the effect of training these muscles to

Correspondence: Siv Mørkved, Department of Community Medicine and General Practice, Medisinsk teknisk forskningssenter, N-7489 Trondheim, Norway. E-mail: siv.morkved@ntnu.no

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decrease lumbopelvic pain has been sparsely documented. Four randomized clinical trials (RCT) (12–15) aiming at prevention and/or treatment of low back and pelvic girdle pain during pregnancy have been published.

We conducted a RCT where the primary outcome was prevention and treatment of urinary incontinence. The intervention included daily PFM training at home and weekly group training including aerobic exercises, PFM and additional exercises, and information related to pregnancy. Women in the training group had stronger PFM and reported less urinary incontinence after the training period (16).

A secondary aim of the trial and the focus of this report was to assess if this training program could prevent lumbopelvic pain during pregnancy and after delivery.

Materials and methods

Women were recruited to the trial from October 1998 to May 2000 and followed up until April 2001. In this period, 1,533 non-selected nulliparous women from a geographically well defined area consisting of four municipalities surrounding and including the city of Trondheim were invited to participate in the trial.

Approval was obtained from the local medical research ethics committee. Women were eligible if they were nulliparous, 18 years or more, with a singleton live fetus at a routine ultrasound scan at 18 weeks of pregnancy. Exclusion criteria were pregnancy complications, high risk for preterm labor, pain during PFM contractions, ongoing urinary tract infection, or diseases that could interfere with participation. In addition, women who lived too far from Trondheim to be able to attend weekly training groups were excluded.

Three hundred and forty-two women gave their signed consent to participate in the trial, 41 women were excluded or withdrew before the first examination, and 301 women were randomly allocated to a training group or to a control group (Figure 1). Randomization was done in blocks of 32 with the use of opaque sealed envelopes. A secretary with no other involvement in the trial prepared the envelopes. Each woman opened one of the envelopes herself and was enrolled by the secretary in the secretary's office. The professional staff involved in the training groups or the outcome assessments had no access to the randomization procedure. The principal investigator (SM) was not involved in the training of the women, and was blinded to group allocation while making the assessments and plotting the data.

Intervention

The training group followed a specially designed exercise course including PFM and additional exercises. They trained with a physical therapist in groups of 10–15 women for 60 min once per week for 12 weeks (between pregnancy weeks 20 and 36). Five physical therapists were involved in a total of 14 groups. In addition, the women were encouraged to perform 8–12 intensive PFM contractions twice per day at home. Motivation was strongly emphasized by the physical therapists. The PFM training protocol has been published previously (16). The selection of additional exercises was based on current knowledge of etiology and pathogenesis of lumbopelvic pain and clinical experience. The training program followed the recommendations concerning physical activity practice during pregnancy according to the American College of Obstetricians and Gynecologists (17). Each training session consisted of:

1. 15–20 min aerobic activity. Aerobic exercises included low impact aerobics (no running or jumping). Step length and body rotations were reduced to a minimum, and crossing of legs and sharp and sudden changes of position were avoided. The aerobic dance program was performed at moderate intensity, defined as 13 and 14 on Borg's rating scale of perceived exertion (18).
2. 30–35 min of exercises including 5 sets of specific strength training of the PFM (16), exercises aiming at activation of dorsal and ventral muscle-tendon-fascia slings (6), specific low force contractions of the transversely oriented abdominal muscles (7), and exercises for the upper and lower limbs using body weight as resistance (e.g. push-ups in different positions and squatting). Three sets of ten repetitions of each exercise were performed.
3. 5–10 min of light stretching, body awareness, and breathing and relaxation exercises.

In addition the women were given general advice related to ergonomics and daily life activities in pregnancy.

Adherence to the training protocol was registered based on the women's personal training diary (two sets of 8–12 contractions of the PFM per day) and the reports from the physical therapists that led the group training (participation in ≥ 6 group training sessions).

Women in the control group received the customary information given by their midwife or general

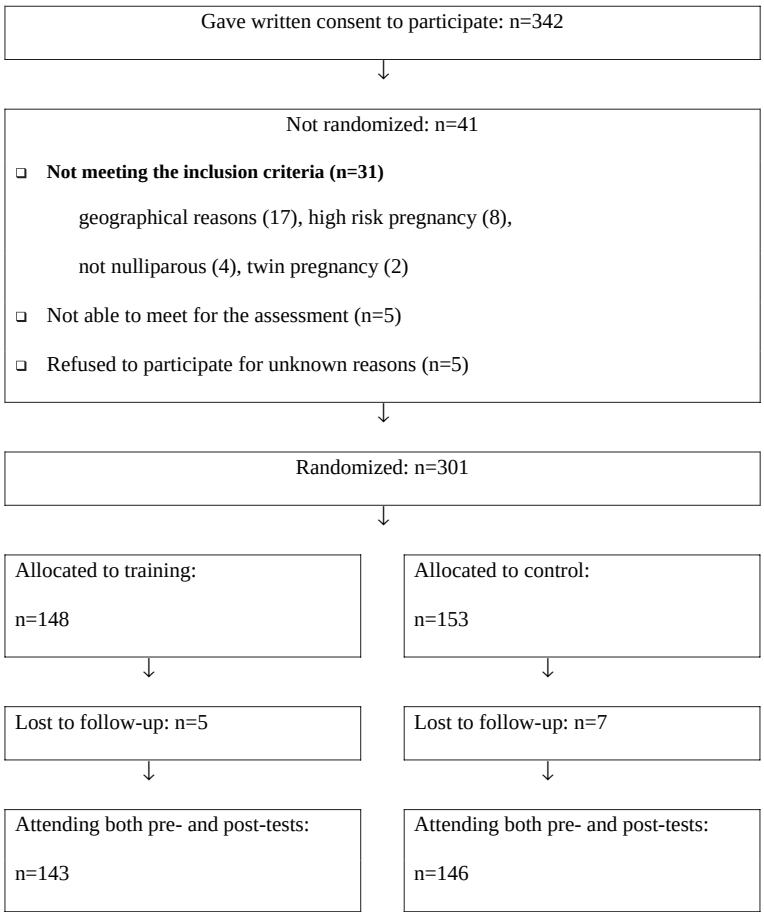

Figure 1. Flowchart of the study participants.

practitioner. They were not discouraged from exercising on their own.

Outcomes

Women were examined at 20 and 36 weeks of pregnancy, and three months after birth.

Lumbopelvic pain was defined as self-reports of pain once per week or more in the region of the pubic symphysis, over the sacroiliac joint area(s) (sometimes with radiation to the thighs), and in the lumbar region with or without radiation into one or both legs. Pain drawing was used to document the painful area of the body (19).

Sick leave was registered by self-reports at 36 weeks of pregnancy, according to the question: "Have you been/are you now on sick leave because of pain in the pelvic girdle or lower back?"

Functional status was registered by the Disability Rating Index (DRI) (20). The patients marked on a 100-mm visual analog scale (VAS) in accordance to their presumed ability to perform the 12 daily life activities in question. The anchor points are "without difficulty" – 0, and "not at all" – 100.

PFM strength (vaginal squeeze pressure, cm H_2O) was measured by a vaginal balloon catheter (balloon size 6.7×1.7 cm) connected to a pressure transducer (Camtech Ltd. 1300, Sandvika, Norway) (21).

Power calculation

Power calculation was done for the primary outcome and has been reported elsewhere (16).

Analysis/statistics

The main analysis was by intention to treat. Risk differences were analyzed by Pearson's chi-squared test, and by computing 95% Agresti and Caffo (22) confidence intervals. Possible influences of covariates (age, body mass index (BMI), leisure time physical activity, and PFM strength) on risk differences were explored using logistic regression. Student's *t*-test was used to compare distributions

Table I. Background and outcome variables before treatment (20 weeks pregnancy) in the training group and the control group. Values are means (SD) unless stated otherwise. $n=301$

	Training group ($n=148$)	Control group ($n=153$)
Age (years)	28.0 (5.3)	26.9 (3.9)
Body mass index before pregnancy	23.1 (3.0)	23.4 (3.5)
Body mass index	24.5 (2.9)	24.8 (3.5)
Pelvic floor muscle strength (cm H_2O)	34.4 (16.3)	35.7 (17.2)
No. (%) exercising regularly	79 (53)	74 (48)
No. (%) exercising the pelvic floor muscles	48 (30)	53 (28)
No. (%) incontinent	47 (32)	47 (31)
No. (%) with low back and/or pelvic girdle pain	64 (43)	66 (43)

between groups. In an exploratory analysis of a possible association between PFM strength and lumbopelvic pain, we grouped women according to self-reports of pain instead of the randomized groups. Two-sided p-values <0.05 were considered significant.

Results

Three-hundred and one nulliparous women were randomized to a training group ($n=148$) or a control group ($n=153$) (Figure 1). The trial groups were comparable at baseline (Table I). Seven women in the control group and five women in the training group withdrew after the first assessment. The reasons for withdrawal were diseases connected to pregnancy ($n=6$) or personal reasons ($n=6$), e.g. changes in work situation, family reasons, or moving away.

In all, 120 (81%) of 148 women in the training group followed the training protocol. The remaining 28 women were introduced to the training program, but participated in less than half of the group training sessions and did not return their personal training diary after the 12-week training program. No side effects of the training were reported.

At 36 weeks of gestation women in the training group were significantly less likely to report lumbopelvic pain: 65/148 (43.9%) versus 86/153 (56.2%) (risk difference 12.2%, $p=0.033$, 95% CI 1.0–23.3%). Three months after delivery the difference was 39/148 (26.3%) in the training group versus 56/153 (36.6%) in the control group (risk difference 10.2%, $p=0.056$, 95% CI -0.2 to 20.5%) (Table II).

The influence of covariates (age, BMI, leisure time physical activity, and PFM strength) on the main results was explored using logistic regression, and did not change the results materially.

There was no significant difference between groups in self-reported sick leave related to lumbopelvic pain at 36 weeks of pregnancy: 31/148 (20.9%) in the training group versus 25/153 (24.8%) in the control group (risk difference 3.9%, $p=0.42$, 95% CI -5.6 to 13.2%) (Table III).

Analyses of numbers needed to treat (NNT) demonstrated that this specific training program prevented lumbopelvic pain in about one in 8.1 women during pregnancy, and one in 9.8 women after delivery. The corresponding confidence intervals for number needed to benefit (NNTB) and number needed to harm (NNTH) (23) are NNTB 101 to NNTB 4.3 during pregnancy, and NNTH $405-\infty$ to NNTB 4.9 after delivery.

Functional status (DRI) after the intervention period was statistically significantly ($p=0.011$) higher among women reporting lumbopelvic pain in the training group [median 14 (interquartile range 28)] than in the control group [median 19 (interquartile range 27)].

In an exploratory analysis of a possible association between PFM strength and lumbopelvic pain, there was no association between mean PFM strength at 36 weeks of pregnancy and 3 months after delivery, or changes in strength, and lumbopelvic pain (Table IV).

Discussion

Significantly fewer women in the training group reported lumbopelvic pain during pregnancy. There was no significant difference between groups on sick leave due to lumbopelvic pain during pregnancy.

Table II. Women with self-reported lumbopelvic pain at 36 weeks of pregnancy and 3 months after delivery

	Training group ($n=148$)		Control group ($n=153$)			
	n	%	n	%	Significance	Risk difference % (95% CI)
36 weeks of pregnancy	65	44	86	56	$\chi^2=4.54$, $p=0.033$	12.2 (1.0–23.3)
3 months after delivery	39	26	56	37	$\chi^2=3.66$, $p=0.056$	10.2 (-0.2 to 20.5)

n, number of women with low back and/or pelvic girdle pain; N, total number of women;%, proportion of women with lumbopelvic pain.

Table III. Women on sick leave related to lumbopelvic pain

	Training group ($N=148$)		Control group ($N=153$)		
	n	%	n	%	$p^\star$
36 weeks of pregnancy	31	21	38	25	0.42

n, number of women with low back and/or pelvic gridle pain; N, total number of women;%, proportion of women with lumbopelvic pain. *Pearson's χ^2 test.

Women with lumbopelvic pain in the training group reported higher ability to perform daily life activities. However, the clinical relevance of a difference $<10\%$ may be questionable.

The present study was a RCT of nulliparous women, with blinding of the investigator, a low dropout rate, and high adherence to the training protocol. One limitation of the study was that we only used self-reports and pain drawings, and no clinical tests of lumbopelvic pain. However, to date there is no agreement about the most appropriate outcome measurements for lumbopelvic pain and the use of self-report scales are recommended (24,25).

The self-reports of sick leave may be prone to bias. We only registered sick leave during pregnancy as a yes/no question. A registration of the number of days of sick leave or specified according to pregnancy weeks might have been a better measurement. However, the percentage of women on sick leave in the study was similar to the percentages found in another study (13).

Results from previous trials evaluating training during pregnancy in prevention of lumbopelvic pain are inconsistent (12–15). Comparison of results is difficult due to different study populations, interventions, and outcome measurements used in the trials. Only one previous study included both women with and without back/low back pain at the baseline registration (13). This trial found reduced sick leave during pregnancy and lower pain intensity postpartum in a group doing water gymnastics compared to a control group (13). No differences in pelvic girdle pain during pregnancy and postpartum were found between a control group, a home exercise group, and a medical training therapy group (all groups were given non-elastic sacroiliac belt and information) (12). Two studies have compared individualized physiotherapy and acupuncture (14,15). In pregnant women with low back pain, better functional status was reported in a group receiving acupuncture than in a group receiving individualized physical therapy (14), while Elden et al. (15) found less pain in groups of pregnant women with pelvic girdle pain receiving either acupuncture or stabilizing exercises compared to standard treatment alone.

In the present study daily PFM training was encouraged. The effect of PFM training on the treatment of urinary incontinence is well documented in systematic reviews (26,27). An association between PFM strength and lumbopelvic pain is an open question. We observed no significant difference in PFM strength in groups of women with and without lumbopelvic pain, and similar results have been reported in one previous study (28).

Training of local and global muscle systems were included in the interventions for pregnant women with pelvic girdle pain described by Elden et al. (15), and for women with postpartum pelvic girdle pain described by Stuge et al. (29). Both trials demonstrated significantly greater pain reduction in groups receiving individual interventions with stabilizing exercises. We focused on training of local and global muscle systems in a group training setting. However, our preventive program also included other factors that may have had some contributory effect:

Table IV. Pelvic floor muscle strength (PFM) (mean and 95% confidence interval) at 36 weeks of pregnancy and 3 months after delivery, measured by vaginal squeeze pressure (cm H_2O), and change in strength in groups with and without lumbopelvic pain

	Without lumbopelvic pain	With lumbopelvic pain	$p^\star$
36 weeks of pregnancy	$n=150$	$n=151$	
PFM strength	36.6 (33.9–39.3)	37.6 (34.6–40.5)	0.635
Change in PFM strength between 20 and 36 weeks	2.5 (0.9–4.1)	1.6 (0.2–3.0)	0.384
3 months after delivery	$n=206$	$n=95$	
PFM strength	26.2 (24.2–28.3)	30.2 (26.7–33.8)	0.056
Change in PFM strength between 36 weeks and 3 months postpartum	−10.2 (−8.6 to 11.9)	−8.2 (−5.9 to 10.6)	0.167

*Student's t-test.

aerobic capacity, light stretching, relaxation exercises, general information about pregnancy, and advice about ergonomics and activities of daily living.

Conclusion

A 12-week specially designed group training program during pregnancy was effective in preventing lumbopelvic pain at 36 weeks of pregnancy.

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