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Developing strategies to be added to the protocol for antenatal care: An exercise and birth preparation program

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OBJECTIVES: To describe the implementation process of a birth preparation program, the activities in the protocol for physical and birth preparation exercises, and the educational activities that have been evaluated regarding effectiveness and women's satisfaction. The birth preparation program described was developed with the following objectives: to prevent lumbopelvic pain, urinary incontinence and anxiety; to encourage the practice of physical activity during pregnancy and of positions and exercises for non-pharmacological pain relief during labor; and to discuss information that would help women to have autonomy during labor.

METHODS: The program comprised the following activities: supervised physical exercise, relaxation exercises, and educational activities (explanations of lumbopelvic pain prevention, pelvic floor function, labor and delivery, and which non-pharmacological pain relief to use during labor) provided regularly after prenatal consultations. These activities were held monthly, starting when the women joined the program at 18–24 weeks of pregnancy and continuing until 30 weeks of pregnancy, fortnightly thereafter from 31 to 36 weeks of pregnancy, and then weekly from the 37th week until delivery. Information and printed materials regarding the physical exercises to be performed at home were provided. Clinicaltrials.gov: NCT01155804.

RESULTS: The program was an innovative type of intervention that systematized birth preparation activities that were organized to encompass aspects related both to pregnancy and to labor and that included physical, educational and home-based activities.

CONCLUSIONS: The detailed description of the protocol used may serve as a basis for further studies and also for the implementation of birth preparation programs within the healthcare system in different settings.

KEYWORDS: Antenatal education; Exercise; Labor pain; Pain management; Pelvic floor.

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■ INTRODUCTION

Pregnancy and childbirth involve physiological, emotional and social changes, and it is important during this period to implement lifestyle changes that will benefit both maternal and fetal well-being. Within the context of healthcare for pregnant woman, structured birth preparation programs using a multidisciplinary approach play an important role; such programs are being recommended for pregnant women and their partners (1–3). Topics related to pregnancy, childbirth, puerperium, newborn infant care, the physical and

emotional changes experienced during pregnancy, fears and fantasies regarding childbirth and puerperium, and the insecurity associated with becoming parents should be discussed during pregnancy in an attempt to minimize anxieties (4–6). These interventions should also include a set of activities that allow women the opportunity to experience labor and childbirth as physiological processes and to feel that they are in control of the situation (1).

Birth preparation is a broad term that includes diverse interventions and the work of different healthcare professionals (7), and this makes the evaluation and standardization of effective practices difficult. Although birth preparation programs are common in many countries, scientific evidence confirming their benefits and establishing the optimal way in which to organize and systematize actions to ensure that they are effective is scarce (8–11). Studies have evaluated isolated activities included in the interventions comprising a birth preparation program but have not assessed the complete set of actions of a program,

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their effectiveness, or the regularity required to ensure their effectiveness. Examples include studies on pelvic floor muscle exercises for urinary incontinence (12), exercises to prevent lumbopelvic pain (7,13–15) and techniques to improve self-control during labor (16–18).

Even when shown to be effective, the techniques are heterogeneous, and there is little information on their benefits when offered in conjunction or organized into a systematic program. This situation makes it difficult to reach a consensus on the best interventions necessary and the ideal number of meetings to reach effectiveness. Despite the recognition of the relevance of birth preparation programs by health care authorities in various countries (1,19), the difficulty in making these programs available lies in the lack of evaluation of the proposed practices and the scarcity of available published information.

Within the context of public health, the observation of beneficial results within a broader program could bring significant changes in the approach to prenatal care offered to pregnant women. Therefore, the objective of the present article was to describe the implementation process and the activities included in a birth preparation protocol that has been evaluated for its effectiveness.

■ METHODS

The birth preparation program (BPP) described in this paper was developed in the Department of Obstetrics and Gynecology of Woman's Hospital, Universidade de Campinas (UNICAMP), a referral maternity hospital for the care of high-risk pregnant women, and in four primary municipal healthcare centers in the same city.

The Institutional Review Board of the School of Medicine, Universidade de Campinas (UNICAMP), approved the study protocol under the registration number 407/2008. The study was also registered at clinicaltrials.gov (NCT01155804).

The main objectives of the BPP interventions were: 1) to prevent lumbopelvic pain, urinary incontinence and anxiety, 2) to encourage the practice of physical activity during pregnancy, 3) to practice positions and exercises to be used for non-pharmacological pain relief during labor, and 4) to discuss basic information that would help women have autonomy during labor.

The efficacy of this program was evaluated in a randomized controlled trial (20) that assessed the effectiveness of the BPP for the prevention of pain, urinary incontinence and anxiety during pregnancy and evaluated perinatal outcomes by comparing nulliparous women enrolled in the program with pregnant women who did not participate in the program. The main positive effects resulting from the BPP included a lower risk of developing urinary incontinence, better compliance with the regular practice of physical exercise and lower levels of anxiety (20). The qualitative evaluation showed that the guidance provided at the BPP meetings and the use of non-pharmacological pain relief techniques improved women's self-control during labor, with all the women reporting satisfaction with the birthing experience (21).

Before the implementation of the BPP, there was no systematic birth preparation program at our maternity hospital, and participation in a prenatal exercise program, offered once a week and at a different time from prenatal consultation, was optional. The municipal healthcare centers in which the BPP was implemented did not previously offer

prenatal exercise programs nor did they have professionals trained to conduct birth preparation activities with the pregnant women.

Because the activities included in the BPP were not part of the routine services provided during prenatal care, the physical space had to be negotiated with the directors of both the maternity and the healthcare units and adapted to all the activities included in the program that was to be implemented. In the maternity hospital, the encounters were held in groups in the physiotherapy clinic or, when that was unavailable, at the outpatient clinic. In the health centers, the encounters took place in doctors' visiting rooms or in spaces such as waiting rooms that were not in use at the time of the BPP. The only support material required for the practice of physical, relaxation, and non-pharmacological pain control exercises were mats. The materials required for the educational activities were already available at the maternity clinic and were replicated for the health centers.

Description of the BPP interventions

The meetings occurred on the days of the prenatal visits to facilitate participation and compliance with the program. They were held monthly from the time the woman joined the program at 18–24 weeks of pregnancy until 30 weeks of pregnancy, fortnightly thereafter from 31 to 36 weeks of pregnancy, and weekly from the 37th week of pregnancy until delivery. The BPP activities were provided by physiotherapists trained to conduct the activities included in the program and were supervised by an obstetrician, a psychologist and a physiotherapist, all with experience working with women during pregnancy, childbirth and puerperium.

The activities developed by the BPP comprised supervised exercises, educational activities and physical activities to be performed at home. The activities were planned and structured especially for this program, based on the need to prevent the discomforts of pregnancy (pain, urinary incontinence, and edema) (13,22–26), to encourage the regular practice of aerobic exercise (27) and to alleviate anxiety in relation to childbirth (1).

Supervised exercises

The exercises were performed under the supervision of a physiotherapist. The same protocol was applied at all the meetings. It comprised light and moderate exercises that lasted approximately 50 minutes. The protocol included general stretching exercises, with particular emphasis on exercises for the spine and exercises to stimulate venous flow in the lower limbs, to strengthen the transversus abdominis, gluteal and quadriceps muscles, as well as pelvic floor muscle training and breathing and relaxation techniques (Table 1).

Educational activities

Following the exercise sessions, educational activities were conducted at all the meetings. At the first and second meetings, the topics covered included the prevention of lumbopelvic pain during pregnancy and the role of the pelvic floor muscles in pregnancy, childbirth and puerperium. From the 34th week of pregnancy onwards, information was provided on the physiology of labor and non-pharmacological pain control techniques to be used during uterine contractions in labor and delivery. The information provided was discussed, and the subject was raised again at subsequent meetings whenever the women expressed

**Table 1** - Protocol of supervised exercise.

Position: Standing		
Head and neck stretches	Flexion, extension, lateral bending	Hold each position for 20 seconds
Side bends	With one arm raised, bend trunk laterally to the opposite side	Hold for 20 seconds on each side
Pelvic mobilization	Perform anteversion, retroversion and circumduction of the hip	One minute
Pelvic tilts with pelvic floor muscle training	Perineal exercises performed with the pelvis tilted backward	15 rapid contractions
Stimulation of venous flow in the lower limbs	Plantar flexion	One minute
Stimulation of venous flow in the lower limbs	Squatting using support equipment such as the back of a chair, a wall bar or a stick	2 series of 10 repetitions
Abdominal activation	Contract the transversus abdominis muscle while breathing out	15 repetitions
Position: Seated (using an exercise mat)		
Stretching	Triceps brachial muscle; pectoral muscles; posterior thoracic region; hip abductor muscles; posterior thigh muscles	Hold for 20 seconds each
Pelvic floor muscle training	With thighs flexed and abducted and the soles of the feet together, perform perineal exercises.	15 rapid contractions; 15 contractions held for 10 seconds with a 5-second resting period
Position: On all fours		
Mobilization of the spine and pelvis	Breathe in, facing forwards, and tilt the pelvis forward; breathe out, lowering head (blow onto stomach) and tilt the pelvis backward.	10 repetitions
Abdominal activation	Contract the abdomen while breathing out slowly, as if trying to make the belly button touch the back.	15 repetitions
Back stretching	Sitting on heels with knees apart, raise arms above head, rest arms and forehead on the mat.	Hold position for 20 seconds
Position: Lateral Decubitus		
Stretching and stimulation of the venous circulation in the lower limbs	Flexion/extension of the ankle with one leg raised.	3 series of 20 seconds on each side
Stretching and trunk rotation	With hips and knees flexed and knees together, rotate the trunk in the opposite direction	Hold for 20 seconds
Position: Dorsal Decubitus		
Stretching and relaxing the lumbopelvic region	With knees flexed and apart, raise both legs up to the chest and hold; perform flexion/extension of the ankles, swinging the trunk slightly to each side	Hold for one minute
Manual traction of the spine	With knees flexed and feet flat on the mat, the woman is asked to raise her hips. On lowering hips while breathing out, the therapist, with one hand on the sacral region, performs traction in the caudal direction.	Hold for one minute
Relaxation in lateral decubitus		
Breathing training for labor	Diaphragmatic breathing with prolonged exhalation through pursed lips.	3 minutes
Relaxation	Progressive relaxation; massage; visualization.	7 minutes

interest in readdressing a certain topic, doubts or questions. All the topics dealt with in the educational activities, as well as the explanations and guidance given during the exercises, followed a script that had been pre-tested and adapted into informal language to facilitate understanding (Table 2).

Activities to be performed at home

Due to the periodicity with which the women participated in their BPP group, a pamphlet was produced describing activities to be performed at home between one meeting and the next. At the first meeting, the participants were given the



Table 2 - Educational information.

<p>Postural alterations and pain prevention in pregnancy During pregnancy, various changes occur in the pregnant woman's body, and some of these may cause discomfort. Certain attitudes adopted in daily life may avoid or minimize these discomforts.</p>	<ul style="list-style-type: none"> • To get out of bed, lie on your side, swing your legs out of bed, and use your arms to help you get up. To get into bed, do this in reverse. • When sweeping the house or vacuuming or mopping the floor, try to keep your back straight. Do not bend forward. To make this easier, use a broom with a longer handle or crouch down when sweeping under furniture. • When washing the dishes, doing the laundry and ironing, use a support for your feet. This could be a brick or a phone book. Support one foot to relieve your back, changing from one foot to the other from time to time. • Do the proposed exercises for avoiding or relieving discomfort. If you do them every day, your back and pelvis will become more relaxed, less tense, and you will feel less pain. These exercises can be performed several times a day, and when you do housework, try to do the exercises both before and afterwards.
<p>The role of the pelvic floor muscles in pregnancy and childbirth The pelvic floor comprises a set of muscles that function to support the internal organs. Weakening of these muscles may lead to dysfunction.</p>	<ul style="list-style-type: none"> • If your pelvic floor muscles are weak, you may experience stress or urinary incontinence. Pregnancy tends to facilitate urinary incontinence, since, as the fetus grows, these muscles are stretched and become weakened. • To avoid or ameliorate this problem, there are some exercises that can strengthen these muscles. However, to perform the exercises, you first need to know how to contract these muscles. • To do so, pretend you have to urinate and then hold it, just as you would do if you needed to go to the bathroom and there was no bathroom anywhere near you. Try it. Did you notice that these muscles rise a little and that when you relax they go back down? If you did not feel it, try doing the following test at home: when you are urinating, try to stop the flow. If you succeed, this is the movement you need to do. However, be careful: this test should only be performed once, just for you to recognize the movement. The exercises should be performed at another time; never when you are urinating. • The instructor teaches the women the pelvic floor muscle exercises.
<p>Labor and breathing during the expulsive phase Labor can be compared to a trip you are going on to fetch your baby. This trip is divided into three parts: the first is long and difficult; the second is short and nice; and the third you often do not even see.</p>	<ul style="list-style-type: none"> • In the first part of the trip, there are the contractions that make the cervix dilate for the baby to be able to pass through. The cervix must dilate 10 cm to allow the baby to pass through; for this to occur, the contractions become more and more frequent, stronger and longer lasting. • The second part of the trip is when the baby is born. You will probably already have been anesthetized and will not feel any pain. Even so, your participation is very important because you are the one who helps the baby be born by pushing. For you to be able to push hard enough, you first need to have all your strength, which means that you need to have saved enough energy for this moment. • To find enough strength to push the baby out, breathe in deeply during the contraction and breathe out strongly and slowly, pushing down with your abdomen as if you were defecating. When required, breathe in again without releasing the abdominal contraction. Continue with this breathing as long as the contraction lasts and then rest until the next contraction. Try this a few times. If when the time comes, you do not manage to do this breathing very easily or you need to increase the force of your pushing, breathe in, hold your breath and push down with your abdomen. When breathing in, try not to release the abdominal contraction. • The third part of the trip involves the delivery of the placenta but you may not even notice it because you will be with your baby. • Are you able to recognize the signs telling you that you are in labor? When you feel 2-3 contractions in 10 minutes, even if they are painless, or if your water breaks, you are in labor. You may notice that your water has broken in one of two ways: the loss of a great quantity of fluid or a small quantity that keeps your underwear constantly damp. If some of these signs occur, you should go to the hospital. Do not stay at home with contractions as you wait for your water to break or vice-versa.
<p>Pain relief techniques for labor During labor, the contractions may range from uncomfortable to quite painful. This depends to a great extent on the woman and on how labor occurs. To facilitate self-control, there are some non-pharmacological techniques that help reduce anxiety, tension and pain.</p>	<ul style="list-style-type: none"> • Breathing: helps you to relax and reduces the pain. Breathe as if you were smelling a flower and then blowing out a candle during the contractions. During strong contractions, sniff the flower, and knock the candle right over. When the contraction is over, rest and breathe normally. • Massage: to help relieve the pain and tension. This should be performed in the sacral region (S2-S4) during contractions by the person accompanying the birth. It should be performed using the palm of the hand and in circular movements. • Vertical positions: improve the sensation of comfort, relieve pain and facilitate cervical dilation. The options are as follows: standing, seated, walking, on all fours, sitting on the birth ball or squatting. These positions can be used during the first stage of labor and can be associated with other pain relief techniques such as massage, taking a shower, the birth ball and breathing. • Shower: helps relaxation, relieves pain and facilitates cervical dilation. The shower should be hot and prolonged – a minimum of 30 minutes, allowing the water to fall on the back or abdomen. Showers can be taken as often as desired, according to the needs and the degree of pain of each woman.

**Table 3** - Instructions for exercises to be performed at home.

Pelvic floor muscle training	In any position, perform rapid contractions of the pelvic floor muscles. 30 repetitions. Seated with your legs abducted and soles of the feet together, perform 20 contractions, holding each contraction for 10 seconds.
Mobilizing and stretching the spine	In dorsal decubitus with your knees apart and bent, raise your legs towards your chest. Hug your legs for 20 seconds. Then, gently turn your body from one side to the other, five times for each side. Get down on your hands and knees. As you breathe in, stretch your head and neck and tilt the pelvis forward. Breathe out, while gently circling your head and neck, and relaxing your back into a neutral position. 10 repetitions. Sit on your heels with your knees apart. Bend over, keeping your arms above your head, and rest your forehead on the mat. Hold for 20 seconds.
Exercises to stimulate venous return	On foot, plantar flexion. 30 repetitions. In lateral decubitus and with one leg raised, rotate your ankle. Two series of 20 repetitions. Change sides, and repeat with the other leg.
Exercises for a healthy pregnancy	Walking, water aerobics, stationary bicycle or swimming – 30 minutes. Avoid the hottest times of the day (between 10 am and 3 pm), and eat something light 30 minutes before exercising. Use comfortable clothes and running shoes if you go walking or if you choose to exercise on a stationary bicycle.

pamphlet describing these activities, which comprised pelvic floor muscle training with rapid and sustained contractions, stretching exercises for the spine and exercises to stimulate venous flow from the lower limbs. The women were also encouraged to practice aerobic exercises three to five times weekly. Because these activities were unsupervised, the participants received additional written instructions regarding signs at which these exercises should be halted (27). These signs included the following: vaginal bleeding; chest or abdominal pain; amniotic fluid leakage; strong, persistent headache; palpitations, dizziness or a sensation of flashing lights; sudden swelling in the hands, face or feet; decreased fetal movement; pain or a burning sensation at urination; fever; persistent nausea or vomiting; frequent uterine contractions; and dyspnea at rest (Table 3).

■ RESULTS

The BPP was organized to encompass aspects related to both pregnancy and labor and to allow physical, educational and home-based activities to be included. The program was also organized to facilitate participation so that women could participate in most of the group meetings from their inclusion at 18/24 weeks of pregnancy as well as to prevent or minimize the discomforts of pregnancy and to improve the woman's autonomy during labor without compromising maternal or fetal safety.

The BPP is an innovative type of intervention in the sense that it systematized a broad range of birth preparation activities and organized them into a program. The results of the program were statistically evaluated regarding its implementation, effectiveness and outcomes, and a qualitative study described the participants' birthing experiences (20,21).

The results of the evaluation showed that the program was ineffective in reducing lumbopelvic pain during pregnancy (20). One hypothesis for this finding is that the supervised practice of exercise, performed only on the days of the prenatal visit, was insufficient to avoid or minimize this type of pain. Indeed, studies in which better results were obtained were based on supervised exercise performed weekly or fortnightly (7,13–15). Encouraging pregnant women to participate in supervised exercise groups held on a weekly basis may prove a better strategy for preventing lumbopelvic pain.

■ DISCUSSION

In terms of public health policies, it has been shown that the participation of low-risk pregnant women in BPP and relaxation sessions may be effective in reducing the number of cesarean sections (28) and, furthermore, that the fear of childbirth was minimized in women who participated in exercise programs during their prenatal care (29). In Brazil, the option for a cesarean section was associated with a fear of pain at childbirth, although the majority of women preferred vaginal delivery (30,31). In Sweden, symptoms of anxiety in the first trimester of pregnancy considerably increased women's fear of childbirth and their preference for a cesarean section (32). However, data from the *Listening to Mothers* study (33) showed that only 34% of the participants reported having participated in childbirth classes during their current pregnancy, and the majority of these participants were primigravidas.

The interventions evaluated in the BPP encompassed aspects of preparation for childbirth that are proposed within the public health policies of Brazil (1,34), thus raising questions on routine practices and challenging them with evidence-based practices. These health policies are aimed at improving prenatal care, guaranteeing humanized quality care for women based on scientific evidence, avoiding unnecessary interventions and preserving women's autonomy (1,34). The effective practices that should be encouraged during labor include the presence of a companion of the woman's own choice, the use of non-pharmacological techniques for pain relief, the freedom to choose the position the woman prefers to be in, and encouragement to move around during labor (1,34).

Multidisciplinary care guarantees an integrated approach that complements the care provided at medical visits (1). To construct a broader, more comprehensive program requires the participation of different healthcare professionals working within their individual specialties to offer an enriching experience for the pregnant woman and her partner. Within the context of birth preparation, a multidisciplinary team is essential because the different approaches complement and enhance each other.

In the present study, scheduling the program for the days of prenatal medical consultation was a way to facilitate women's compliance, particularly of low-income women. Furthermore, having a multidisciplinary team already



available contributed towards the low cost of implementing the program and to the richness of its content. The physical space used for the BPP activities was available at the institution without a need for adaptation because the space required for the proposed activities differed according to the number of participants to allow sufficient space for exercise mats to be spread out on the floor, enabling the exercises and educational activities to be performed.

The detailed description of the protocol used may serve as a basis for further studies and for the implementation of birth preparation programs in different settings within the public healthcare system. As the majority of the birth preparation programs or interventions in this area are still based exclusively on the experiences of the healthcare professionals who coordinate them (35), knowledge on which interventions are most effective in controlling the discomforts of pregnancy and preparing the women physically and emotionally for childbirth is a challenge that remains to be faced. The interventions that have proven safe and effective, as evaluated in systematic reviews, would form a theoretically ideal set of actions that, in turn, would be randomly tested on a larger scale to provide the information still required to implement practices in this area.

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AUTHOR CONTRIBUTIONS

Miquelutti MA participated in designing the research project, collecting the data, interpreting the results and writing the manuscript. Makuch MY participated in designing the research project, interpreting the results and writing the manuscript. Cecatti JG participated in the final editing of the research project, interpreting the results and preparing the manuscript.

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