



Effect of antenatal exercises on bearing down in primiparous under epidural anesthesia during labor: A randomized controlled trial

Eman Awad ^{1*}, Ali Mobark ², Hamada A. Hamada ³, Amel M. Yousef ⁴, Engy M. El Nahas ^{4,5}

¹ Physical Therapy Department for Woman and Child Health, Faculty of Physical Therapy, Beni-Suef University, Beni-Suef, EGYPT

² Department of Obstetrics and Gynecology, Faculty of Medicine, Beni-Suef University, Beni-Suef, EGYPT

³ Department of Biomechanics, Faculty of Physical Therapy, Cairo University, Cairo, EGYPT

⁴ Department of Physical Therapy for Woman's Health, Faculty of Physical Therapy, Cairo University, Cairo, EGYPT

⁵ Acting Vice dean for education and student affairs, Faculty of Physical Therapy, Heliopolis University for sustainable development, EGYPT

*Corresponding author: Eman Awad

Abstract

Evidence suggests that for primiparous females delivered with epidural anesthesia maternal comfort is accomplished at the expense of a longer second stage, higher frequencies of operative delivery as well as reduced muscular tone of pelvic floor needed for normal internal rotation of the fetal head, and the reflex maternal urge to bear down. This study was conducted to determine the effect of antenatal exercises on bearing down in primiparous under epidural anesthesia. A prospective, randomized, single-blind, controlled trial was performed. Overall, 70 primiparous expected vaginal delivery under epidural anesthesia with a single healthy fetus at their 14-15 weeks' of gestation were included, aged 18-35 years with a body mass index not exceeding 25 kg/m². The participants were randomly assigned into 2 groups: group (A), receiving antenatal exercise program and advice relevant to each trimester of pregnancy, while group (B) continued their ordinary life style after receiving the advice as group (A). The unpaired t-test revealed significant differences between both groups (A & B) in duration of second stage of labor ($p < 0.05$) with a significant decrease in duration of latent and active phases of 2nd stage of labor in group (A) participants. Also, neonates of group (A) showed statistically higher values of Apgar score at the 1st and 5th minute of life ($p < 0.05$) compared to neonates of group (B). It can be concluded that antenatal exercises are very effective in decreasing labor complications for mothers and fetuses as well as facilitating bearing down during 2nd stage of labor in primiparous under epidural anesthesia.

Keywords: antenatal exercises, bearing down, primiparous, second stage of labor, epidural anesthesia

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INTRODUCTION

One of the essential breakthroughs in the management of labor is the relief of labor pain by means of epidural anesthesia. In some centers, 80% to 90% of women request and receive an epidural anesthetic agent for the relief of labor pain (Khor et al. 2000). Some evidence suggests that stopping maternal pain is accomplished at the expense of a longer second stage of labor and higher frequencies of oxytocin augmentation and operative delivery (Anim-Somuah et al. 2011, Liu and Sia 2004). In addition, it has been suggested that this anesthesia directly reduces uterine contractility, the muscular tone of the pelvic floor needed for normal internal rotation of the fetal head, and the

reflex maternal urge to push the fetus (Wittels 1991, Roberts et al. 2004). Historically, the second stage of labor has been defined as the time between complete cervical dilatation (10 cm) up to the birth of the singleton baby or the last baby in a multiple pregnancy. This labor phase is often characterized by frequent, regular uterine contractions and an overwhelming maternal urge to bear down (Oppenheimer et al. 2013). The second stage of labor is divided into two phases, phase 1 includes passive descent of the fetus through the maternal pelvis while, phase 2 involved the active phase of maternal

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bearing down. Generally, studies suggested that longer second stage of labor carried a risk of adverse maternal and neonatal outcomes did not account for the duration of these phases (Rouse et al. 2009, Allen et al. 2009). Immediately, following the identification of complete cervical dilatation, many women are instructed to assume a lithotomy position and bear down using Valsalva efforts against a closed glottis. This frequently reflexive effort, usually referred to as active pushing (Albers et al. 2006). However, many studies have shown that Valsalva-type pushing alone did not improve maternal and fetal results in females injected with epidural analgesia. Because, women with regional analgesia frequently lack the pressure sensation of the fetal head (Alexander et al. 1998). Starting pushing very early in the second stage raised some concerns about the early maternal fatigue and discomfort due to the lithotomy position together with unduly use of abdominal muscles. There were also concerns about perineum and genito-urinary path damages due to fast and strong descent of fetal head (Kibuka and Thornton 2017, Roberts et al. 2005). Despite, all these concerns this early bearing down method has still been commonly used worldwide. In contrast, delaying maternal pushing efforts until a woman feels an urge to bear down results in optimal use of maternal energy, has no profound effect on maternal health, and results in improved fetal oxygenation. An evidence-based approach to maternal bearing down based on the woman's physical and emotional readiness has been recommended for decades (Hanson 2009, Roberts 2003, Gupta et al. 2017, Redshaw and Henderson 2014, National Collaborating Centre for Women's and Children's Health (UK), Schaeffer et al. 2005). It has been documented that assuming upright position while pushing rather than laying on back improved neonatal outcomes by improving fetal oxygenation and Apgar scores (Yildirim and Beji 2008, Le Ray et al. 2009). Maternal position during the second stage of labor has been suggested to affect the risk of instrumental vaginal delivery. A Cochrane review revealed a reduction in rate of instrumental vaginal delivery in mothers assuming upright position while bearing down, although the quality of the included trials was reported to be generally poor (Gupta 2012). Ideally, clinical practice must be consistent with the latest evidence; however, in some labor units, care providers may not be completely up-to-date on the best available practice for second stage of labor care. First time moms and their families can overcome this limitation if they are fully informed and prepared to ask for selected care processes. Pregnant women who join regular exercise classes may experience less pain and easier labor (Salvesen et al. 2014). This is due to the effect of exercise on inducing metabolic and hormonal changes that may impact uterine contractility and endurance (Clapp 1990). Exercises during pregnancy are also associated with

reduced need for Cesarean section (Tinloy et al. 2014). Childbirth educators like obstetric physiotherapist can help to facilitate this knowledge. Antenatal classes help women indeed nulliparous to overcome their fears and prepare them for a complication free delivery by a combination of exercises and advice especially during last trimesters of pregnancy. For instance, positioning education on assuming upright positions during labor and birth can increase the available space within the pelvis by 28-30% giving more room to the baby for rotation and descent. There is also a 54% decreased incidence of fetal heart rate abnormalities when the mother is upright (Lavender and Mlay n.d.). These birthing positions can also reduce the duration of the second stage of labor, as well as reduce the risk for emergency cesarean sections by 29% (Lawrence et al. 2013, Piantadosi 2017). Therefore, this study was conducted to compare the effect of antenatal training on pushing during the 2nd stage of labor in primiparous females under epidural anesthesia.

MATERIALS AND METHODS

Study Design

The study was designed as a randomized controlled trial that compared 2 groups: group (A) involved participants who received antenatal training program composed of relevant exercises and advices started from 14-15 weeks' of gestation till the date of delivery to avoid the risk of miscarriage (Metwally et al. 2008), while group (B) involved control participants who continued their ordinary lifestyle after giving them the same advices as group (A). Anonymity of subjects' data was assured by coding of all data. A blinded and an independent research assistant randomly assigned participants into 2 groups by opening sealed envelopes that contained a computer-generated randomization card.

Sampling

During the 2 years' recruitment period from June 2017 to June 2019, a total of 200 convince women were assessed for eligibility with the inclusion criteria of the study. Of these, 90 women did not meet the study criteria and were excluded. 70 of the remaining women consented while, 40 declined from participation in the study. Finally, 70 women participated in the study (**Fig. 1**). They were at their 14-15 weeks' of gestation diagnosed by an obstetrician and confirmed by ultrasonography (Medison Apparatus X6). All of them recruited from the maternity unit of Beni-Suef University Hospital, Beni-Suef, Egypt. Their age ranged from 18-35 years and their body mass index (BMI) did not exceed 25 kg/m². All participants expected vaginal delivery with a single healthy fetus in cephalic presentation at the onset of labor. Females diagnosed with heart diseases, lung diseases, incompetent cervix or cervical cerclage, persistent first-trimester bleeding, intrauterine fetal

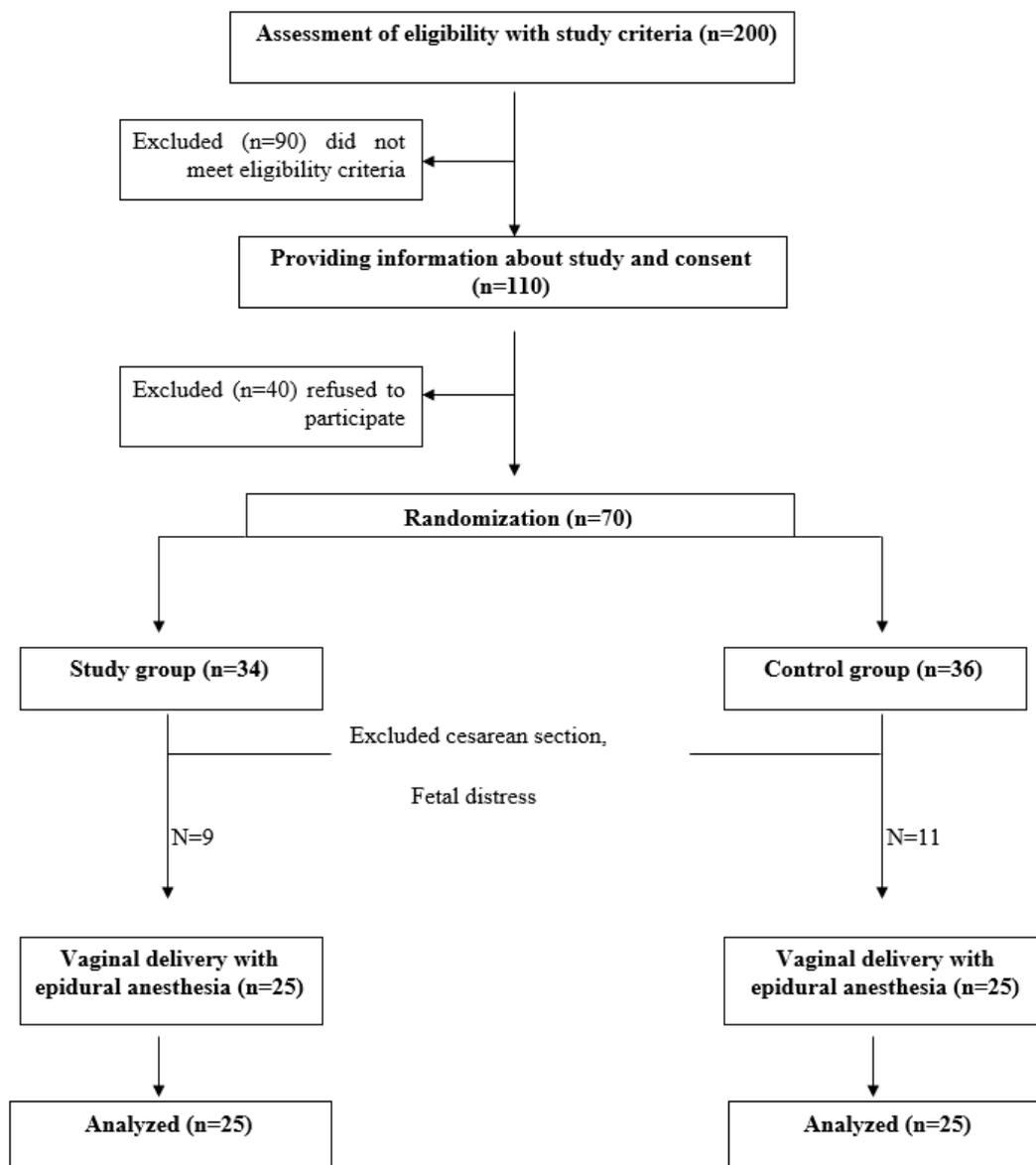


Fig. 1. Flow Chart for the study

growth retardation, hypertension, diabetes mellitus, severe anemia, thyroid disease, overweight or underweight, abnormalities of placentation (eg, low-lying placenta or abruption placentae), uterine structural abnormalities, females not volunteering for participation, women with any medical or obstetric complications that may affect second stage of labor and those who smoked were excluded from the study.

Ethical Approval

The research related to human use has been complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the ethical committee at the Obstetrics and Gynecology Department of Beni-Suef University hospital and by the institutional review board at the Faculty of Physical Therapy.

Informed Consent

Informed consent has been obtained for all women included in this study.

Intervention

Additional screening for specific inclusion and exclusion criteria and demographic data was taken for each participant, including age, BMI and gestational age. A full assessment of history was performed for each woman in both groups prior to the start of the study in accordance with the items of the data recording sheet. Women fulfilling the inclusion criteria were informed about the study. All antenatal classes were held by the same physiotherapist. Participants of both groups (A & B) received education and advice regarding effects and performance of different pushing techniques during labor. Also, they were advised on traveling, sexual

intercourse, ideal posture for lifting objects, showering in last trimester of pregnancy as well as walking for 1 hour in fresh air especially during last month of pregnancy.

Next, for group (A) the exercise program parameters were extracted from the American College of Obstetricians and Gynecologists (ACOG) guideline for exercise during pregnancy for sedentary women and with the FITT principle (frequency, intensity, time, and type). The exercise undertaken was characterized by a frequency of minimum 3 times per week, intensity set at moderately hard perceived exertion, time of 60 minutes per day, and type of low impact. These exercise guidelines were utilized for all types of exercises (American College of Obstetricians and Gynecologists 2002, Khan 2018). Antenatal exercises performed during the second trimester included posture correction exercises from crock lying, supine, and sitting and standing positions (each exercise was maintained for 5 seconds and then the woman relaxed for 10 seconds and repeated this each exercise 10 times), static stretching exercises for hamstrings, calves, hip adductors and quadriceps muscles; each stretch was held for 60 seconds and repeated 3 times in each muscle, diaphragmatic and lateral costal breathing exercises (the woman took a deep breath for and expire air with a sigh and repeated this five times), general relaxation and teaching muscle sense (for 10 min), assuming a modified side lying position combined with natural and quiet breathing (for 5 min) with special attention to perform pelvic floor exercises from 14 weeks' of gestation till the date of delivery. Pelvic floor exercises (including exercise for both pubovaginalis and puborectalis muscles) were maintained for 5 seconds, then the woman relaxed for 10 seconds for 10 repetitions. In addition, antenatal exercises during the third trimester included static abdominal, arm exercises (including static and active free arm exercises); each exercise mentioned above was maintained for 5 seconds, then the woman relaxed for 10 seconds and repeated this 10 times. positional education on upright birth positions such as squatting, standing, kneeling, quadruped positions to be performed with bearing down during 2nd stage of labor; each position was maintained for 5 minutes, training on panting breathing for few seconds to be applied at crowning of fetal head, finally training on general relaxation , teaching muscle sense (for 10 minutes) as well as, Diversion drill training (for 3 minutes). The pregnant women were carefully monitored to immediately stop antenatal exercises if they exhibited symptoms such as dizziness, dyspnoea, amniotic fluid leaking, or vaginal bleeding. Moreover, group (A) participants wore a loose-fitting clothing and kept hydrated while exercising in an environment with appropriate temperature and humidity (Davies et al. 2003, American College of Obstetricians and Gynecologists 2015). All exercise sessions were recorded in a log book. Exercise group participants

attended the exercise program three times per week, whereas for the other days, they were instructed to regularly perform the previous exercises at home throughout the study period. Compliance with home-based exercise was monitored by a self-recorded diary. Attendance of at least 20 out of 28 sessions was required to be defined as completion of the intervention. Obstetrician of Group (A) agreed the safety and appropriateness of the previous procedure for group (A) participants.

Outcome Measures

Primary: The duration of the second stage of labor in minutes in both groups including duration of latent and active phases.

Secondary: The type of vaginal delivery which involved spontaneous vaginal birth or operative vaginal delivery that required the use of special devices such as forceps or a vacuum extractor to deliver the fetus vaginally. Also, neonatal Apgar scores was a secondary outcome.

Data Analysis

All statistical procedures were performed with the Statistical Package for the Social Sciences (SPSS) software, version 23 for Windows. The normal Q-Q plot was used to confirm normal distribution of data. Homogeneity of variances ($p > 0.05$) was observed by Levene's test. All these findings allowed the researchers to conduct parametric analysis. Descriptive statistics involved the calculation of the means and standard deviations for each of the variables measured. While, inferential statistics involved the calculation of differences between the two groups by using the independent samples t-test. A p-value of <0.05 was taken to represent statistical significance.

RESULTS

A total of 70 women were eligible for the inclusion criteria and randomized into 2 groups. Twenty out of the seventy women were dropped after randomization and excluded from statistical analysis. Thirteen out of the twenty had emergency cesarean sections due to cephalopelvic disproportion after a prolonged second stage of labor while, the remaining 7 cases had severe fetal bradycardia or severe variable decelerations in the fetal heart rate rhythm. The event of labor was monitored by cardiotocography (CTG) for all participants. Data extracted from 25 women in each group was analyzed after completion of their vaginal delivery with epidural anesthesia.

There were no statistically significant differences ($p > 0.05$) between subjects in both groups concerning age, BMI, or gestational age (**Table 1**). However, the Unpaired t- test revealed a statistical significant difference between groups with regards to duration of 2nd stage of labor ($p < 0.05$) with a significantly shorter latent and active phases of 2nd stage of labor in favored of

Table 1. Demographic characteristics of participants in both groups

Variables	Group A	Group B	t-value	p-value
Age (years)	25.2±4.42	26.8±4.28	-0.52	0.2 ^{NS}
BMI (Kg/m ²)	22.46±1.26	22.76±1.45	-0.903	0.22 ^{NS}
Gestational age (Weeks)	14.6±0.70	14.4±0.76	0.73	0.341 ^{NS}

Data expressed by Mean±SD, p-value: probability value, ^{NS} = non-significant, ^S = significant

Table 2. Mean values of 2nd stage duration, Latent Phase and active phase for participants in both groups

Variables	Group A	Group B	t-value	p-value
2 nd stage duration (min)	106.12±12.84	121.48±17.75	-3.503	0.001 ^S
Latent Phase (min)	50±8.83	60±15.36	13.824	0.0001 ^S
Active Phase (min)	56.12±10.29	61.48±7.91	-12.954	0.0001 ^S

Data expressed by Mean±SD, p-value: probability value, ^{NS} = non-significant, ^S = significant.

Table 3. Mean values of APGAR for participants in both groups (A&B)

	APGAR	
	APGAR first (Mean ±SD)	APGAR fifth (Mean ±SD)
Group A	7.42±0.43	8.72±0.45
Group B	6.4±0.5	8.04±0.61
t-value	6.332	4.452
p-value	0.0001 ^S	0.0001 ^S

SD: Standard Deviation, p-value: probability value, ^{NS} = non-significant, ^S = significant.

Table 4. Frequency distribution of mode of delivery in both groups

Mode of delivery	Group A N (%)	Group B N (%)	x ² -value	p-value
Operative vaginal	5 (20%)	8 (32%)	3.309	0.069 ^{NS}
Spontaneous vaginal	20 (80%)	17 (68%)		
Total	25 (100%)	40 (100%)		

x²-value: chi-square value, p-value: probability value, ^{NS} = non-significant, ^S = significant, data expressed by number and percent

subjects of group (A) ($p < 0.05$). Besides, the duration of 2nd stage of labor was lower than the recommended values for primiparous under epidural anesthesia in group (A) participants ($p < 0.05$) (Table 2). Similarly, the Unpaired t- test revealed a significant increase in the Apgar scores after 1 minute and 5 minutes of delivery for neonates of group (A) subjects ($p < 0.05$) (Table 3). On the other hand, the Chi Square test revealed a non-significant difference between groups for the type of vaginal delivery ($p < 0.05$) (Table 4).

DISCUSSION

In the present study, there were three statistically significant findings revealed concerning the primiparous randomly assigned to perform antenatal exercise and their controls. First, the average duration of 2nd stage of labor was shorter in participants of group (A) than that of group (B) participants. Second, the duration of latent and active phases of 2nd stage of labor was significantly shorter in group (A). Third, the Apgar score findings revealed significantly higher values at 1st minute and 5th minute of life in neonates of group (A). However, there was no statistical significant difference in the type of vaginal delivery between both groups.

These results are in agreement with those of Clapp and Salvesen et al. (Salvesen et al. 2014, Clapp III 1990), who found that females engaged in regular exercise routine during pregnancy may experience less painful and shorter labor. This is due to the effect of exercise on inducing metabolic and hormonal changes that may impact uterine contractility and endurance. The results of this study are also in line with the Cochrane meta-analysis of randomized control trials (RCTs) that examined the effect of antenatal pelvic floor and positioning training on outcomes of the second stage of labor and concluded that assuming upright positions during labor were associated with fewer "abnormal" fetal heart rate patterns and easier delivery (Relative Risk, 0.46; 95% confidence interval (CI): 0.22–0.93) (Gupta et al. 2017). Assuming different positions during 1st and 2nd stages of labor helped to enhance maternal comfort and promote optimal fetal positioning. Also, this approach should be supported as long as the adopted positions allowing appropriate maternal and fetal monitoring and treatments and were not causing any maternal medical or obstetric complications. The present results are also in agreement with that study identified the 95th percentile for the duration of second-stage labor in both nulliparous and multiparous women under epidural anesthesia to be more than 2 hours in comparison with duration of second stage in women without an epidural. The authors concluded that failure to recognize these longer thresholds for second-stage labor duration in a reexamination of the current definitions of prolonged second stage may lead to unnecessary interventions such as cesarean birth and operative vaginal birth (Cheng et al. 2014). The present findings are also supported by those of Yildirim and Beji, (2008) who reported a higher Apgar scores in the newborns delivered to exercising females than those in the newborns delivered to non-exercising females during their 1st pregnancy. Also, results are in line with those of Lawani et al. (Lawani et al. 2008, Nor et al. 2020) who reported in their study a strong positive effect for antenatal training and education on health behaviors and a vaginal low-risk birth in nulliparous females. Antenatal exercise is a form of non-pharmacological childbirth preparation method. It trains the physical and psychological aspects of the body in accordance with the natural mechanisms of childbirth. However, the results of this study are not in line with Tinloy et al. (2014), who revealed no differences in the duration of the second stage or the rates of cesarean delivery, episiotomy, perineal lacerations, 5-minute Apgar score less than 7, or neonatal intensive care admissions in nulliparous participated in exercise programs during pregnancy. The results of this study provide grounds for advocating nulliparous pregnant females to join antenatal exercise programs and using upright positions in pushing during 2nd stage of labor to decrease labor

complications in females choose to deliver with epidural anesthesia in resource-limited countries.

complications associated with delivery under epidural anesthesia.

LIMITATIONS

Despite the design of the present study (a randomized controlled clinical trial), the small sample size recruited could be its potential limitation. On the basis of sample size estimation with the power of the study $1-B = 80\%$ to detect the effect size of $d = 0.5$ with a significance level of < 0.05 , 50 participants were needed for each group. At present, it is not possible to study the effect of each antenatal exercise on common

CONCLUSION

It can be concluded that antenatal exercise with education sessions conducted early during pregnancy can make a difference in management and complications of 2nd stage of labor in primiparous women asking for delivery under epidural anesthesia. Many scientific and professional reports stress the importance of exercise as a preparatory method for a complication free delivery.

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