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Original Article

Effect of Pelvic Rocking and Spherical Birth Ball Interventions on Delivery Outcomes among Primigravidas

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ABSTRACT

Background: Empowering primigravidas through pelvic rocking and birth ball utilization offers dual benefits by reducing unnecessary childbirth medicalization while improving delivery outcomes and birth experiences. This study **aimed** to investigate the effect of pelvic rocking and spherical birth ball interventions on delivery outcomes among primigravidas. **Study Design:** The study adopted a quasi-experimental posttest nonequivalent control group design. **Study Sample:** A convenience sample of 150 primigravidas was recruited. **Study Setting:** The labor and delivery unit of Tanta University Hospital and El-Menshawy Hospital in Tanta City, Gharbia Governorate, Egypt, served as the sites for the study. **Study Tools:** Four tools were used to collect data: a structured interviewing questionnaire, a Partograph, a numerical rating scale for pain, and the Birth Satisfaction Scale-Revised. **Results:** Post-intervention, the study group showed a significantly shorter mean duration of the first and second stages of labor compared to the control group (9.3 ± 0.8 hours vs. 14.9 ± 2.2 hours, $p < 0.001$ and 36.0 ± 7.2 minutes vs. 91.8 ± 14.3 minutes, $p < 0.001$). Pain intensity scores were significantly lower in the study group (4.4 ± 1.3) than in the control group (8.2 ± 1.1, $p < 0.001$). Moreover, birth satisfaction scores were significantly higher in the study group (35.0 ± 4.6) than in the control group (27.2 ± 3.5, $p < 0.001$). **Conclusion:** Primigravidas receiving the pelvic rocking and birth ball interventions showed a significantly shorter mean duration of labor, lower mean labor pain intensity scores, and higher mean birth satisfaction scores than those receiving routine care. **Recommendation:** Integrate pelvic rocking and birth ball interventions into antenatal education programs to increase awareness of their benefits among primigravidas.

Keywords: Delivery Outcomes, Pelvic Rocking, Primigravidas, & Spherical Birth Ball.

Introduction

Childbirth is a life-changing event in a woman's life, especially for primigravidas those experiencing their first pregnancy and delivery. Primigravidas often approach childbirth with a mix of anxiety and excitement, particularly anxiety about the birthing process and fear of labor pain. This anxiety can detrimentally affect the progression of labor, increase the risk of unnecessary medical procedures, and lower overall maternal satisfaction levels **(John et al., 2022).** Given these challenges, there has been growing interest in recent years in incorporating supportive and non-pharmacological interventions into midwifery care to improve maternal well-being and delivery outcomes **(Ingram, Brad, & Peacock, 2022; World Health Organization [WHO], 2023).**

Common non-pharmacological interventions for pregnant women, such as pelvic rocking exercise (PRE) and the use of a spherical birth ball, are increasingly used to improve labor outcomes by

promoting comfort and potentially reducing the need for pain medication. PRE involves pelvic movement in forward, backward, and rotational directions (left and right) **(Lestari, Widyawati, & Budiyono, 2020; Mrayan et al., 2024).**

The purpose of PRE is to strengthen and enhance the flexibility of pelvic muscles, including those in the hips, lower back, and abdomen. These exercises help mothers maintain upright positions during labor, enabling optimal uterine function. This positioning widens the pelvic outlet, facilitates fetal descent through gravity, accelerates labor progress, and reduces pain (**Karningsih et al., 2022)**. Recently, spherical birth balls have emerged as an effective non-pharmacological intervention for managing childbirth pain. These elastic, air-filled devices provide a stable sitting base that promotes upright positioning during labor **(Jha et al., 2023)**.

Exercises using birth balls may increase uterine blood flow, relax muscles, and consequently reduce pain perception and anxiety among laboring women (**Sönmez & Apay, 2023).** Additionally, gravity aids in the expansion and relaxation of pelvic muscles and bones, enhancing fetal descent and labor progress. Birth ball use during labor also prevents prolonged supine positioning, reduces lumbosacral pressure, and increases maternal comfort (**Ulfa, 2021).**

Providing women with excellent care and comfort during pregnancy and childbirth is a major duty of healthcare providers. By promoting the normal delivery through non-pharmacological pain management, midwifery nurses can reduce the need for medical interventions and their associated difficulties (**Ahmed, Mohmed, & Fathalla, 2022).** These nurses educate primigravid women about the benefits of pelvic rocking and birth ball exercises, including pain reduction, promotion of relaxation, and facilitation of fetal descent. They also demonstrate correct techniques for performing pelvic rocking on birth balls, ensuring pregnant women understand how to execute these exercises safely and effectively **(Hashad et al., 2022).**

Moreover, midwifery nurses provide ongoing support and encouragement to laboring women, reminding them to use pelvic rocking and birth balls as needed. They continuously assess maternal and fetal well-being by monitoring vital signs, fetal heart rate, and labor progress. Additionally, they evaluate the effectiveness of these interventions in managing pain and promoting labor advancement **(Harwin & Shofiatul, 2023)**.

Significance of the study

According to a WHO report, Egypt's cesarean section (CS) rate reached 51.8%, ranking fourth globally. Furthermore, the Egyptian Ministry of Health reported that 72.2% of births in 2021 were CS (**Central Agency for Public Mobilization and Statistics [CAPMAS], 2023)**. Furthermore, **Oraby (2023)** highlights alarmingly high CS rates in Cairo and Gharbia, which frequently exceed WHO guidelines, underscoring the urgent need for safe, affordable, and accessible strategies to reverse this trend. In response, the Egyptian government has implemented measures to reduce unnecessary CS through hospital practice monitoring, financial incentives for obstetricians promoting vaginal delivery, and fee alignment with natural childbirth charges **(Dewedar, 2025).**

Routine obstetric procedures in Egypt remain highly medicalized and frequently lack woman-centered, non-pharmacological interventions that support normal labor and maternal comfort. Most women deliver while lying supine on beds, a position that compromises fetomaternal blood supply. This increases the risk of dystocia, prolonged labor, and CS **(Ibrahim, Said, & Elgzar, 2020)**. Given these risks, research on the efficacy of non-pharmacological measures, such as pelvic rocking and birth ball exercises, in promoting normal vaginal delivery and reducing CS rates is critically important for Egypt's maternal healthcare system.

International evidence suggests that birth balls and PRE may provide low-cost, non-invasive, and efficient ways to promote labor progression. These interventions are believed to improve fetal positioning, enhance pelvic mobility, reduce labor pain, and encourage a more active and fulfilling birthing experience. According to **Terres et al. (2025)**, when used properly, they may also shorten labor duration and lessen the need for pharmacological pain relief or labor augmentation. Despite these potential benefits, empirical studies examining the efficacy of these methods among primigravidas are lacking in Egypt. Most existing research is conducted in differing cultural and healthcare contexts, limiting its applicability to local maternity settings.

Therefore, this study proposes to investigate the effect of pelvic rocking and birth ball interventions on delivery outcomes among primigravidas. By evaluating labor duration, pain intensity, and birth satisfaction, it aims to generate evidence supporting the widespread adoption of these simple interventions into routine labor care in Egyptian labor wards. This could address the significant public health issue of unnecessary CS, thereby reducing associated risks such as surgical complications, infection, prolonged recovery, increased economic burden, and potential harm to subsequent pregnancies. Ultimately, the findings may contribute to improved maternal health outcomes and a more positive childbirth experience for primigravidas.

Aim of the study

This study aimed to investigate the effect of pelvic rocking and spherical birth ball interventions on delivery outcomes among primigravidas.

Study Hypotheses

The following hypotheses were proposed to achieve the study aim:

- **Hypothesis One:** Primigravidas receiving pelvic rocking and birth ball interventions will have a shorter mean duration of labor than those receiving routine care.
- **Hypothesis Two:** Primigravidas receiving pelvic rocking and birth ball interventions will report lower mean labor pain intensity scores than those receiving routine care.
- **Hypothesis Three:** Primigravidas receiving pelvic rocking and birth ball interventions will report higher mean birth satisfaction scores than those receiving routine care.

Operational definition for delivery outcomes

In this study delivery outcomes refer to labor duration, labor pain intensity, and maternal

childbirth satisfaction. These variables were measured systematically using a partograph, a numerical pain rating scale, and a birth satisfaction scale.

SUBJECTS AND METHOD

SUBJECTS

Study Design

The effect of the independent variables (birth ball and pelvic rocking) on the dependent variables (labor duration, labor pain intensity, and maternal childbirth satisfaction) was investigated in this study, which adopted a quasi-experimental posttest nonequivalent control group design.

Study Setting

The labor and delivery unit of Tanta University Hospital, affiliated with the Ministry of Higher Education, and El-Menshawy Hospital, affiliated with the Ministry of Health and Population in Tanta City, Gharbia Governorate, Egypt, served as the sites for the study. These hospitals were selected as study sites because they serve as large, tertiary-level referral centers in Tanta City, Gharbia Governorate, Egypt. Throughout the reproductive life cycle, both hospitals provide free or subsidized obstetric care to women from rural and urban areas.

Study Sample

One hundred fifty primigravida women were selected as a convenience sample based on the following inclusion criteria: singleton pregnancy, early active phase of the first stage of labor (cervical dilation of 4-5 cm), cephalic presentation of the fetus, gestational age of ≥37 weeks, and intact membranes. **Exclusion criteria included primigravida** women with medical or obstetric complications, a history of previous uterine surgery, and physical disabilities that prevent exercise participation.

Sample Size Calculation

Using the formula for comparing two means, the sample size for this study was determined based on data from previous studies (Jha et al., 2023; Sulistianingsih et al., 2022). This formula's estimated standard deviation (SD) was 8.93. Taking into account a 5% level of significance and an 80% power of study, the sample size can be determined using the following method based on previously published results: Zα/2 is 1.96 for 5%, and Zβ is 0.84 for 80%. The significant difference (d) was set at 5, which is regarded as a meaningful predicted difference. n = (Zα/2 + Zβ)^2 ×2(SD)^2)/(d^2), where SD is the standard deviation as determined by the prior study. Because of this, n = (1.96 + 0.84)^2 × 2(8.93)^2)/((5)^2) = 50.1. Each group consists of 75 women in order to offset the nonresponse rate.

Study Tools

Four tools were used to collect data:

Tool (I): A Structured Interviewing Questionnaire Schedule: This instrument comprised two sections: **Part 1: Demographic Characteristics:** Age, level of education, occupation, and residence. **Part 2: Obstetric Characteristics:** Gestational age, antenatal care (ANC) location, and number of ANC visits.

Tool (II): Partograph: This standardized tool, adopted from the **WHO (1994),** is used to assess labor progress. It tracks uterine contractions (interval and duration), cervical dilation, fetal head descent, and the durations of the first and second stages of labor.

Tool (III): Numerical Rating Scale (NRS): It is used to measure pain intensity. Like the Visual Analogue Scale (VAS). However, due to its excellent compliance rates, responsiveness, simplicity of administration, and clinical value, it is considered a superior fit for measuring unidimensional pain intensity (**Hjermstad et al., 2011)**. The tool includes a 10-cm horizontal line that represents the subjective level of pain, accompanied by a 0–10 numerical scale where only the two extremes are labeled, e.g., *"No pain at all"* and *"Worst imaginable pain."* Primigravidas were asked to select a number indicating their perceived pain intensity at the given time.

Tool (IV): The Birth Satisfaction Scale-Revised (BSS-R): This 10-item tool, adopted from **C. J. H. Martin and C. R. Martin (2014)**, measures maternal birth satisfaction. It evaluates key dimensions of satisfaction, including the experience of childbirth without sustaining injuries, satisfaction with birth duration, the extent of encouragement from healthcare providers in the delivery room to participate in decision-making about the progress of labor, and the level of extreme anxiety experienced during labor and delivery. Primigravidas rate their agreement with each item using a 5-point Likert scale. The total score ranges from 0 to 40, where a score of 40 indicates optimal birth satisfaction and a score of 0 indicates minimal satisfaction.

Content Validity and Reliability:

To evaluate the content validity of the study tools, a panel of three knowledgeable professors with backgrounds in midwifery nursing and women's health was assembled. Their suggestions were methodically incorporated during the tool refinement process. The Birth Satisfaction Scale-Revised (BSS-R) exhibited acceptable internal consistency ($\alpha = 0.94$), while the Numeric Rating Scale (NRS) showed ($\alpha = 0.72$).

METHOD

The following procedures were followed to achieve the study's aim.

First Phase (Preparatory Phase):

Ethical Considerations: Tanta University Faculty of Nursing's Research Ethics Committee examined and approved the research protocol prior to the start of the study in 2024 **(527-9-2024)**. All recruited primigravidas were informed of the study's aim before the intervention began, and their informed consent was obtained. The research team rigorously respected the rights of the primigravidas, ensuring anonymity by removing all personal identifiers to preserve confidentiality. Primigravidas were free to withdraw at any time without incurring any penalties. All collected data were securely stored and kept confidential. Study procedures and materials were designed to avoid physical risks, moral conflicts, or cultural/religious sensitivities, thereby ensuring the dignity and rights of all primigravidas were respected throughout the study.

Preparation of Pelvic Rocking with Birth Ball Interventions: Following an in-depth review of current literature **(Lowdermilk et al., 2024; Perez, 2000)**, the research team used a birth ball intervention incorporating designed pelvic rocking techniques. The proposed intervention was evaluated by three expert professors specializing in midwifery care: a women's health physiotherapist, an obstetric medicine specialist, and a midwifery nursing specialist.

Pilot Study: Ten percent of the sample (15 primigravidas) who met the inclusion criteria participated in a pilot study to evaluate the study's feasibility, tool clarity, and completion time. The tools were left unchanged based on the pilot's findings.

Second Phase (Implementation Phase):

Data were collected over a seven-month period from October 2024 to April 2025. The research team visited the labor and delivery units on the HOT days at each data collection setting: Saturdays at El-Menshawy Hospital and Tuesdays and Wednesdays at Tanta University Hospital. During these visits, the team reviewed registration logs to identify eligible primigravid women who met the inclusion criteria. Institutional authorities granted approval for data collection after receiving an explanation of the study procedures. After explaining the research aim and obtaining written informed consent, primigravidas were allocated to two groups using sealed envelopes containing assignment cards for either the pelvic rocking and birth ball group or the control group.

Following enrollment, researchers conducted individual meetings with each primigravida to collect demographic and obstetric characteristics through face-to-face interviews. Labor progress parameters, including uterine contraction patterns, cervical dilation, and fetal head descent, were collected from the medical records of both groups. Before starting the pelvic rocking and birth ball group intervention, the researchers conducted a study with the control group to avoid contaminating the samples. From admission to birth, primigravidas in the control group received routine care in accordance with the standard of routine hospital care guidelines. This involved closely monitoring the progression of labor (fetal head descent, uterine contractions, cervical dilation, and membrane status).

Primigravidas in the pelvic rocking and birth ball groups received routine hospital care in addition to the pelvic rocking and birth ball interventions. Researchers assisted primigravidas in implementing pelvic rocking and birth ball techniques, ensuring comfortable positions for unrestricted movement. The positioning protocol was implemented as follows: When in an active sitting and bouncing position, the primigravida sat on the birth ball with feet wide apart, gently bouncing, circling her hips, or rocking her pelvis forward (posterior pelvic tilt) and backward (anterior tilt). When in a kneeling position: The primigravida knelt on the mat with her body leaning forward, both hands holding the birth ball, and her head resting on the ball while swaying gently. When in in a supported squatting position: T, theimigravida maintained a squatting position while using the ball for balance support, promoting pelvic outlet expansion.

Throughout the intervention, the birth ball's height and diameter were adjusted according to each primigravida's needs. Researchers provided continuous support during the first stage of labor, implementing comprehensive safety measures. Primigravidas were instructed to perform pelvic rocking exercises using the birth ball in 10-20 minute intervals hourly until achieving full cervical dilation (10 cm).

Third Phase (Outcome Evaluation Phase):

The duration of both the first and second stages of labor was recorded, while pain intensity was

measured using the NRS. Maternal birth satisfaction was assessed during the immediate postpartum period using the Birth Satisfaction Scale. Subsequently, a comparative intergroup analysis evaluated the effect of birth ball exercises and pelvic rocking techniques on primigravidas' delivery outcomes.

Statistical Analysis

IBM SPSS Statistics (Version 27) was used to analyze the data. Assuming a normal distribution, continuous variables were compared using independent samples t-tests and expressed as mean ± standard deviation (SD). Frequencies (N) and percentages were used to report categorical variables, with χ^2 tests or Fisher's exact tests applied as necessary for group comparisons. Mann-Whitney U tests (for non-parametric data) or independent t-tests (when normality assumptions were met) were used to compare the groups' post-intervention pain intensity and birth satisfaction. Relationships between maternal/labor factors and post-intervention birth satisfaction were measured using Pearson's correlation coefficients. For two-tailed tests, statistical significance was set at $p < 0.05$.

Results

The study results present information regarding primigravid women's demographic and obstetric characteristics and labor progress parameters, as well as maternal pain intensity and birth satisfaction scores measured before and after pelvic rocking and birth ball interventions.

Table 1. Demographic characteristics distribution in study and control groups: Table 1 displays the mean age of primigravidas in the study and control groups, which was comparable (26.7 ± 6.8 and 26.4 ± 5.3 years, respectively), with a non-significant difference ($p = 0.801$). Moreover, the distribution across age categories also did not differ significantly between groups ($p = 0.099$). Regarding education, both groups had a substantial proportion of university-educated women, though slightly fewer in the study group (49.3%) than the control group (62.7%). This difference was not statistically significant ($p = 0.488$). Occupation also did not significantly differ ($p = 0.245$), with 45.3% of the study group and 36.0% of the control group reporting being employed. Although a higher proportion of rural residents was observed in the study group (65.3%) compared to the control group (53.3%), this difference did not reach statistical significance ($p = 0.135$).

Table 2. Obstetric characteristics distribution in study and control groups: As presented in Table 2, the mean gestational age was nearly identical between the groups (39.0 ± 1.1 weeks in the study group vs. 39.9 ± 1.0 weeks in the control group), with no significant difference noted ($p = 0.770$). Similarly, the categorical distribution of gestational age showed a comparable proportion of primigravidas delivering between 37 and 40 weeks (82.7% in the study group vs. 86.7% in the control group) ($p = 0.497$). Regarding ANC, 73.3% in the study group and 69.3% in the control group received care in private clinics with no significant difference ($p = 0.931$). The average number of ANC visits was slightly higher in the study group (6.1 ± 1.6) compared to the control group (5.7 ± 2.0), but this difference did not reach statistical significance ($p = 0.195$).

Table 3. Mean labor progress parameters in study and control groups: Table 3 reveals the mean interval between uterine contractions was nearly identical between the groups (3.0 ± 1.1 in the study group vs. 2.9 ± 1.1 minutes in the control group), with no significant difference ($p = 0.385$). Similarly, the duration of uterine contractions was slightly shorter in the study group (54.5 ± 22.8 seconds) compared to the control group (60.5 ± 22.6 seconds), but this difference was not statistically significant ($p = 0.109$). Fetal head descent was also comparable between groups, with no statistically significant differences in either the mean values ($p = 0.469$) or station categories ($p = 0.859$). Furthermore, a significant difference was observed in cervical dilation, where the study group had a slightly higher mean dilation (7.7 ± 1.3 cm) compared to the control group (7.3 ± 1.1 cm), with a p-value <0.045. The categorical distribution of cervical dilation showed that 8% of the study group had reached full dilation (10 cm) versus none (0.0%) in the control group; however, this difference was not statistically significant ($p = 0.055$).

Figure 1. Mean labor duration in the first and second stages in the studied groups: Figure 1 reveals statistically significant differences in labor stage durations. The mean duration of the first stage was significantly shorter in the study group (9.3 ± 0.8 hours) than in the control group (14.9 ± 2.2 hours), with a highly significant p-value ($p < 0.001$). Similarly, the second stage duration was notably shorter in the study group (36.0 ± 7.2 minutes) compared to the control group (91.8 ± 14.3 minutes), a difference that was also highly significant ($p < 0.001$).

Figure 2. Mean labor pain scores in the study and control groups: As shown in Figure 2, post-intervention pain intensity scores decreased significantly in the study group to 4.4 ± 1.3 compared to the control group (8.2±1.1) ($t = 18.16$, $p < 0.001$), indicating that the intervention significantly reduced perceived pain during labor.

Figure 3. Mean birth satisfaction scores in the study and control groups: Figure 3 illustrates that the mean birth satisfaction score improved significantly in the study group. The study group scored higher (35.0 ± 4.6) than the control group (27.2 ± 3.5), with a significant difference ($p < 0.001$).

Table 4. Correlation between maternal and labour-related variables and post-intervention birth satisfaction: Table 4 presents correlations between maternal and labour-related variables and post-intervention birth satisfaction. Findings indicate a strong negative correlation between post-intervention pain intensity and birth satisfaction ($r = -0.565$, $p < 0.001$), suggesting higher pain levels are associated with significantly lower satisfaction. Similarly, both the duration of the first stage ($r = -0.536$, $p < 0.001$) and the second stage of labour ($r = -0.639$, $p < 0.001$) showed significant negative correlations with satisfaction, indicating longer labour durations correspond to reduced satisfaction. In contrast, no statistically significant associations ($p > 0.05$) were found between birth satisfaction and the following variables: maternal age, gestational age, number of antenatal care visits, duration of uterine contractions, cervical dilation, or fetal head descent.

Table 1. Demographic characteristics distribution in study and control groups

Variables		Study group (N=75)	Control group (N=75)	Significance test and p-values
Age (Years)	Mean±SD	26.7±6.8	26.4±5.3	t=0.25
	Range (Min-Max)	23 (17-40)	19 (18-37)	p=0.801
Age categories (Years)	<20	12 (16.0)	5 (6.7)	χ^2=7.79
	20-24	24 (32.0)	27 (36.0)	p=0.099
	25-29	9 (12.0)	16 (21.3)	
	30-34	16 (21.3)	20 (26.7)	
	≥35	14 (18.7)	7 (9.3)	
Level of education	Illiterate	12 (16.0)	7 (9.3)	χ^2=3.55
	Read and write	4 (5.3)	4 (5.3)	p=0.488
	Primary education	10 (13.3)	6 (8.0)	
	Secondary education	12 (16.0)	11 (14.7)	
	University education	37 (49.3)	47 (62.7)	
Occupation	Housewife	41 (54.7)	48 (64.0)	χ^2=1.35
	Working	34 (45.3)	27 (36.0)	p=0.245
Residence	Rural	49 (65.3)	40 (53.3)	χ^2=2.23
	Urban	26 (34.7)	35 (46.7)	p=0.135

SD: Standard deviation

Table 2. Obstetric characteristics distribution in study and control groups

Variables		Study group (N=75)	Control group (N=75)	Significance test and p-values
Gestational Age in weeks	Mean±SD	39.0±1.1	39.9±1.0	t=0.29
	Range (Min-Max)	4 (38-42)	4 (38-42)	p=0.770
Gestational Age in weeks categories	37-40	62 (82.7)	65 (86.7)	χ^2=0.46
	>40	13 (17.3)	10 (13.3)	p=0.497
Place of ANC	Governmental hospital	5 (6.7)	5 (6.7)	χ^2=0.44
	MCHC	11 (14.7)	14 (18.7)	p=0.931
	Private clinic	55 (73.3)	52 (69.3)	
	Private hospital	4 (5.3)	4 (5.3)	
Number of ANC	Mean±SD	6.1 (1.6)	5.7±2.0	t=1.30
	Range (Min-Max)	7 (2-9)	7 (2-9)	p=0.195

SD: Standard deviation. ANC: Antenatal care. MCHC: Maternal and Child Health Centre

Table 3. Mean labor progress parameters in study and control groups

Variables		Study group (N=75)	Control group (N=75)	Significance test and p-values
Uterine contractions interval/Minutes	Mean±SD	3.0±1.1	2.9±1.1	t=0.87 p=0.385
	Range (Min-Max)	3 (2-5)	3 (2-5)	
Uterine contractions duration/Seconds	Mean±SD	54.5±22.8	60.5±22.6	t=1.61 p=0.109
	Range (Min-Max)	70 (20-90)	70 (20-90)	
Cervical dilation (cm)	Mean±SD	7.7±1.3	7.3±1.1	t=2.02 p=0.045*
	Range (Min-Max)	5 (5-10)	4 (5-9)	
Cervical dilation (cm)	4-5	14 (18.7)	16 (21.3)	Fisher Exact=7. p=0.055
	6-7	17 (22.7)	24 (32.0)	
	8-9	38 (50.7)	35 (46.7)	
	10	6 (8.0)	0 (0.0)	
Fetal head descent	Mean±SD	0.8±1.9	1.0±1.9	MWU=2624.0 p=0.469
	Range (Min-Max)	6 (-3 to 3)	6 (-3 to 3)	
	Median (IQR)	1.0 (4)	2.0 (3)	
Fetal head descent stations	High (-3)	6 (8.0)	6 (8.0)	χ^2=0.30 p=0.859
	Mild (-2 to 0)	23 (30.7)	20 (26.7)	
	Low (+1 to +3)	46 (61.3)	49 (65.3)	

** Statistical significance at p < 0.05. SD: Standard deviation. IQR: Interquartile range*

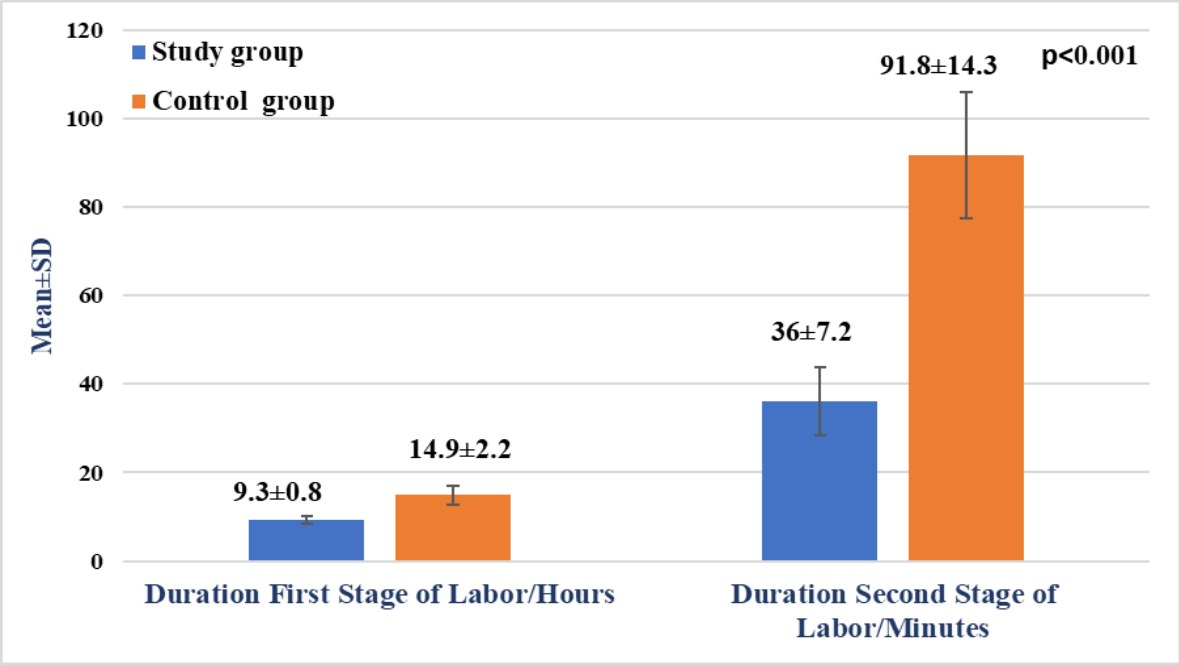

Figure 1. Mean labor duration in the first and second stages in the studied groups

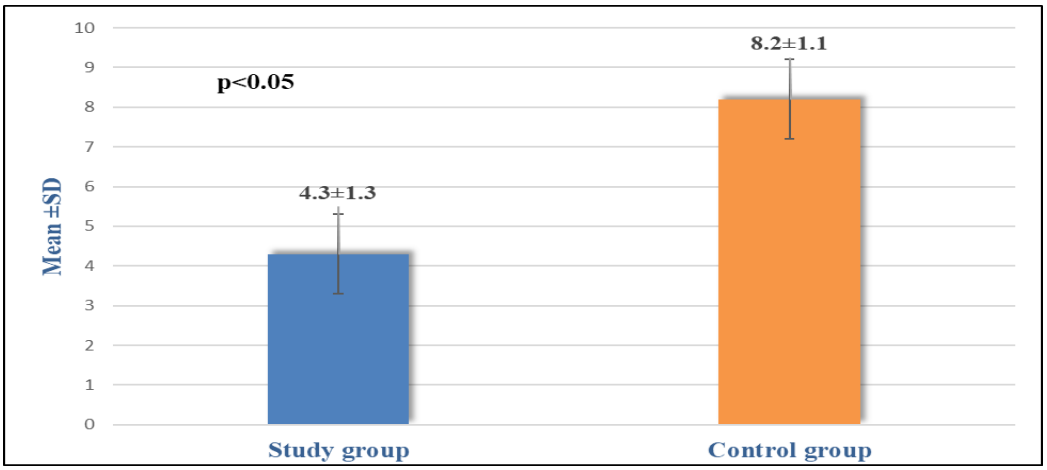

Figure 2. Mean labor pain scores in the study and control groups

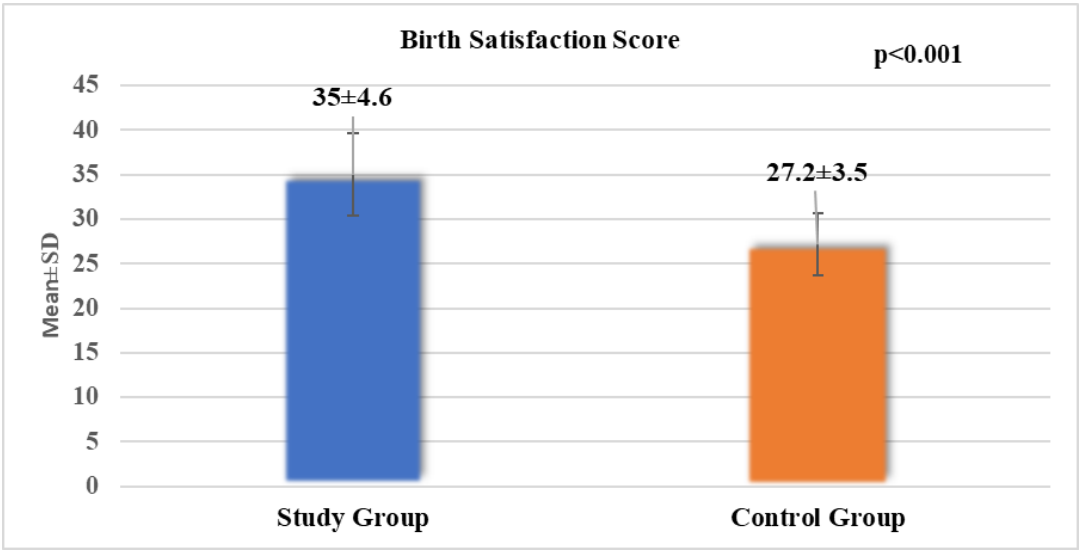

Figure 3. Mean birth satisfaction scores in the study and control groups.

Table 4. Correlation between maternal and labour-related variables and post-intervention birth satisfaction

Variable	Pearson Correlation (r)	p-values
Age	0.044	0.590
Gestational weeks	-0.048	0.563
Number of antenatal care visits	0.110	0.181
Uterine contractions duration (seconds)	-0.108	0.186
Cervical dilation	-0.139	0.089
Fetal head descent	-0.076	0.358
Post-intervention pain intensity	-0.565	**<0.000***
Duration of 1st stage of labour (hrs)	-0.536	**<0.000***
Duration of 2nd stage of labour (min)	-0.639	**<0.000***

Discussion

Empowering primigravidas through pelvic rocking and birth ball utilization offers dual benefits by reducing unnecessary childbirth medicalization while improving delivery outcomes and birth experiences **(Lopes, Vieira, & Cardoso, 2024)**.

This study aimed to examine the effect of pelvic rocking and birth ball interventions on delivery outcomes among primigravidas. The major findings revealed that primigravidas receiving these interventions had a significantly shorter mean duration of labor, lower mean labor pain intensity scores, and higher mean birth satisfaction scores compared to those receiving routine care. These findings support the study's hypotheses.

The current study's results revealed a significant difference in cervical dilation, with the study group using pelvic rocking and a birth ball experiencing a somewhat higher mean cervical dilation than the control group. These findings could be attributable to pelvic rocking actively mobilizing the sacroiliac joints and symphysis pubis, potentially optimizing pelvic diameters. Additionally, birth balls encourage upright positions such as kneeling or squatting, which expand the pelvic outlet compared to the supine position. This improved alignment may reduce soft tissue resistance, allowing the fetal head to exert more direct and effective pressure on the cervix and promote increased dilation. This mechanism is further supported by a systematic review by **Desyanti and Widad (2023)**, which documented that birth ball exercise relieves pressure, increases pelvic space, encourages fetal head descent, improves uterine contraction efficiency, and accelerates cervical dilation.

The results of the current study are consistent with the Indian study conducted **by Jha et al. (2023)**, which investigated the effect of birthing ball exercises on labor outcomes for parturient mothers. After the intervention, they found that the experimental group's cervical dilation rate was significantly higher than that of the control group. Similarly, **Hashad et al. (2022)** discovered that the study group had a significantly higher mean cervical dilation following the intervention than the control group in their Egyptian study examining the effect of birth ball exercises during the first stage of labor on birthing outcomes.

The current study's results revealed a significantly shorter mean duration of the first stage of labor in the study group compared to the control group. Furthermore, the second stage duration was notably shorter in the study group, a difference that was also highly significant. The shorter duration of both labor stages in the study group can be attributed to pelvic rocking and birth ball use. These interventions promote movement, which increases oxytocin release and cervical pressure, accelerating dilation during the first stage and facilitating descent during the second stage. This mechanism likely explains the dramatic reduction in the second stage (36 vs. 91 minutes).

The results of the current study align with a study conducted in Indonesia by **Karningsih et al. (2022)**, which examined how pelvic rocking exercises using a birth ball and SP6 acupressure affected the duration of the first and second stages of labor. Their findings showed that the duration of both the first and second stages of labor was shortened for pregnant women who performed pelvic rocking exercises with a birth ball. Similarly, **Ulfa's (2021)** research from Indonesia investigated how using birth balls affected primigravidas' pain levels and labor duration. According to this study, the intervention group's first stage of labor was

significantly shorter than that of the control group, and their second stage also lasted less time.

According to the current study's findings, following the pelvic rocking and birth ball interventions, a significant reduction in pain intensity scores was observed in the study group compared to the control group. This significant reduction can be explained by several factors: Active pelvic rocking and birth ball movements enhance pelvic blood circulation, helping alleviate ischemic pain, and also relieve muscle spasms in the lower back, abdomen, and pelvic floor, common sources of labor pain. Additionally, active participation empowers women by reducing pain-amplifying factors such as fear and anxiety, while the concentration required acts as a powerful cognitive distraction, diverting attention from the pain sensation. Furthermore, this type of exercise encourages the release of the body's own opioids, known as endogenous endorphins, which help reduce pain.

The present study's results are consistent with a Turkish study by **Aslantaş and Çankaya (2024)**, which examined how birth ball exercise affected labor pain, delivery duration, comfort, and satisfaction. According to their findings, the intervention group's labor pain scores were noticeably lower than those of the control group. Similar findings were reported in another Turkish study by **Sönmez and Apay (2023)**, which examined how using various birth balls during the first stage of labor affected maternal satisfaction and birth outcomes. The intervention group reported lower pain levels than the control group.

The results of the present study are consistent with those of **Erkal Aksoy, Dereli Yilmaz, and Çelimli (2024),** who investigated how birth ball use affected the pain and satisfaction of laboring women in Turkey. According to their findings, the intervention group reported higher birth satisfaction scores than the control group. Furthermore, an Indian study by **Sundaram et al. (2023)** examined how satisfied primiparous women were with the effects of sacral massage and birthing ball exercises on both maternal and fetal outcomes. Their research indicated that the study group's satisfaction ratings were higher than those of the control group.

Conclusion

Primigravidas receiving the pelvic rocking and birth ball interventions showed a significantly shorter mean duration of labor, lower mean labor pain intensity scores, and higher mean birth satisfaction scores than those receiving routine care. These findings highlight the potential of pelvic rocking and birth ball interventions as an empowering tool to reduce unnecessary medicalization of childbirth while improving delivery outcomes and childbirth experiences among primigravidas.

Recommendations

In view of the current study's findings, the following are recommended.

- Integrate pelvic rocking and birth ball interventions into antenatal education programs to increase awareness of their benefits among primigravidas.
- Adopt pelvic rocking and birth ball interventions as routine care in labour and delivery units.

- Endorse pelvic rocking and birth ball exercises within the maternity and midwifery nursing syllabus to improve clinical practice.
- Conduct larger, multi-center studies in the future to improve generalizability.

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