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The Impact of Prenatal Birthing Ball Exercises on First Stage Labor Progression

Dr. Fahima Afroz[1*], Dr. Mah Zabin Naz[2], Dr. Khaleda Akhter[3], Dr. Tanjina Ahmed[4], Dr. Ayesha Siddika[5]

[1]Associate Professor, Obstetrics and Gynaecolgy, Ahsania Mission Medical College; and AMC & GH, Dhaka, Bangladesh
[2]Associate Professor, Gynae and Obs, East West Medical College & Hospital, Dhaka, Bangladesh
[3]MBBS, DCH, FCPS (Paediatrics), Ahsania Mission Cancer and General Hospital, Dhaka, Bangladesh
[4]Registrar, Ahsania Mission Cancer and General Hospital, Dhaka, Bangladesh
[5]SMO Obs-Gynae, Ahsania Mission Cancer and General Hospital, Dhaka, Bangladesh

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***Corresponding author:** Dr. Fahima Afroz
Associate Professor, Obstetrics and Gynaecolgy, Ahsania Mission Medical College; and AMC & GH, Dhaka, Bangladesh

Abstract **Original Research Article**

Background: Labor is a significant physiological event in a woman's life, and its progression can vary greatly across individuals. Factors such as maternal health, fetal positioning, and interventions can influence the pace of labor. Among the strategies to support labor progression, prenatal birthing ball exercises have been increasingly used, with claims of enhancing pelvic flexibility, promoting better fetal positioning, and facilitating cervical dilation, potentially leading to smoother labor and delivery. ***Objective:*** This study aims to evaluate the impact of prenatal birthing ball exercises on the progression of the first stage of labor. ***Methods:*** This prospective study was conducted at Ahsania Mission Medical College and Cancer & General Hospital over one year, with 47 participants selected based on inclusion criteria. Participants received 3-6 birthing ball exercise sessions between 36-40 weeks of gestation. Data were collected on demographics, obstetric history, labor progression, pain assessment, and delivery outcomes. Statistical analysis, including t-tests, ANOVA, and chi-square tests, was used to analyze the data. ***Results:*** The majority of participants were young (18-29 years old), with most having secondary education and residing in urban areas. A significant portion was primigravida (64%), and 100% of participants performed birthing ball exercises. Pain experiences during labor varied, with most participants reporting moderate pain. Labor progression was mostly normal, with 66% experiencing vaginal deliveries. All participants showed normal fetal molding, and 88% had clear amniotic fluid. ***Conclusion:*** Prenatal birthing ball exercises appear to have a positive impact on labor outcomes, contributing to normal fetal molding and a higher rate of vaginal deliveries. The study suggests that these exercises may aid in labor progression and maternal comfort, though further research with larger sample sizes is needed to confirm these findings.

Keywords: Birthing Ball Exercises, Labor Progression, Cervical Dilation, Maternal Comfort, Fetal Positioning, Vaginal Delivery.

INTRODUCTION

Labor is a significant physiological event in a woman's life, and its progression is crucial for a safe delivery. The first stage of labor, which involves cervical dilation and effacement, can vary significantly in duration and intensity across different women. Factors such as maternal health, fetal position, and the type of interventions used can influence the speed and effectiveness of this stage. Among the many strategies used to support and enhance labor progression, prenatal birthing ball exercises have gained attention for their potential to improve maternal comfort and facilitate cervical dilation, making the labor process smoother and more efficient [1-3].

Prenatal birthing ball exercises involve the use of an inflatable ball, which is often recommended during pregnancy to enhance pelvic flexibility, reduce discomfort, and encourage optimal fetal positioning. These exercises are thought to engage the muscles of the pelvic floor and abdomen, providing benefits such as promoting better posture, reducing back pain, and potentially accelerating the progression of labor. The use of the birthing ball is particularly emphasized in the context of the first stage of labor, where its application may help with cervical dilation and reduce the need for medical interventions such as induction [4, 5].

In recent years, several studies have explored the impact of physical activity during labor, particularly the role of birthing balls in supporting optimal fetal positioning and encouraging uterine contractions. It is believed that exercises such as sitting, bouncing, or rocking on the birthing ball can help the baby move into a more favorable position for delivery, which may reduce the duration of the first stage of labor [6-7]. Additionally, these exercises are thought to enhance uterine contractions by increasing the flexibility of the pelvic region, thus potentially reducing the need for prolonged medical interventions.

Despite the growing interest and positive anecdotal evidence, the scientific community remains divided on the exact benefits of birthing ball exercises. While some studies show positive outcomes in terms of labor progression and maternal comfort, others raise questions about the effectiveness and long-term benefits of these exercises [8-11]. For instance, there is limited research on the precise mechanisms through which birthing ball exercises impact cervical dilation and the time spent in the first stage of labor. As such, further research is necessary to clarify whether these exercises can consistently facilitate quicker labor progression in a wide range of pregnancies.

Objective

This study aims to evaluate the impact of prenatal birthing ball exercises on the progression of the first stage of labor.

METHODOLOGY

Study Type

The study was a prospective design, aimed at investigating the impact of prenatal birthing ball exercises on the progression of the first stage of labor.

Study Place and Duration

The study was conducted at Ahsania Mission Medical College and Cancer & General Hospital. It was carried out over a period of one year following approval of the study protocol.

Study Population

The study population comprised pregnant women admitted to the antenatal clinic of the Obstetrics & Gynecology Specialist center and the labor unit.

Sample Size

To determine the sample size, Fisher's formula was applied. The sample size was calculated as follows:
n = Desired sample size
z = Standard normal deviate, typically set at 1.96 for a 95% confidence level
p = Proportion in the population
For a population of fewer than 10,000, the formula used was:
$nf = n / (1 + n / N)^2$
Where,
n = sample size for a population greater than 10,000 = $(Z^2pq) / d^2$
N = estimated population size, which was set at 100 couples
z = 1.96, corresponding to the 95% confidence level
p = 0.84, based on the prevalence of couples who underwent circumcision
q = 1 - p = 0.16
d = degree of accuracy desired = 0.05
Moreover, 47 samples were selected for the study.

Sampling Type

Purposive sampling was employed. Participants were selected based on the inclusion and exclusion criteria.

Inclusion Criteria

- Pregnant women within a certain gestational age range, typically from the second trimester onwards.
- Women who were willing to participate in the study, attend prenatal sessions, and follow the birthing ball exercise protocols.
- Low-risk pregnancies, with no significant complications that could affect the labor process.
- Women capable of performing the exercises as advised by their healthcare providers.

Exclusion Criteria

- High-risk pregnancies, including those with conditions such as gestational diabetes, preeclampsia, or placental abnormalities.
- Pregnancies at risk of preterm labor or with a history of preterm birth.
- Medical conditions that contraindicate physical activities or exercises.
- Women who were unable or unwilling to commit to regular participation in birthing ball exercises.
- Multiple gestations, due to potential differences in labor progression.

Operative Definitions

- **Birthing Ball Exercises:**

Physical movements and positions performed by pregnant women using a specifically designed exercise ball to enhance pelvic mobility, strengthen core muscles, and promote relaxation during the prenatal period.

- **Gestational Age:**

The stage of fetal development, typically measured in weeks from the first day of the last menstrual period or by ultrasound examination.

- **Delivery Mode:** The method through which a baby is born, either vaginal delivery or cesarean section (C-section).

Procedure of Data Collection

Data collection was carried out in several stages, starting with participant recruitment. Pregnant women who met the inclusion criteria were selected from the healthcare facilities. Baseline data were gathered, including demographic details, medical history, and pregnancy-related information. Participants were then randomly assigned to the intervention or control group. The intervention group received training on performing birthing ball exercises, and both groups were monitored continuously. Regular documentation tracked the exercise frequency, duration, and details for the intervention group. Maternal comfort, pain perception, and complications were assessed for both groups. Labor progress, including contractions, cervical dilation, and any medical interventions, was documented during labor. Fetal heart rate patterns, neonatal outcomes (such as Apgar scores, birth weight), and maternal recovery were recorded after delivery.

Procedure of Data Analysis

The collected data were analyzed using statistical software. Descriptive statistics summarized the variables, and comparative analyses were conducted between the intervention and control groups using t-tests or ANOVA for continuous variables, and chi-square tests for categorical variables. Regression analyses were also applied to explore the relationships between variables. The results were interpreted to evaluate the impact of birthing ball exercises on labor progression, maternal outcomes, and neonatal health.

Ethical Considerations

Approval was obtained from the Institutional Review Board (IRB) of Ahsania Mission Medical College & Hospital. The study's objectives, procedures, risks, and benefits were explained to participants in a local language. Informed written consent was obtained from all participants, ensuring confidentiality of all data and records.

RESULTS

The demographic and occupational distribution of the participants reveals a varied sample. The majority of participants were between 18 and 29 years old, with 38% in both the 18-23 and 24-29 age groups, and a smaller percentage of 18% in the 30-35 age group. In terms of education, most participants had secondary education (62%), followed by university graduates (24%) and a smaller percentage with primary education (8%). Occupationally, a significant proportion of the participants were housewives (72%), with a smaller percentage working in other capacities: 20% were working, and only 2% were employees. The majority of participants resided in urban areas (90%), with only 4% residing in rural areas.

Table 1: Demographic and Occupational Distribution of Participants

Parameter	Category	Number of Participants	Percentage (%)
Age Group Distribution	18-23	19	38%
	24-29	19	38%
	30-35	9	18%
	Total	47	100%
Education Level	Primary	4	8%
	Secondary	31	62%
	University	12	24%
	Total	47	100%
Occupation	Housewife	36	72%
	Working	10	20%
	Employee	1	2%
	Total	47	100%
Residence	Urban	45	90%
	Rural	2	4%
	Total	47	100%

The majority of participants were primigravida (64%), with 28% having 2-3 pregnancies and only 2% having 4 or more pregnancies. In terms of parity, 64% were nulliparous, 16% were primiparous, and 14% were multiparous. Regarding abortion history, 80% of participants had no previous abortions, while 14% had experienced 1-3 abortions. All participants (100%) engaged in 3-6 sessions of birthing ball exercises during the 36-40 week gestational period.

Table 2: Distribution of Participants Based on Obstetric History and Birthing Ball Exercise

Parameter	Category	Number of Participants	Percentage (%)
Gravida (Number of Pregnancies)	Primi (1 pregnancy)	32	64%
	2-3 pregnancies	14	28%
	4 or more pregnancies	1	2%
	Total	47	100%
Parity (Number of Deliveries)	Nullipara	32	64%
	Primipara	8	16%
	Multipara	7	14%
	Total	47	100%
History of Abortion	None	40	80%
	1-3 times	7	14%
	Total	47	100%
Birthing Ball Exercise (Session Count: 3-6, 36-40 weeks)	3-6 sessions (36-40 weeks)	47	100%

A significant proportion of participants reported abdominal pain (64%) and back pain (36%). Smaller percentages experienced muscle cramps (6%), nausea (4%), sweating (4%), and thirst sensation (4%). Additionally, 18% of participants reported no complaints at all during the study. The total distribution sums up to 100%.

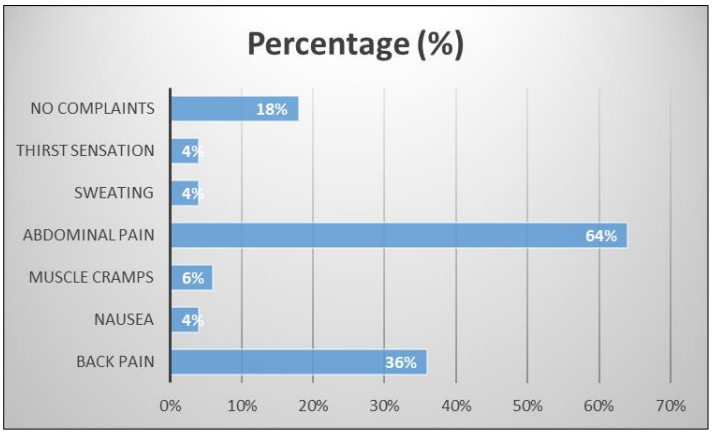

Figure 1: Complaints during pregnancy

The figure presents the distribution of participants based on their Bishop scores during labor. Among the participants, 30% had a Bishop score of 1-2, 48% had a score of 3-4, and 16% had a score of 5-6.

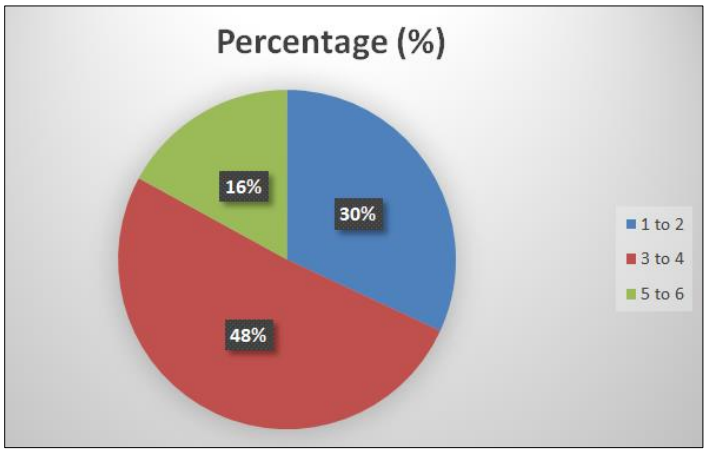

Figure 2: Bishop Score during Labor

Table-3 presents the distribution of participants based on labor-related parameters. Regarding uterine contraction intensity, 8% of participants experienced mild contractions, 66% had moderate contractions, and 20% had severe contractions. In terms of the latent and active phase of labor, 72% of participants had a normal

progression, while 22% experienced a prolonged phase. All participants (100%) received Ringer's fluid during labor. For liquor appearance, 88% had clear liquor, while 6% had meconium-stained liquor. Regarding fetal molding, all participants (100%) had normal molding, with no cases of abnormal molding.

Table 3: Distribution of Participants Based on Labor-Related Parameters

Category	Subcategory	Number of Participants	Percentage (%)
Uterine Contraction Intensity	Mild	4	8%
	Moderate	33	66%
	Severe	10	20%
	Total	47	100%
Latent and Active Phase of Labor	Normal	36	72%
	Prolonged	11	22%
	Total	47	100%
Type of Fluid Used During Labor	Ringer's	47	100%
Liquor Appearance	Clear	44	88%
	Meconium Stained	3	6%
	Total	47	100%
Molding of Fetus	Normal	47	100%
	Abnormal	0	0%
	Total	47	100%

The pain assessment results revealed a wide distribution of pain levels among participants during labor. The majority of participants (48%) reported experiencing moderate pain, scoring 8 on the pain scale, followed by 24% who reported severe pain with a score of 9. A smaller proportion of participants reported experiencing mild pain (2% with a score of 2), and less than 10% of participants reported pain levels of 5 (6%) and 7 (8%). A few participants (6%) indicated the highest pain level of 10, reflecting a varied experience of pain during labor.

Table 4: Pain Assessment Scale (0-10)

Pain Scale	Number of Participants	Percentage (%)
2	1	2%
5	3	6%
7	4	8%
8	24	48%
9	12	24%
10	3	6%
Total	47	100%

The delivery type distribution shows that the majority of participants (66%) had a vaginal delivery, including 2 cases of vaginal birth after cesarean (VBAC). A smaller portion of participants (28%) underwent a cesarean section, with the remaining 6% not specified. This indicates a higher prevalence of vaginal deliveries in the study group, with a notable percentage of cesarean deliveries as well.

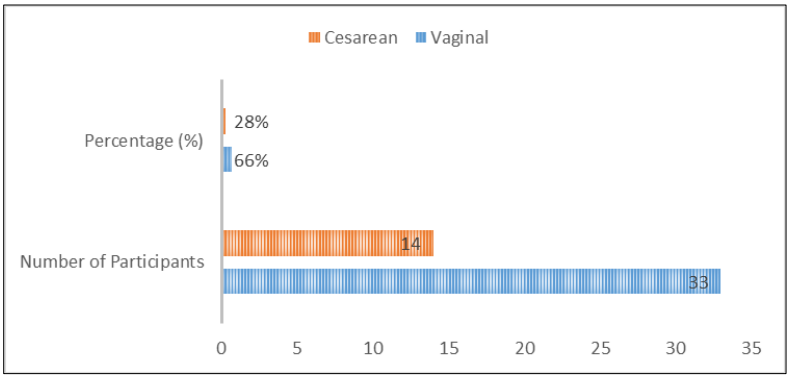

Figure 3: Type of Delivery

DISCUSSION

The study's findings on demographic and occupational factors reveal some notable trends that are

consistent with existing literature, while also showing unique aspects specific to this cohort. The age distribution shows a predominant concentration of participants in the younger age groups, with 38% in both the 18-23 and 24-29 age ranges. This is consistent with studies that report higher participation from younger, primigravida women, which may be attributed to increased awareness and prenatal care seeking behaviors during these age periods [12]. A significant proportion of participants had secondary education (62%), which aligns with studies suggesting that access to education is a key factor in prenatal care participation. Additionally, the majority of participants were housewives (72%) and resided in urban areas (90%), reflecting the socio-economic demographics often observed in urban settings, where access to healthcare services and awareness programs are more prevalent.

In terms of obstetric history, the results indicate that the majority of participants were primigravida (64%), which is in line with similar studies that report higher engagement in prenatal interventions among first-time mothers. The high percentage of nulliparous women (64%) is also a common trend in studies focused on first-time pregnancy interventions. Additionally, 80% of the participants had no history of abortion, which may reflect the population's relatively healthy obstetric history. All participants engaged in birthing ball exercises during the 36-40 weeks of gestation, a key intervention in the study, highlighting the focus on promoting natural labor progression and enhancing maternal comfort.

Regarding labor experiences, the majority of participants (64%) reported abdominal pain, a common symptom in labor, followed by back pain (36%), which is frequently discussed in literature as a prevalent discomfort during labor. A small proportion experienced muscle cramps, nausea, sweating, and thirst sensation, which are generally less common but still reported in some studies. These findings corroborate existing research on the types of complaints experienced during labor, though the specific frequency of each symptom may vary depending on the study's sample size and methodology.

When examining labor-related parameters, our study showed that most participants (66%) experienced moderate uterine contractions, which aligns with what is observed in most clinical settings, where moderate contractions are typical in active labor. The prolonged latent phase in 22% of participants mirrors findings from studies suggesting that certain interventions, such as birthing ball exercises, may help in managing labor duration but not eliminate variability in labor progression [12, 13]. The absence of abnormal fetal molding in all participants (100%) is a reassuring result, as this is generally associated with positive fetal positioning and reduced risk of complications during delivery. The use of Ringer's fluid in all cases and the appearance of clear liquor in 88% of participants are consistent with typical clinical practices in managing hydration and monitoring amniotic fluid status.

Pain assessment results show a broad spectrum of pain experiences, with the majority (48%) rating their pain at 8 on the scale, a common finding in labor studies, as it reflects a typical pain experience during the active phase of labor [14, 15]. The distribution of pain scores aligns with reports from other studies that show a wide variability in pain perception among women in labor. Interestingly, the prevalence of vaginal deliveries (66%) in this study, including 2 cases of VBAC, is higher than the national cesarean section rates seen in many regions, where cesarean rates often surpass vaginal deliveries. This could reflect the potential benefits of prenatal interventions such as birthing ball exercises in encouraging natural labor progression, as well as the impact of the study's focused interventions.

CONCLUSION

In conclusion, the results of this study provide valuable insights into the demographic, obstetric, and labor-related characteristics of the participants, highlighting a predominance of younger, primigravida women with secondary education and predominantly urban residence. The use of birthing ball exercises in the 36-40 week gestational period was universally adopted and appears to have contributed to positive labor outcomes, including normal fetal molding and a relatively high rate of vaginal deliveries. While the pain experiences during labor were diverse, the majority of participants reported moderate pain, with a substantial number experiencing abdominal and back pain. The findings align with existing literature on common labor complaints and delivery outcomes, emphasizing the potential benefits of prenatal interventions in improving labor progression and maternal comfort. Further research with larger sample sizes is recommended to validate these results and explore the long-term impact of such interventions.

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