

Effectiveness of Birthing Ball Exercises on Labour Pain, Coping, Foeto-Maternal Parameters and Childbirth Experience among Parturient Women in a Selected Hospital of Kochi (Kerala)

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Abstract

Childbirth is an exciting and meaningful experience in a woman's life. Considering the utility of birthing ball among pregnant mothers in their antenatal period for reducing the intensity of labour pain, and fear, thus promoting a normal delivery, this study evaluated the effectiveness of this technique among 30 parturient women, 15 each from the experimental, and the control group, in the labour room of Lisie Hospital, Kochi (Kerala) selected by purposive sampling. Parameters of labour pain, coping and foeto-maternal aspects were factored in. The qualitative aspect of data collection involved 10 parturient participating women after childbirth picked by convenience sampling technique. The study revealed that they could cope with the labour pain experienced. The thematic analysis represents the childbirth experience after using birthing ball exercises among parturient women.

Key words: Birthing ball exercises, Labour pain, Foeto-maternal parameters

A woman is endowed with an amazing, creative and enriching experience as she gives birth to a child and nurtures it. During labour the women experiences some degree of stress as her system response to the physical changes that prepare her to give birth. Almost every woman in labour experiences some degree of discomfort.

In India, the current birth rate per thousand people is 17.163. The birth rate in Kerala was 13.20/1000 births in 2020. The caesarean section (CS) rate in Kerala was 42.4 percent in 2021. In past few decades, the number of patients who go into spontaneous labour has decreased while the percentage of inductions (iatrogenic labour) has increased to 22 percent of all pregnancies. Thus, all women who give birth to the baby necessitate some type of pain relief methods (Wester et al, 2018).

A birthing ball is a wonderful comfort tool for pregnancy and labour. It is a large air-filled rubber ball about 50-60 cm in diameter, made up of extra tough non-slip burst burst-proof PVC that is easily wiped and cleaned. Research has proved that it has many advantages. Although various types of non-pharmacological measures are available to relieve pain, birthing ball was found to be safe, inexpensive and effective for pain relief and coping during labour.

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Need for the study: In Kerala, pregnant women are usually unaware of the importance of the birthing ball and its uses, and prefer caesarean section. A need was felt to use birthing ball among pregnant mothers during their antenatal period to reduce the intensity of labour pain and fear, shorten the duration of labour, aid the process of cervical ripening, provide comfort, and thereby promote normal delivery.

Objectives

1. To assess the level of labour pain, coping and foeto-maternal parameters among the parturient women during labour in the experimental and control groups.
2. To evaluate the effectiveness of birthing ball exercises on labour pain, coping and foetal-maternal parameters among parturient women between the experimental and control groups.
3. To find the association between the pre-test level of labour pain and coping with selected demographic variables among parturient women in the experimental group.
4. To explore the childbirth experience among parturient women after undergoing birthing ball exercises in the experimental group.

Review of Literature

Related to the nature of labour pain: A qualitative study was conducted by Laura Y Whitburn, Lester E Jones, et al in 2019 through database

review, using phenomenology as the theoretical framework. Data were collected from 21 nulliparous women, birthing at one of two large maternity services, through face-to-face interviews and written questionnaires. The data suggest that when women interpret the pain as productive and purposeful, it is associated with positive cognitions and emotions, and they are more likely to feel they can cope.

Related to coping with labour pain: A mixed-methods systematic review regarding coping strategies for labour pain, related outcomes, and influencing factors was conducted by Simona Fumagalli, Sara Borrelli, et al in 2022. Electronic databases were searched to identify eligible studies from December 2020 to November 2021. A total of 23 studies were included. The findings provide midwives and healthcare professionals with information to recognise coping strategies spontaneously adopted by labouring women and promote the use of various techniques, as required by individual needs and preferences.

Related to pain management in labour: Levett & Collins conducted randomised controlled trials comparing relaxation methods with standard care in the use of 2020 in relaxation techniques for pain management in labour. Of the 1374 participating women, 677 were taught yoga and 374 were taught breathing and relaxation techniques; the remaining underwent standard care in the hospital. The authors concluded that 82.6 percent mothers were highly satisfied with relaxation therapies.

Related to birthing ball exercises in labour: A randomised control trial in Taiwan in 2019 examined the effect of birthing ball exercise on pain and self-efficacy during childbirth; 48 interventional group mothers and 39 control group mothers were used for the study. The study concluded that the birthing ball is most effective during labour as 72.8 percent mothers experienced a reduction in pain perception.

Methodology

A mixed method approach with explanatory sequential design was adopted. The independent variable was birthing ball exercise, and dependent variable - labour pain, coping, and foetomaternal parameters. The study was set in the labour room of Lisie Hospital in Kochi (Kerala), for the experimental and control groups. All the parturient women attending the labour room during the latent phase of labour in Lisie Hospital constituted the study population. The sample consisted of the parturient women having

attended the labour room during the latent phase of the first stage of labour in Lisie Hospital who fulfilled the inclusion criteria and are available during data collection.

Inclusion criteria: Parturient women above 18 years of age with a single-tone pregnancy, having completed 37 weeks of gestation and undergoing normal vaginal delivery during the latent phase of labour (true labour pain to 4cm of cervical dilatation), understanding English and regional language, and willingness to participate in the study.

Exclusion criteria: Parturient women with premature rupture of the membrane and placenta previa, posted for planned lower segmental caesarean section.

Purposive sampling technique was used. The sample comprised a total of 30 parturient women, 15 each in the experimental and the control group.

Description of the Tool

It had four parts: demographic and obstetrical variables for parturient women; the Wong-Baker FACES pain rating scale for parturient women; labour coping scale for parturient women; and Modified WHO Partograph for parturient women.

Validity and reliability of the tool: To ensure the utmost content validity of the tool, it was submitted to four experts each in gynaecology and nursing, and one statistician. The clarity of the tool was ensured by testing it among parturient mothers.

Ethical consideration: Ethical approval was obtained from the Research and Ethical Committee of Lisie Hospital.

Quantitative Aspect of Data Collection

PRE-TEST PHASE: The researcher introduced herself to all selected parturient women and obtained their written consent. The participants were selected using purposive sampling, and 15 parturient women each were assigned to the control group and experimental group. The demographic and obstetrical data were collected through interviews and medical records. The labour pain level was assessed by the Wong-Baker FACES pain rating scale, coping level with labour coping scale and foeto-maternal parameters using modified WHO partograph before intervention for both control and experimental group of parturient women in the latent phase of labour.

INTERVENTION PHASE: The researcher prepared the training room in the first stage of labour at Lisie Hospital to demonstrate Birthing Ball Exercises for the parturient women. The parturient women

were helped in sitting over the ball with their feet shoulder-width apart. The women were held by researcher and breathing techniques was started initially with for 1 to 10 counts. Birthing ball exercise was provided for 20 minutes in 2 different positions (10 minutes in each position, sitting and squatting; 10 minutes rest was provided to the women after each session, and exercise up to 4 cm of cervical dilatation was continued. After the sample size was achieved for the experimental group, data collection from the control group was started.

POST-TEST PHASE: Parturient women were made in comfortable position. The pain level, coping level and foeto-maternal parameters were assessed after the intervention for both groups with the same tool up to 4 cm of cervical dilatation.

Analysis was carried out using descriptive statistics and inferential statistics. For all statistical purposes, a p value <0.05 was considered significant.

Qualitative Phase

The research variable was childbirth experience; research approach qualitative, its design was explanatory sequential. The setting was labour room of Lisie Hospital. All the parturient women after childbirth who participated in the quantitative study constituted the study population.

Sample and sample size: The sample comprised of 10 parturient women after childbirth who participated in the quantitative study (the sample size was calculated till data saturation was achieved) and fulfilled the inclusion criteria and were available during data collection before discharge from the hospital.

Sampling Technique -Participants in a qualitative study are a subset of the participants in the quantitative study selected by using a convenience sampling technique.

All parturient women who completed normal vaginal delivery after using birthing ball exercises, were willing to participate in the study before discharge from the hospital, were included. Parturient women posted for planned lower-segmental caesarean section were excluded.

Description of the Tool

PART-2

Semi-structured interview schedule on childbirth experience of birthing ball exercise upon labour pain and coping - used to assess the experience felt by the parturient women regarding the use of birthing ball exercise during the active phase of the first stage of labour, which is assessed after

childbirth through the direct interview method before discharge from the hospital.

Validity and reliability of the tool: To ensure the utmost content validity of the tool, it was submitted to 4 experts in gynaecology and 4 experts in the nursing field and one statistician. The clarity of the tool was ensured by testing it among parturient mothers.

Data collection procedure- qualitative aspect: The level of childbirth experience of birthing ball exercises was assessed in the experimental groups of 10 parturient women (5 primi and 5 multi) by direct interview through a semi-structured interview schedule after delivery, before discharge from the hospital.

Individual discussion was done with participants. During data analysis, thematic approach was followed; transcripts were systematically coded and categorised to identify recurring themes and patterns across the samples. A modified Colaizzi's seven-step thematic analysis method was employed.

Results for Phase-1: Quantitative Organisation & Presentation of the Data

The age distribution shows that the majority of participants in both groups fall within the 23 to 27 age range. In the experimental group, the majority of participants (80.0%) have a degree or above (Table 1). In the control group, 66.7 percent of participants had a degree or above; in the experimental group, the majority of participants (53.3%) were in the private sector. In the control group, participants were more evenly distributed among homemakers (26.7%), self-employed (26.7%), and private sector workers (40.0%). Both the experimental and control groups have the majority of participants from semi-urban areas, with 80.0 % in the experimental group and 86.7% in the control group. In the experimental group, all participants (100.0%) are from nuclear families, with no participants from joint families. In the control group, the majority of participants (93.3%) are from nuclear families.

In the experimental group, the majority of participants (93.3%) had received previous information about birthing ball exercises (BBE), with only 6.7 percent not having received such information. In the control group, 80.0 percent participants had received previous information about BBE, while 20.0 percent had not. In the experimental group, the majority of participants (73.3%) received information about birthing ball exercises from media sources. In the control group, 80.0 percent participants received information from media sources.

Table 1: Frequency and percentage distribution of demographic variables in the experimental and control groups of parturient women (N=30)

Demographic variables		Experimental group		Control group		χ^2	p value
		Frequency	Percentage	Frequency	Percentage		
Age in years	23-27	8	53.3	6	40.0	2.692	0.260
	28-32	4	26.7	8	53.3		
	32 above	3	20.0	1	6.7		
Educational status	Higher secondary	3	20.0	5	33.3	0.687	0.407
	Degree and above	12	80.0	10	66.7		
Occupation	Home maker	6	40.0	4	26.7	6.235	0.101
	Self-employee	0	0.0	4	26.7		
	Private employee	8	53.3	6	40.0		
	Government employee	1	6.7	1	6.7		
Place of residence	Urban	3	20.0	1	6.7	2.473	0.290
	Rural	0	0.0	1	6.7		
	Semi urban	12	80.0	13	86.7		
Type of family	Nuclear	15	100.0	14	93.3	1.421	0.233
	Joint	0	0.0	1	6.7		
Previous information	Yes	14	93.3	12	80.0	1.200	0.273
	No	1	6.7	3	20.0		
Source of information.	Media	11	73.3	12	80.0	0.187	0.666
	Health professionals	4	26.7	3	20.0		

Table 2: Frequency and percentage distribution of obstetrical variables in experimental and control groups of parturient women (N=30)

Obstetric variables		Experimental group		Control group		χ^2	p value
		Frequency	Percentage	frequency	Percentage		
Obstetrical score	Primi	10	66.7	7	46.7	1.23	0.267
	Multi	5	33.3	8	53.3		
Gestational weeks	37-38	4	26.7	9	60.0	3.466	0.063
	39-40	11	73.3	6	40.0		
Previous mode of delivery	Primi mothers	10	66.7	7	46.7	1.23	0.267
	Normal vaginal delivery	5	33.3	8	53.3		

In the experimental group, majority of participants were primi (66.7%), followed by multi (33.3%). In the control group, the distribution is different, with primi (46.7%), multi (53.3%). In the experimental group, the majority of participants (73.3%) are between 39 to 40 weeks of gestation. In the control group, the distribution is more balanced, with 60.0 percent participants between 37 to 38 weeks of gestation (Table 2).

Experimental group, a higher proportion of participants are primiparous mothers (66.7%), compared to 33.3 percent who had previous

normal vaginal deliveries. Control group, the distribution is somewhat more balanced, with 46.7 percent primi and 53.3 percent having had previous normal deliveries.

The level of labour pain, coping and foeto-maternal parameters among the parturient women during the latent phase of labour in the experimental and control groups (N=30).

Table 3: Data and results of significant difference in the labour pain (N=30)

Labour pain	Group	N	Mean	Std deviation	t value	p value
Before therapy	Experimental group	15	2.80	2.366	2.20	0.039
	Control group	15	1.33	0.976		
After therapy	Experimental group	15	5.07	1.486	4.81	0.000
	Control group	15	2.40	1.549		

The obtained t value 2.20 is significant ($t=2.20$; $p<0.05$) in the labour pain before therapy between the experimental and control groups (Table 3). In the case of after the therapy, the obtained t value 4.81 is significant at the 0.05 level of significance ($t=4.81$; $p<0.05$), which means there is a significant difference in post-test scores between the experimental and control group.

The obtained t value of 4.97, is not significant ($t=0.497$; $p>0.05$) in the labour pain before therapy between the experimental and control groups (Table 4). In the case of after the therapy,

Table 4: Data and results of significant difference in the labour coping level (N=30)

Labour coping level	Group	N	Mean	Std deviation	t value	p value
Before therapy	Experimental group	15	5.267	1.7410	0.497	0.563
	Control group	15	5.000	1.1339		
After therapy	Experimental group	15	7.000	1.1000	7.51	0.000
	Control group	15	4.000	1.1802		

the obtained t value 7.51 is significant at the 0.05 level of significance ($t=7.51$; $p<0.05$), which means there is a significant difference in post-test scores in the labour coping level between the experimental and control group.

There are significant differences in the descent of the foetal head before and after therapy, and the rate of descent and cervical dilatation for primi between the experimental and control groups. These differences suggest that the birthing ball exercises might influence these specific parameters (Table 5).

For other variables such as FHR, latent phase duration, and contractions, there are no statistically significant differences between the groups, indicating that the birthing ball exercises did not significantly impact these aspects. The significant reduction in pain ratings and the notable differences in foetal head descent and cervical dilatation for primi suggest potential benefits of birthing ball exercises during labour.

Evaluating the effectiveness of birthing ball exercises on labour pain, coping and foetal-maternal parameters among parturient women between experimental and control groups

Table 6 shows that the obtained t value for pain

score in the experimental group before and after exercises is 3.11 is significant at the 0.05 level. So, it can be concluded that there is a significant difference between 0 cm and 4 cm. The obtained t value for coping level score in the experimental group before and after exercises is 3.10 is significant at the 0.05 level. So, it can be concluded that there is a significant difference between 0cm and 4 cm.

Interpretation and Comparison of Quantitative and Qualitative Data

From the analysis, it can be inferred that the participants could cope with the labour pain experienced. The coping level was more in the experimental group than in the control group, showing that the birthing ball was effective in reducing the intensity of labour pain perception with good coping level during the first stage of labour among the primiparous parturient women.

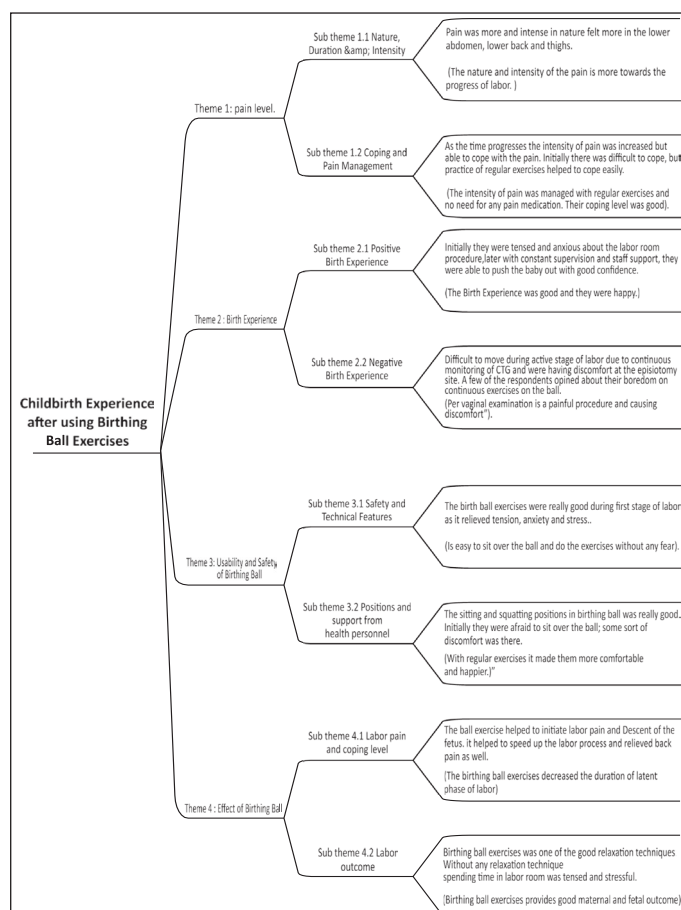
The thematic analysis represents the childbirth experience after using birthing ball exercises among parturient women in terms of the labour pain, the birth experiences, usability and safety of the birthing ball and the effect of the birthing ball. Most of the mothers in the experimental group didn't receive any analgesics for pain. Initially,

Table 5: Data and results of significant difference in the foeto-maternal parameters

Group		N	Mean	SD	F test value	p value
FHR	Experimental group	15	1.00	0.000	1.740	0.093
	Control group	15	1.27	0.594		
Cervical dilatation before exercises	Experimental group	15	0.67	0.724	1.479	0.150
	Control group	15	0.33	0.488		
Cervical dilatation after exercises	Experimental group	15	4.40	0.507	1.427	0.165
	Control group	15	4.13	0.516		
Descent of the foetal head before exercise	Experimental group	15	3.53	0.640	3.207	0.003
	Control group	15	4.33	0.724		
Descent of the foetal head after exercise	Experimental group	15	0.27	0.704	4.541	0.000
	Control group	15	1.47	0.743		
Primi duration of latent phase in hours	Experimental group	9	1.78	0.441	0.233	0.819
	Control group	7	1.86	0.900		
Multi duration of latent phase in hours	Experimental group	6	2.17	0.408	0.257	0.802
	Control group	8	2.25	0.707		
Contraction level before exercise	Experimental group	15	1.27	0.458	0.386	0.702
	Control group	15	1.33	0.488		
Contraction level after exercise	Experimental group	15	2.00	0.535	0.807	0.426
	Control group	15	1.87	0.352		

Table 6: Data and results of significant difference in the labour pain, coping (N=30)

Group	Cm	Mean	N	Std deviation	t value	p value
Experimental group Pain level	0 cm	2.80	15	2.366	3.11	0.000
	4 cm	5.07	15	1.486		
Control group Pain level	0 cm	1.33	15	0.976	2.26	0.038
	4 cm	2.40	15	1.549		
Experimental group Coping level	0 cm	5.267	15	1.7410	3.10	0.000
	4 cm	7.000	15	1.000		
Control group Coping level	0 cm	5.000	15	1.1339	8.36	0.000
	4 cm	4.000	15	1.1802		



they were tense and anxious about the labour room procedure. Later, with constant supervision and support from health personnel, they could practice birth ball exercises, as it is easy to sit over the ball and do the exercises without fear.

Discussion

Most of the women in both the control and experimental group (60%, 40%) were between the ages 23-27 years, which shows that most of them are aware about the right age of reproduction. It is also noted that half of the mothers in control group and experimental group delivered after 30 years of age, which emphasises that there is more risk of developing complications during the antenatal period.

As for educational qualification of the women, 73.3 percent of participants had a degree or above,

and 26.7 percent had a higher secondary education. As women with inadequate education may have less information regarding health care practices, the it was felt that higher education helps mothers in better understanding about labour process and better coping, hence all women should be encouraged to pursue higher education beyond school level.

Both the experimental and control groups had majority of participants from semi-urban areas (80.0% in experimental group and 86.7% in control group) and even though the women were distributed in different areas of residence they seek good medical advice and are aware about the advantages of taking adequate antenatal care, thus reducing the incidence of complications during delivery.

Majority of participants (96.7%) were from nuclear families, and a very small percentage (3.3%) from joint families. So, it is observed that as the responsibility to care for other family members was less in the nuclear families, which prompts the mother to seek antenatal care with the support of their spouse. A study conducted by Deck et al in 2010 says that among nuclear families, women with better marital relationships are more likely than others to use antenatal care services and to deliver in a health-care facility.

Previous information about BBE: 86.7 percent of the total participants had received previous information about BBE, and 13.3 percent had not. Most of them received information from media sources, while 23.3 percent received it from health professionals. Hence, the nurse midwives must explain to the women about various methods available for pain relief during labour.

Obstetric variables: In the experimental group, the majority of participants (66.7%) are primi, followed by multi (33.3%). In the control group, the distribution is different (primi 46.7%, multi 53.3%).

Gestational weeks reveal, the total distribution shows that 56.7 percent of participants are between 39 to 40 weeks of gestation, while 43.3 percent between 37 to 38 weeks. This proves that the risk of pre-term labour and maternal complications was reduced with regular antenatal check-ups and screening methods. This view was supported by Aaron et al (2018) in the study conducted at the

Department of Obstetrics and Gynaecology that maternal complications were high beyond 40 weeks of gestation.

The total distribution shows that 56.7 percent participants are primi, while 43.3 percent had previous normal deliveries.

The mean and standard deviation of labour pain among the parturient women during the latent phase of labour in the experimental and control groups: The mean pain rating before exercises in the experimental group (2.80) is higher than in the control group (1.33). The mean pain rating after exercises in the experimental group (5.07) is lower than in the control group (2.40). The significant reduction in pain ratings in the experimental group after 4 cm dilatation compared to the control group suggests that birthing ball exercises may be effective in reducing pain during labour.

The mean and standard deviation of coping among the parturient women during the latent phase of labour in the experimental and control groups: The mean coping rating before exercises in the experimental group (5.267) is slightly higher than in the control group (5.000). The mean coping rating after exercises in the experimental group (7.000) is significantly higher than in the control group (4.000). The significant improvement in coping ratings in the experimental group after therapy, compared to the control group, strongly suggests that the birthing ball exercises are effective in reducing labour coping.

The effectiveness of birthing ball exercises in improving coping during labour was a key finding of the study. The coping rating data before and after therapy emphasise the significant coping improvement achieved through birthing ball exercises in the experimental group. A study conducted by Davidason in 2019 among women describes that they used different coping methods, which included physiological, psychological, spiritual and cognitive methods to cope during labour.

The mean and standard deviation of foetomaternal parameters among the parturient women during the latent phase of labour in the experimental and control groups: There are significant differences in the descent of the foetal head before and after therapy, and the rate of descent and cervical dilatation for primi between the experimental and control groups. These differences suggest that the birthing ball exercises might influence these specific parameters.

For other variables such as FHR, latent phase duration, and contractions, there are no statistically significant differences between the groups, indicating that the birthing ball exercises did not significantly impact these aspects.

The significant reduction in pain ratings and the notable differences in foetal head descent and

cervical dilatation for primi suggest potential benefits of birthing ball exercises during labour.

This shows that the use of a birthing ball increases the uterine contraction and cervical dilatation for the primiparous parturient women. Swapna Sukumaran in 2021 reveals a significant relationship between cervical dilatation and uterine dilatation (Sukumaran, 2020).

Qualitative aspects: The thematic analysis represents the childbirth experience after using birthing ball exercises among parturient women in terms of the labour pain, the birth experiences, usability and safety of the birthing ball and the effect of the birthing ball. As labour progresses, they could tolerate the labour pain with good coping. Most of the mothers in the experimental group didn't receive any analgesics for pain. The birthing ball exercises were effective among parturient women with good maternal and foetal outcomes.

Recommendations

Similar study can be conducted (i) with a larger number of samples, and (ii) in different settings.

A comparison can be made with different stages of labour.

A comparison can be made between different types of alternative and complementary therapies.

Conclusion

This study shows that the use of a birthing ball was effective in reducing the labour pain perception and improving the coping level. The experimental group of women who received birthing ball exercises had good coping with labour pain, with good maternal and foetal outcomes that led to normal vaginal delivery. The birthing ball is a non-invasive procedure and has no adverse effects on the mother and the foetus, and hence the midwives could be encouraged to use this as a pain relief method during labour.

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