

An Evidence-Based Guideline of Birth Ball Exercise during the First Stage of Labor on the Outcome of Birthing Criteria

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Abstract

Background: Birth ball makes labor more efficient, helps mothers feel more comfortable, and helps the descent of fetal head. **Aim of study:** Was to assess the effect of an evidence-based guideline of birth ball exercise during the first stage of labor on the outcome of birthing criteria. **Design:** The experimental design was utilized to fulfill the aim of this study. **Sample:** A group of 200 laboring women was included by purposive sampling technique; the study subjects randomly assigned into two equal group. **Setting:** The study was implemented in the Labor and Delivery Unit at Benha university hospital. **Tools:** Data were collected by using four tools included: a Structured Interview Questionnaire Sheet to assess general characteristics of women and obstetrical data for women., The Partograph to measure the progress of labor in term of cervical dilatation, effacement, descent of fetal head, & uterine contraction progress, Visual analog pain intensity scale (VAS): It was a standardized linear scale, APGAR score chart to measure the physical condition of the newborn. **Results:** There was no significant difference among control and intervention groups regarding general characteristics and obstetric data. There was statistically positive correlations between the birth ball exercise effects on the progress of labor in term of decreases interval and increases duration and frequency of uterine contraction, cervical dilatation and fetal head descent among the study group, while the control group showed less progress with highly statically significant differences ($p < 0.0001$)**. Moreover the control group expressed more pain score; consume longer duration of 1st, 2nd, and 3rd stage of labor than the study group. **Conclusion:** Using of birthing ball throughout the first stage of labor had positive effect on labor progress and outcome. **Recommendation:** Encourage women to use birth ball during the first stage of labor as one of the significant modalities to improve labor progress, manage pain, and attain more satisfactory birthing experience.

Key words: Birthing ball, Exercise, First stage of labor, Progress of labor, Partograph

Introduction:

Labour is the term for the changes in anatomy and physiology of the female reproductive tract which involves rhythmic contraction and relaxation of uterine muscles with progressive effacement and dilatation of the cervix leading to expulsion of the products

of conception. The first stage of labour is the period of time characterized by painful uterine contraction and ends at full cervical dilatation (Arranz et al., 2018).

There are three phases in the first stage of labor where the latent phase is time when the cervix dilates from 0 - 3cm, the active phase

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begins when the cervix dilates 4 to 7cm and transition phase dilates 8-10cm (**Selvan & Kumar, 2019**). In this stage, cramp-like contraction pain originates from distension of uterine tissues and dilation of the cervix, transmits via spinal nerves to the abdominal area and lumbosacral region. As, most women describe childbirth pain as the most intensive pain that they have ever experienced (**Garbelli & Lira, 2021**).

Effective labor pain management remains a crucial aspect of intra partum care. As a result, enhancing the comfort and satisfaction of women giving birth is one of the most important tasks of nurses and other healthcare providers. Reducing the incidence of health problems can grant women a greater feeling of comfort and control while giving birth (**Arranz et al., 2018**).

The introduction of birth ball is a relatively new non pharmacological tool for improving the experience of labor. Use of the birth ball incorporates movements and exercises which, theoretically, help the fetus find better fit through the pelvis as well promote labor progresses (**Farrag & Omar 2018**).

Birthing ball is a large air filled rubber ball which is strong enough to support the weight of the mother. Birthing ball helps to widen and flex the pelvic bone and joints and helps the baby to descent into birth canal more easily and also helps in the strengthening the muscles of the pelvic floor, which is responsible for the pushing stage of childbirth (**Apriani et al., 2019**).

Birth ball can also assist positional changes and could be utilized as a comforting device for delivering women. Some of the benefits of birth ball exercise during labor are reducing anxiety and pain, reducing the use painkillers, speeding up the recovery process

and the reduction of the lowest part of the fetus, thereby increasing satisfaction and assistance (**Makvandi et al., 2019**).

Maternity nurses are primary caregiver during the birth process, have the potential to reduce some use of medical interventions by providing effective comfort measures that support and promote physiologic labour. Maternity nurses must be proactive and play a vital role in offering advice on alternative positions and resources to help women to be as comfortable as possible throughout labor. Nurses providing care in first stage of labour also need to provide clear, consistent, and evidence based explanation, so that parturient women will understand benefits of using birth ball (**Abo El Enin, 2018**).

Significance of the study:

Most of the women are giving birth in health care facilities in lying down position on the bed. Lying on supine put the fetus and uterus heaviness on the blood vessels in the abdomen which interfere with the blood supply and increased risk with dystocia or a prolonged labour, and caesarean section (**Farrag & Omar, 2018**). World Health Organization (WHO) stated that the acceptable caesarean section rate in any region of the world shouldn't exceed 10-15%. In spite of WHO recommendation caesarean section delivery rate have increased dramatically. Caesarean section prevalence is representative 52% among women in Egypt, Caesarean section rate is 3.5 times higher than it should be (**Sheishaa et al., 2019**).

New labour guidelines may be helpful in promoting vaginal birth by allowing labour to progress based on more recent evidence about normal labour. The using of birthing ball can play a key role as non-pharmacological method of pain relief, as well as enhancing

the positive birth experience by achieving good labor progress and outcomes (WHO, 2020). Therefore, this study was conducted to evaluate the effect of birthing ball exercises during the first stage of labor on the outcomes of birthing criteria.

Aim of the study:

The aim of the current study was to assess the effect of an evidence-based guideline of birth ball exercise during the first stage of labor on the outcome of birthing criteria

Research Hypotheses:

Women using experimental birth ball exercise during the first stage of labour would exhibit more strong uterine contractions and enhance outcome of birthing criteria.

Subject and Methods

Subjects

Research Design: Experimental design was used to fulfill the aim of the study.

Research Setting: The study was conducted at the labor and delivery unit of obstetric and gynecological department at Benha university hospital

Sampling

Sample type

A non-probability purposive sample was used in collecting the data.

Sample Size:

Two hundred (200) primiparous women were assigned randomly into two equal groups; A study group (100) and control group (100).

Sampling criteria

Parturient women were recruited in the current study according to the following

Inclusion criteria:

- 1) Primipara, full term & at latent phase of first stage of labour
- 2) Age (20-35) years old
- 3) Intact membrane on admission
- 4) Normal course of pregnancy (single fetus, mature, with cephalic position).
- 5) Free from any medical and obstetrical diseases

Sample Technique:

The subjects were assigned after fulfilled the previous criteria into two equal groups :

- 1) **Group I** study group (n= 100): received an evidence based guidelines regarding birth ball exercises
- 2) **Group II** control group (n=100): received routine hospital care

Tools of Data Collection:

Four tools were used in this study:

Tool I) A structured interviewing questionnaire sheet: It consists of two parts:

First part: General characteristics of women (age, level of education, occupation, residence & BMI).

Second part: obstetric data history such as (last menstrual period, gestational age, number of pregnancy& expected fetal weight).

Tool II) “Standerlized Partograph chart” (WHO 1994). It was developed by WHO to evaluate the progress of labor in term of cervical dilatation, effacement, descent of the fetal head, uterine contraction progress (duration, frequency, interval and intensity). It consisted of three main components: fetal condition, labour progress and maternal condition.

Tool III): Visual analog pain intensity scale (VAS). It is a standardized linear scale developed by McCaffery and Pasero (1999)

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it was adopted and used by the researcher to assess the severity of pain before and after intervention. It is a self-reported 10 cm horizontal line which represents the subjective estimation of pain intensity, It is a self-report device consisting of the line used for of pain intensity. This tool added was after reviewed by jury of experts

Tool IV) Apgar score chart as appointed by (**Apgar & James, 1962**) is a measure the physical condition of the newborn at first and fifth minutes to evaluate the neonatal outcomes.

Validity of Tools:

Content validity of tools was assessed by three experts in obstetric and gynecological nursing field to assure the validity and reliability of the questionnaire

Reliability of Tools:

Reliability was applied by the researcher for testing the internal consistency of the tools. Answers from repeated testing were compared by using Alpha Cronbach reliability. Reliability for the study group was 0.97 and the Reliability for the control group was 0.80.

Ethical consideration

- An oral consent was obtained from each woman to participate in the study and withdrawn at any time.
- There was not having any physical, social or psychological risk on students.
- The data was collected and treated confidentially.
- Each study subject was informed about time throughout the study.

Pilot study:

A pilot study was carried for 10% of the total sample (20 women) to evaluate

simplicity, clarity and applicability of study tools and the time needed to fill in the questionnaire, no modification were done. So, pilot study was included in the main study sample.

Field work:

Data collection through a period of one year from the beginning of January 2020 to the end of December 2020 after obtaining an official permission from the director of the Benha university hospital and agreement of the chairman of obstetric department. The researcher visited the sitting of the study two days weekly from 9 am to 7 pm to collect the required sample and introduced herself with explaining the purpose of the study to the parturient woman who met criteria for inclusion in the sample. Parturient woman were informed that participation was voluntary and had the right to refuse or withdraw at any time with no consequences.

The researcher implements the procedure through three phases:

Preparatory phase

During that phase, the researcher interviewed the parturient women to gather the general characteristics data by using tool I, The researcher screens all primiparous women in the latent phase and meets the eligible criteria in the study and randomly designated to study and control group. The researcher started the interviews by welcoming the participating women, and then explained the study aim and took an oral consent for participation.

The initial assessment was done on admission when women in latent phase of first stage of labour to collect data through physical examination (to detect general maternal condition and vital signs),

abdominal (to determine fundal level, lie, presentation, position, descent of the fetus and fetal heart rate by using external electric fetal monitoring) and vaginal examination to determine cervical dilatation, effacement, membrane status, station and the presenting part) to meet the sample criteria.

Implementation phase:

Each parturient woman in the study group was met individually during the latent phase. They were informed about the advantages of using the birth ball during the first stage of labor. A guide booklet was designed by researcher using simple Arabic language and different illustrated pictures in order to facilitate women understand and videotape show 10 minutes to gain more confidence on how to use the birth ball with different positions throughout the first stage of labor followed by live demonstration by the researcher.

Each parturient women in study group was given birth ball during labour and practiced following positions and movements using birth ball:

I. Sitting on a birth ball: According to the height of the mother the researcher selects the ball size and placed on the floor near to the bedside and make the mother to sit on the ball by holding the lateral edge of the bed and the support is given by standing back side of the mother and holding her shoulder and asks mother sit on a birth ball for 5-10 minutes. Woman sit with leg bend at 90 degree with the legs spread apart to keep the fetus align in the pelvis to encourage the descent of fetal head and to widen the pelvis to speed up the labour

II. Swaying movements: swaying on birth ball from front to back or side to side movements for 5-10 minutes

III. Leaning over the ball: Leaning on the birth ball and getting in to hands and knees position by hugging the birthball from kneeling position for 5-10 minutes.

IV. Squatting position (leaning against the ball on the wall).

IIV. Backward over the ball

Sit on the floor with back leaning against the birth ball. The feet on the floor. Use the birth ball and cover with two arms and upper body and roll around. The pelvis that is in midair will move in a way that strengthens for birth.

At the end of latent phase, the participants were motivated to adopt all types of birth ball exercises every hour at least 10-20 minutes until memberane rupture and starting intravenous uterine stimulant of oxytocin. In contrast, the women in the control group were not receiving any additional intervention, just receiving the routine care of the hospital.

Evaluation phase

The researcher evaluated and compared the effect of practicing birth ball exercises during first stage of labour between study and control group and assessed its labour outcomes through:

-Assessing progress of labour in term of uterine contraction characteristics (duration, intensity, interval, and frequency), cervical dilatation, rate of cervical dilatation per hour, fetal head descent, mode of delivery, duration of 1st, 2nd, 3rd stage of labour, maternal condition, and fetal condition by using (partograph).

- Measuring the intensity of labour pain by using a visual analogue pain scale after latent, active and transitional phase of first stage of labour.

- Measuring of neonatal physical outcomes immediately after birth, such as baby birth,

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weight by using Apgar's score at first and fifth minute.

Statistical analysis:

The collected data were coded, organized, analyzed and tabulated using computer. Presentation of tables and graphs were carried out according to types of variables by using the statistical package for social science (SPSS version 15).

Results:

Table (1): Shows that more than half (64% & 56%) respectively of both control and study group aged 20-24 years with Mean \pm SD (24.02 \pm 3.051, 24.62 \pm 3.164), while 40% & 45% respectively of the control and study group were preparatory school. Also about slightly more than two third of the two groups (74% and 70% from rural area). Regarding family type (69% and 65%) of both groups were nuclear. In addition the majority (70% & 58%) respectively of both group were housewives.

Table (2): Reveals that there was no statistically significance during latent phase in the mean of frequency, duration, interval and intensity of uterine contraction between both groups. Meanwhile there was a highly statistically significance during active and transitional phase ($p < 0.0001^{**}$).

Table (3): Indicates that there was no statistically significant difference between the control and study groups. regarding cervical dilatation through latent phase $P = (0.426)$. Regarding rate of cervical dilatation /hr during active phase of first stage of labour, there was a progression in cervical dilatation and there was a highly statistically significance difference between both groups with mean of (1.14 \pm 0.34) of control group compared to (1.84 \pm 0.36) of study group.

Table (4): Indicates as well that no statistically significant difference was recognized between the control and study groups during latent phase. An improvement in the fetal head descent was noted among the study group during active phase and. There was a highly statistically difference between both group during transitional phase with mean of (0.700 \pm 0.784) of control group compared to (1.25 \pm 0.701) of study group.

Table (5): Illustrates duration of different stages of labour. Regarding duration of first stage of labour, there was no statistically significance during latent phase, and there was a highly statistically significance between during active and transitional phase with mean (6.21 \pm 2.01 & 1.04 \pm 0.75) of control group compared to (5.81 \pm 2.14 & 0.9 \pm 0.74) of study group respectively. The mean total duration of normal labour was highly significantly shorter in the study group (14.740 \pm 1.2029) as compared to control group (17.510 \pm 1.3446).

Table (6): Illustrates that there was no statistically significance difference concerning mean score of pain through latent phase of first stage of labour ($p = 0.071$), however there was a highly statistical significance difference in pain score at active and transitional phase ($p < 0.001^{**}$).

Table (7): Shows means of Apgar scoring of neonate among control and study group at first and fifth minutes. The study revealed that there was a statistically significance difference between both control and study group. The Apgar score at 1st and 5th minutes was better among study group than control groups.

Table (1): Distribution of studied women (study and control group) according characteristics of study groups (n=200).

Characteristics	Control group (n=100)		Study group (n=100)	
	No	%	No	%
Age (in years)				
20 -	64	64.0	56	56.0
25-	28	28.0	34	34.0
30-35	8	8.0	10	10.0
Mean ±SD	24.02±3.051		24.62±3.164	
Level of education				
Read and write	43	43.0	40	40.0
middle education	45	45.0	40	40.0
University education	12	12.0	20	20.0
Residence				
Urban	26	26.0	30	30.0
Rural	74	74.0	70	70.0
Extended	35	35.0	31	31.0
Occupation				
Housewife	70	70.0	58	58.0
Working	30	30.0	42	42.0

Table (2) Distribution of the study subjects according to characteristics of uterine contraction (frequency per /10 minutes, duration in seconds, interval of in minutes) (n=200).

Characteristics of uterine contraction	Control group (n=100)	Study group (n=100)	t test	p-value
Mean±SD	Mean±SD	Mean±SD		
Frequency of uterine contraction/10 minutes through				
Latent phase	1.96±.575	2.07±.781	2.282	0.07
Active phase	2.81±.486	4.41±.933	15.208	<0.0001**
Transitional phase	3.68±.766	5.56±.580	14.457	<0.0001**
Duration of uterine contraction/seconds				
Latent phase	25.07±4.374	26.58±5.310	2.101	0.071
Active phase	37.68±4.440	48.54±6.254	16.718	<0.0001**
Transitional phase	52.47±6.512	71.52±9.571	21.981	<0.0001**
Interval of uterine contraction				
Latent phase	17.62±3.283	16.91±2.271	1.532	0.213
Active phase	13.90±2.98	9.44±1.696	13.009	<0.0001**
Transitional phase	10.00±2.132	3.78±1.069	26.079	<0.0001**
Intensity of uterine contraction				
Latent phase	5.78±0.89	4.02±1.15	0.542	0.462
Active phase	6.70±1.11	7.80±0.92	63.10	0.000**
Transitional phase	8.08±1.15	9.02±0.57	70.09	0.000**

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Table (3): Distribution of studied women (study and control groups) according cervical Cervical dilatation during latent phase and cervical dilatation rate during active phase (n=200).

Variable	Control group (n=100)		Study group (n=100)		Test of significance	p-value
	No	%	No	%		
Cervical dilatation through latent phase						
Mean ±SD	2.67±0.62		2.72±0.51		t=1.51	0.426
Rate of cervical dilatation through active phase (cm/hr)						
1 cm/hr	20	20.0	8	8.0	X ² =18.64	0.000**
1.2 cm/hr	38	38.0	20	20.0		
1.4 cm/hr	18	18.0	32	32.0		
1.6 cm/hr	24	24.0	40	40.0		
Mean ±SD	1.14±0.34		1.84±0.36			

Table (4): Distribution of studied women (study and control groups) according decent of fetal head(n=200).

Variable	Control group (n=100)		Study group (n=100)		Test of significance	p-value
	Mean	±SD	Mean	±SD		
Descent of fetal head						
Descent of fetal head in latent phase						
Mean±SD	-0.92±0.849		-1.00±0.785		2.509	0.285
Descent of fetal head in active phase						
Mean±SD	-0.37±1.32		0.35±1.24		16.33	0.003*
Descent of fetal head in transitional phase						
Mean±SD	0.700±0.784		1.25±0.70		37.16	0.000**

Table (5): Distribution of studied women (study and control groups) according duration of different stages of normal labour (n=200).

Duration of stages of labour	Control group (n=100)		Study group (n=100)		Test of significance	p-value
	Mean	±SD	Mean	±SD		
Duration of first stage						
latent phase	8.65±1.74		8.51±1.24		0.985	0.871
Active phase	6.21±2.01		5.81±2.14		2.05	0.000**
Transitional phase	1.04±0.75		0.9±0.74		3.65	0.000**
Duration of second stage						
Mean ±SD	45.87±10.25		32.51±5.24		5.25	0.000**
Duration of third stage						
Mean ±SD	28.72 ± 4.78		14.63±3.15		7.97	0.000**
Total mean duration of normal labour						
Mean ±SD	17.510±1.3446		14.740±1.2029		t=15.35	0.000**

Table (6) Distribution of pain mean score of studied sample groups according to pain degree of the first stage of labour in relation to cervical dilatation (n=200)

Degree of pain at (cervical dilataion)	Control group (n=100)	Study group (n= 100))	t test	p-value
	Mean ±SD	Mean±SD		
Latent phase >3cm	5.780±.8942	4.020±1.1545	2.101	.071
Active phase > 6cm	7.803±-.9296	6.700±1.1146	9.738	<0.0001**
Transitional phase >8cm)	9.020±5752	8.080±-1.1519	13.862	<0.0001**

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Table (7): Distribution of studied women (study and control groups) according Apgar score (n=200).

Apgar score	Study group (n=100)		Control group (n=100)		Test of significance	p-value
	No	%	No	%		
new born weight(Kg)	3.1150	.40735	3.0125	.33404	t=1.946	.053
Apgar score at 1 minutes						
Good (8-10)	55	55.0	40	40.0	X ² =4.511	0.034*
Moderate (5-7)	45	45.0	60	60.0		
Sever <4	0	0.0	0	0.0		
Mean ±SD	8.500	.6113	6.930	1.4160		
Apgar score at 5 minutes						
Good (8-10)	98	98.0	90	90.0	X ² =5.674	0.017*
Moderate (5-7)	2	2.0	10	10.0		
Sever <4	0	0.0	0	0.0		
Mean ±SD	9.160	.7152	8.060	1.2538		

Discussion:

Birth ball has been used in a variety of birth settings and is believed to be a simple, effective, and safe method of promoting the progress of labor and relieving pain. Birth ball exercises have some physical benefits for pregnant and childbearing women as, reducing women's anxiety, use of opiates in a less frequent manner, facilitation of fetal head rotation and descent, decrease of labor length, and enhancement of women's wellbeing and satisfaction (there have been few studies to substantiate this belief **Makvandi et al., (2019)**).

The current study was aimed to assess the effect of an evidence-based guideline of birth ball exercise during the first stage of labor on the outcome of birthing criteria. This aim was realized through the present study findings which revealed that practicing birthing ball exercises during first stage of labour improved first stage progress among

parturient women as the cervical dilatation significantly higher among intervention group, the uterine contraction was better among intervention group, and the duration of first stage of labor was reduced among intervention group. Result of this study supported the following investigated hypothesis.

The results of the present study revealed that participants of both the study and control groups were matching in almost all aspects of their demographic characters and reproductive history. This matching is useful in limiting extraneous variables, which could interfere with the effect of the intended intervention on labor progress.

This was on line with a study by **Mirzakhani et al., (2015)** who illustrated that there is no significant differences were found regarding age groups, education, occupation type, and body mass index (BMI). Also, these finding are in accordance with **Sheishaa et**

al., (2019) who showed that no significant differences were elicited in both groups as regarding age groups, education, occupation, residence and, body mass index. Both groups were matched.

Regarding labour progress, this study concluded that birth ball exercises improve the progress of uterine contraction. The study revealed that there was no statistically significance during latent phase in the mean of frequency, duration and interval and intensity of uterine contraction between both groups, however a positive significant correlation was evident among the study group in term of increase number of uterine contraction /10 minutes, stronger uterine intensity, and increased duration, as well as decreased interval after intervention during active and transitional phase. Likewise, the control group shows less progress of uterine contraction. Meanwhile there was a highly statistically significance during active and transitional phase

The effects of sitting position on the birth ball and doing birth ball exercise are eminent, where the sitting positions use gravity effect which potentially reduces aorto-caval compression, resulting in strengthened uterine contraction and aids descent of fetal head into the pelvis. As the head is applied directly on the cervix, uterine contraction is intensified in strength, regularity, and frequency. This efficiency of uterine contractions aids cervical dilatation and successful completion of the first stage of labor.

This study in the same line with **Aprian et al., (2019)** who revealed that the duration of uterine contractions of the experimental group 48,94 second, SD 12,64 meanwhile the duration of the control group was 46,40 second, SD 14,23 with $p=0,863$. Intervals between uterine contractions in the

experiment group was 159,11 second, SD 39,10 while the interval in the control group was 158,38 second, SD 40,78 with $p=537$. However, differences in the duration and intervals between uterine contractions in the birth in experiment and control group were not statistically significant before intervention.

This study collaborated with **Sharma, (2020)** who clarified that Primigravida mothers in experimental group had less pain and higher duration of uterine contraction as compared to control group which is significant at p value < 0.001 , and also showed that using birthing ball helps to reduce labor pain and progress of selected fetal maternal parameters

The current study indicates that, there is no statistically significant difference between the study and control groups regarding cervical dilatation on through latent phase $P=(0.426)$. Regarding rate of cervical dilatation rate /hr during active phase of first stage of labour, there was a progression in cervical dilatation in study group than control group and there was a highly statistically significance difference between both groups with mean of (1.84 ± 0.36) of study group compared to (1.14 ± 0.34) of control group.

These findings supported and congruent with the study findings conducted in Alexandria by **Zaky, (2016)** who investigated the impact of pelvic rocking exercises utilizing the sitting posture on birth ball during the first stage of labor on its advance and reported that there was no statistically significant difference between the treatment and control groups related to dilatation of the cervix before intervention $P=(0.568)$. Nevertheless, a highly statistically significant difference was found between both groups after intervention as the study group had a

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higher mean score of cervical dilatation compared to the control group $P = (<0.0001)$.

Regarding descent of fetal head, the results of this study showed a significant difference between the two groups in terms of descent and rotation of fetal head. An improvement in the fetal head descent was noted among the study group during active phase. There was a statistically significant difference between study and control group during active phase and There was a highly statistically difference between both group during transitional phase

. There were significantly positive correlation between practicing birth ball exercise and fetal head descent among the study group after intervention compared to the control group, this can be explained as following regular pelvic rocking exercise while assuming sitting position on birth ball facilitate increasing the antro posterior diameter of the pelvis while the women lean forward and backwards consequently help to guide the fetal head into the pelvis.

This finding agreement with **Grenvik et al., (2021)** who confirmed that parturient assuming alternative upright position had a favoring gravity effect in aligning the fetus to the birth canal, increasing pelvic outlet diameter, intensifies the uterine contractions, as well as reducing intrapartum maternal and neonatal complication

As regards to labor duration, the present study results put forward evidence that the mean duration of first (latent, active and transitional phase), second and third stage of labor were significantly shorter in the study group when put against that of the control group. This is encouraging the positive effects of the birth ball which paves the way for the use of the upright sitting and kneeling position. Birth ball also strengthens the pelvic

floor muscles, specially the pubococcygeus and levatorani, and the fascia of the pelvis. The laboring women move free, do perineal exercises by using birth ball and consequently actively participate in the delivery process as help the fetus descent and rotation, improving the uterine flow of blood, improving the effectiveness of contractions and helping the dilation of the cervix. Eventually, shortening the duration of labor.

In agreement with these findings **Mutoharoh et al., (2020)** and reported that the duration of the first, second, and third stages of delivery elucidates a high significantly shorter duration in the treatment group than the control group.

Consequent to these findings **Mirzakhani et al., (2015)** and reported that the duration of the first, second, and third stages of delivery elucidates a high significantly shorter duration in the treatment group than the control group.

In accordance with this finding, study by **Ulfa, (2021)** who explained that maternity duration of labor for the first stage of labour in the treatment group are shorter with the results of the length of time of labor, namely (130.38 ± 39.28) minutes, compared to the control group with the result (257.85 ± 65.16) minutes. Furthermore, the length of delivery in the second stage of the treatment group was also shorter with the result (30.08 ± 11.38) minutes, compared to the control group (36.85 ± 12.41) minutes.

In relation to labour pain among study and control group during the three phases of first stage of labour, there was no statistically significance difference at latent phase, however there was a highly statistical significance difference in pain score at active and transitional phase ($p < 0.001^{**}$)

The results showed that after controlling for several variables with potential effects on labor pain, scores were significantly lower in the intervention group. The current study showed a statistically significant decrease in labor pain when the birth ball was used in the first stage of labor. This may be due to practicing pelvic rocking exercise with birth ball, which can reduce tension in the lower back. It also helps to relieve back discomfort and pain, which reflected also on reducing anxiety. Also in this context, the faster the progress of labor, with less usage of medical interventions, the higher the mother's comfort. Hence the effect of using birthing ball while discomfort can often be helped by body positions that allow gravity to speed dilation, such as walking, squatting, kneeling or being seated on the birthing ball. This will help the baby move down in the pelvis faster and less painfully.

These findings agreement with **Farrag,& Omar 2018** who revealed that there was a statistically significant difference between the study and control group according pain degree of first stage of labour.

The result is suitable for the study of **Marwiyah & Pusporini (2017)** showed that the average labor pain before intervention is 6.57 with standard deviation 0.843; meanwhile, the average labor pain after the intervention is 6.13 with standard deviation 0.920. What the average score of paired t-test results in table 2 is 0.435, the standard deviation is 0.662, the p value is 0.005. The data shows that the package of a birthing ball, pelvic rocking, and massage endorphin contributes to a significant, influence to first stage labor pain.

Furthermore, the result of **Shirazi et al., 2019** and showed that labour pain is lower in the birth ball exercise group compared to the

control group ($P < 0.001$ in both cervical dilatations).

In relation to neonatal Apgar score among study and control group at first and fifth minutes, the study revealed that there was a statistically significance difference between both study and control group. The score at 1st and 5th minute was better among study group than control group. This may be due to that assuming birthing ball exercises prevent venacava compression and increase fetal blood circulation and assuming pelvic rocking exercise speed up the labour with gravity effect that decreases fetal exhaustion. This also in agreement with the finding **Abdullah & Najib (2020)** and explained that the Apgar score was higher in the intervention group compared to the control group at the first minute and fifth minute.. Moreover, the study is matched with **Nahid et al., (2017)** and reported that Performing exercise with birth ball during labor can decrease the active phase of labor, with no harmful consequences on the Apgar score and neonatal outcomes.

Conclusion

Using the birth ball during the first stage of labor exhibits effective maternal labor progress outcome as: faster cervical dilatation, stronger uterine contraction, the mean score of frequency, interval, duration and intensity of uterine contraction between both groups. Faster fetal head descent, Shorter duration of the three stages of labor and total duration of labour, Reduction labor pain level and the Apgar score at 1st and 5th mintes was better among study group than control groups. Therefore, the study hypothesis was supported.

Recommendations

- Suggest a protocol of staff training to utilize birthing ball exercise as the evidence based

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practice for pregnant women in maternity services hospitals in Egypt.

- Contribute this study the first step at labour unit for primiparous woman as evidence based practice.

-Poster, pamphlets and video illustrating the benefit of sitting on the birth ball, practicing pelvic rocking exercise in antenatal clinics and labor ward

Further researches:

-Replicated the study on a larger sample for generalizing the findings.

-Further multicenter studies are needed to establish the true prevalence of birthing ball exercises and its correlates in Egyptian pregnant women.

References:

Abdullah, W. and Najib, B. (2020). Effect of Antenatal Exercise Teaching Program on Neonatal Outcomes During Delivery in Erbil, Iraq. *Medico-legal Update*, 20(1). DOI Number: 10.37506/v20/i1/2020/mlu/194373.

Abo El Enin, H. (2018). Implementing Different Maternal Positions during First Stage of Labor & its Effect on Labor Outcomes, Doctorate thesis, faculty of nursing Banha university, p35.

Arranz, J., Martínez , E., Martín, R., Sánchez, P. & Cortés , C. (2018). Using the Birth Ball for Pain Relief during Induction of Labour, 2nd European Congress Intrapartum Care, available at <https://www.codem.es/procedimientos/using-the-birth-ball-for-pain-relief-during-induction-of-labour>.

Apgar, V., & James, L. (1962). Further Observation on the Scoring System . *Am. J.Dis.Child.*, 104:419,1962.

Garbelli, L. and Lira, V.(2021). Maternal positions during labor: Midwives' knowledge and educational needs in northern Italy, *Eur J Midwifery*, 5: 15. doi: 10.18332/.

Apriani, A., Herfanda,E.& Utami, F.(2019). The Effectivity of Birth Ball Exercise on Labor: a Systematic Literature Review *Advances in Health Sciences Research*, 24(5), Universitas Ahmad Dahlan Public Health Conference (UPHEC 2019), P 192.

Farrag, R & Omar, A.(2018). Using of Birthing Ball during the first Stage of Labor: Its Effect on the Progress of Labor and Outcome among Nulliparous Women, *International Journal of Nursing Didactics*, 8: (09),p 8

Grenvik, J., Rosenthal, E., Wey, S., Saccone,G., Vivo, V., Prisco, A. (2021). Birthing ball for reducing labor pain: a systematic review and meta-analysis of randomized controlled trials, Download citation

<https://doi.org/10.1080/14767058.2021.1875439>.

Makvandi, S., Latifnejad, R., Roudsari Ramin, R.& Karimi, L.(2019). Effect of birth ball on labor pain relief: A systematic review and meta-analysis, *the journal of obstetric and gynecology research* 41(11), P 1679-1686.

Marwiyah, N.& Pusporini, L.(2017). Package of Birthing Ball, Pelvic Rocking, and Endorphin Massage (bpe) Decrease the First Step Labor Pain, *jurnal INJEC*, 2 (1), 65–70.

McCaffery, M., and Pasero, C., (1999). *Numeric Pain Rating Scale: Clinical Manual*, Mosby,.St. Louis, , P. 16.

Mutoharoh, S., Kusumastuti, and Indriyani, E. (2020). The Effectiveness of

Birth Ball During Pregnancy in Length of Labor, *Advances in Health Sciences Research*, volume 20, p 286

Mirzakhani, K., Hejazinia, Z., Golmakani, N., Sardar, M. & Shakeri, M. (2015). The Effect of Birth Ball Exercises during Pregnancy on Mode of Delivery in Primiparous Women, 3(1), P 269-275.

Nahid, B., Arezoo, S., Farideh, K., Seede, M., Zahra, M. (2017). The Effect Of Using Birth Ball On Maternal and Neonatal Outcomes: A Randomized Clinical Trial, *avicenna journal of nursing and midwifery care (scientific journal of hamadan nursing & midwifery faculty)*, 25(1), P 18-33

Selvan, A. Kumar, N. (2019). Effect of Computer-Assisted Instructions on the Students about Rocking In the Chair during First Stage of Labour, *Trends in Nursing Administration & Education, Research Article*, 8(1), P. 18-24

Sharma, J. (2020). Effectiveness of birthing ball on reduction of labor pain in selected fetal maternal parameters among primigravida; 5th International Conference on Gynecology and Obstetrics; March 02- 03, 2020; Paris, France, Volume:4 (3), P 15.

Sheishaa, D., El-Mashad, H. & Khedr, N. (2019). Effect of Birthing Ball Exercises during Pregnancy on the First Stage Progress of Labor, *International Journal of Nursing*, Vol. 6, No. 2, pp. 47-67.

Shirazi, G., Kohan, S., Firoozeh Firoozehchian, F. & Ebrahimi, E. (2019). Experience of Childbirth With Birth Ball: A Randomized Controlled, *International Journal of Women's Health and Reproduction Sciences* 7(3), p 301–305 ISSN 2330- 4456.

Ulfa, R. M. (2021). Effect of the Use of Birth Balls on the Reduction of Pain and Duration of Labor During the First Stage of

Active and Second Stage of Labor in Primigravida Maternity”, *Science Midwifery*, 9(2), pp.418-430.

WHO, (1994). Preventing Prolonged labor: A practical Guide (the Partograph Part 1: Principles and Strategies. Geneva.

World Health Organization (2020). Intrapartum care for a positive childbirth experience, ISBN978-92-4-155021-5. Available at <https://apps.who.int/iris/bitstream/handle/10665/260178/9789241550215-eng.pdf>

Zaky N. (2016). Effect of pelvic rocking exercise using sitting position on birth ball during the first stage of labor on its progress, *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, 5(4), PP 19-27.

التوجيه القائم على الأدلة حول تمرين كرة الولادة خلال المرحلة الأولى من المخاض على نتائج معايير الولادة نورا صبحي صابر حشاد - منى احمد الشيخ - سماح عبد الحليم سعيد - الهام ابو زيد رمضان

الولادة من اهم الاحداث التي تعيشها المرأة والخوف من آلام المخاض هو أحد أهم أسباب عدم رغبة المرأة للولادة الطبيعية لذلك فإن تغيير وضعية السيدات أثناء الولادة يلعب دورًا رئيسيًا في تقليل آلام الولادة و تحسين تجربة الولادة الإيجابية. وتم إدخال كرة الولادة إلى اماكن الولادة لتسهيل حركة النساء أثناء الولادة. يتم عمل اوضاع متعددة على هذه الكرة ولها الكثير من الفوائد التي تعود على الأم والجنين . لذلك هدفت الدراسة الي تقييم تأثير المبادئ التوجيهية القائمة على الأدلة لممارسة كرة الولادة خلال المرحلة الأولى من المخاض على نتائج معايير الولادة. تم استخدام تصميم تجريبي لإجراء هذه الدراسة. أجريت هذه الدراسة بوحدة الولادة بقسم أمراض النساء والتوليد بمستشفى جامعة بنها، وحدة الولادة الطبيعية. تضمنت هذه الدراسة ٢٠٠ سيدة بكرية فى مرحلة الولادة وتنطبق عليهم مواصفات العينة. تم تقسيم العينة الى مجموعتين: مجموعة الدراسة وعددها (١٠٠سيدة) و المجموعة الضابطة وعددهم ١٠٠سيدة. حيث كشفت النتائج أن استخدام كرة الولادة خلال المرحلة الأولى من المخاض يُظهر نتائج فعالة لتقدم المخاض للأم (انقباضات أقوى للرحم ، وتوسع أسرع لعنق الرحم. مدة أقصر للمراحل الثلاث من المخاض) ، مما يدعم فرضيات الدراسة. كما اوصت الدراسة اقتراح بروتوكول لاستخدام تمارين كرة الولادة للحوامل في مستشفيات خدمات الولادة في مصر. زيادة الوعي بين مقدمي الرعاية الصحية وخاصة الممرضات المتخصصات حول أهمية ممارسة تمارين كرة الولادة أثناء الحمل والولادة.