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Using of Birthing Ball during the first Stage of Labor: Its Effect on the Progress of Labor and Outcome among Nulliparous Women

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Abstract: Background: It is beyond argument that women who are about to give natural birth to their babies need some physical exercise such as standing, walking around, sitting, or kneeling in order to provide for the “gravity effect” that would help in speeding up the dilation of the cervix. The birth ball used to be utilized in various settings of birth and is highly considered as a powerful, secure and easy method of promoting the progress of labor and relieving pain. The current study **aim** sat studying the using of the birthing ball during the first stage of labor and its effect on the progress of labor and outcome among nulliparous women. **The design:** The quasi-experimental design was utilized. A group of 120 laboring women was included by purposive **sampling** technique; the study subjects randomly assigned into two equal group. **Setting:** The study was implemented in the maternity Unit located in El-Nabawy El Mohandes Hospital (economical part), Fayoum. Five **tools** have been employed in gathering the needed data; 1) structure interview schedule questionnaire, 2) Partograph, 3) Visual analog pain intensity scale, 4) State Trait Anxiety Inventory and 5) Satisfaction visual analogue scale. **The Findings** of the present results reveals a high significant statistical difference between the two groups concerning the improvement of the dilatation of the cervix and fetus head descent that end in decreases duration of the first and second labor stages in the study sample. Also the sample of the study expressed less pain and anxiety score. **Conclusion:** the using of birthing ball throughout the first stage of labor is associated with 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, anxiety and attain more satisfactory birthing experience.

Keywords: Birthing ball, First stage of labor, Progress of labor, Nulliparous.

INTRODUCTION

Natural child birth is a unique aspect of association of physiologic processes usually accompanied by contrasting feelings of severe pain and discomfort on one side and great pleasure on the other. This process is universally experienced by women. Labor is a physiological process during which the fetus, membranes, umbilical cord, and placenta are expelled from the uterus, its occur between 37 and 42 weeks. The labour process is divided into four stages. The first stage is concern with the preparation of the birth canal, so as to facilitate expulsion of the fetus. The main events occur in this stage of the labour are the contraction and retraction of the uterine muscles, formation of upper and lower segment, development of the retraction ring, effacement of the cervix, dilatation of the cervix, show presentation, rupture of the membranes and fetal axis pressure. Labor could be easily considered one of the most prominent incidents in a woman's life. When this experience gives unexpected negative results, it negatively impacts the psychological condition of not only the woman herself but also the family as well.[1]

Normal labor progress is greatly linked with properly compatible management. While the improper management may result in dystocia, prolonged and/or obstructed labor, which may result in maternal exhaustion, postpartum hemorrhage and puerperal sepsis. [2] Therefore, prevention and early detection of prolonged labor would significantly eliminate its squeals. Eventually, of importance to reduce

maternal mortality rate (MMR) by three-quarters is one of the Millennium Development Goals (MDGs). Indeed in Egypt, significant successes have been made, where the average MMR reduced from 75 deaths for every 100,000 live births in 2002 to 45 for every 100,000 live births in 2013. However, progress is insufficient and more needs to be done to reach these MDGs through safe, effective, proper management care for women during antenatal, labor and post-partum period.[3]

It has been repeatedly reported that laboring women suffer from one of the most severe pains that could be experienced by human beings. Labor is combined with harsh and long lasting pain that fluctuate continuously between variant levels as has been stated by numerous laboring women [4]. It is assumed that the described levels of pain are majorly altered according to the level of fear, stressor anxiety the woman might be experiencing which would consequently impact the whole labor event. [5] In such case, it is fundamental to manage the felt pain well to support the laboring process. Various approaches have been used to decrease the severity of pain, among which is the injection of the analgesic pethidine which leads when administered intramuscularly to a feeling of dizziness, nausea and vomiting in women and a number of symptoms in their born children such as sucking effort and breastfeeding.[6]

Recently, calls for normal birth shifted their interest from pain management to the midwifery model that provides for all the care elements; namely psychological, emotional and

spiritualones. Maternal position in influences various physiological and anatomical alterations that would consequently impact other labor-related factors such as powers, passage, passenger and psyche.[5]It also controls the attributes and efficiency of uterine contractions, fetus condition, women convenience, and labor progress. The modern calls also tends to reduce the use of the pharmacological approach and suggest suitable alterations such as the birthing ball exercises which manage to decrease delivery pains and limit the use of drugs. These exercises were proved to improve pelvic rotation and enhance the pelvic mobility of pregnant women. During the performance of such exercises, the woman is required to be sitting down in an upright position, which would eventually speed up the delivery process and help relaxation and decrease the felt pain.[7]

Birthing ball is a large air filled rubber ball which is strong enough to support the weight of the mother. Birthing ball is used for the neurodevelopment treatment .It 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.[8]It can assist positional changes and could be utilized as a comforting device for delivering women. It is easy for the pregnant woman to use the ball for sitting or standing up as it meets the women needs providing for a number of sitting, kneeling and squatting postures.[9]Women using the ball might rock it or lightly spring to decrease perineal pressure. When the woman leans over the ball, she would allow her fetus to hang down, decreasing pressure on her back and relieving the accompanying pain.[10]

Also adopt different exercise with different position on birth ball as practicing pelvic rocking exercise in first stage of labor encourages rotation of a posterior baby. If simple movements are carried out as the woman rests on the ball leaning forward, a clear effect would be exhibited on the baby's decent and may actually help the baby's head to get into the cervix. Examples of these movements are: swaying, pelvic rocking, doing figure eights, making circles or slightly bouncing. The rocking movement was proved to decrease the lower back tension, it also helps relieve back discomfort and pain, In this context, faster the progress of labor, with less usage of medical interventions and higher mother's comfort. Women also have displayed higher satisfaction levels and greater probability of spontaneous delivery rather than CS. [11]

Obstetric health care team especially 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 first stage of labor. The choice and preparations that maternity nurse made before the birth have a great impact on birth experience and outcome so nurse has to render non-stop labor support by providing women with information needed as well as physical and emotional assistance. Nurses can provide laboring women with a secured and fulfilling birth to ensure a safe outcome. [12]. Maternity nurses in addition to other care providers play a fundamental role in the delivering process. It is argued that women who were helped by

midwives reflected higher self-esteem and better self-efficacy. They managed to reach out for a level of mastery during the process that was invaluable to the whole delivery incident. One of the most prominent maternity nurses' roles is to continue giving information and enhancing comprehension in addition to supporting exchanging information between a laboring women and her provider. [13]

THE STUDY SIGNIFICANCE

Child birth is a main incident in the life of any human being, as it positively affects the mother's family as well as her family. As well as women experience a wide range of pain in labour especially among the primipara women. Throughout the childbearing period, women experience severe pain that makes them intimidated and anxious causing the increase of blood hormones percentages like epinephrine. These changes negatively impact both the pain level and the duration of the first and second stages of labor. When speculating the results of Demographic and Health Survey (DHS) in 2014, it states that 52% of the Egyptian women give birth by C-section.[14] By comparing these rates to the international ones put forward by the World Health Organization -15% for C-section deliveries- it is found to be 3.5 times higher.

The number of C-section deliveries is today twice the number mentioned in the 2008 DHS survey (27%).Also WHO reports of 2013 shows that one woman die of child birth related to complication during delivery every minute and in that 42% is of abnormal labor.[15] Labour requires normal continuous milestones and failure to meet the milestones results in abnormal progress of labour. Women's in the developing countries usually lies in the bed during first stage of the labor. 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 pushing phase. On the other hand, throughout the last few decades, a clear advance was observed in relation to the degree of protection and restfulness of laboring women nevertheless the Egyptian context especially in its rural section has not given it its due importance. The using of birthing ball can play a key role as non-pharmacological method of pain and anxiety relief, as well as enhancing the positive birth experience by achieving good labor progress and outcome .The birthing ball exert an even pressure on the perineum and there by stimulate the dilatation and widening of pelvic outlet.

The study aim:

The study aims to studying the using of the birthing ball during the first stage of labor and its effect on the progress of labor and outcome among nulliparous women.

Hypothesis:

- Laboring women using the birth ball throughout the first stage of labor exhibits effective maternal labor progress outcome (dilatation of the cervix and descent of the fetus head) faster than those who didn't assume such intervention.
- Laboring women who using the birth ball throughout the first stage of labor exhibits shorter duration of the labor than those who didn't assume such intervention.

- Laboring women who using the birth ball throughout the first stage of labor exhibits reduction in pain and anxiety level during the labor, as well as exhibit more satisfaction than those who didn't assume such intervention.

SUBJECTS AND METHODS

Study Design:

A quasi experimental design was adopted in this study.

Setting:

This study was carried out at the maternity Unit in El-Nabawy El Mohandes Hospital; economical part (public hospital in Fayoum) affiliated to the Ministry of Health, Fayoum, Egypt.

Sample:

A purposive sampling technique was utilized in gathering the required data. 120 laboring women in total were determined according to $N = (z^2 \times p \times q) / D^2$ at CI 95% and power 80%. The subjects were assigned randomly into two equal groups; A study group (60) and control group (60). The sample size based on the incidence of primiparous normal vaginal delivery flow rate at previous study year in the hospitals. The sample selected according to the following inclusion criteria as; normal low risk nulliparous, spontaneous labor without anesthesia, at late latent phase, healthy full term more than 37 weeks of gestation, singleton fetus, and cephalic presentation and accepting to take part in the study. The researcher excluded cases of women suffering from maternal and fetal complications during the current pregnancy, membranes rupture not accompanied by contractions, any complications in first stage (maternal - fetal), prematurity (< 37 weeks), post maturity (> 42 weeks), fetal mal-presentation and fetal mal-position. The excluded cases were limited to nine women who had certain conditions such as the need for an emergency C-section (4), not complete the intervention by using birth ball, but the researchers had backup for those participants.

Data Collection Tools:

Five tools were used in gathering the data needed for the current research.

Tool I. Laboring women basic data collection tool (Socio-demographic data structure interview schedule questionnaire): This part was designed by the researchers which included 6 questions, that dealt with the basic features of the women as women's age, education, occupation, residence, gestational age, and BMI. This tool was filled in the first stage of labor by the researchers.

Tool II. Labor progress and outcome assessment tool (partograph): This standardized tool was adapted from WHO 1994[16], this used by the researchers to measure the progress of labor; labor augmentations, mode of delivery, and duration of labor.

Tool III. Visual analog pain severity scale (VAS) [17]. This is a standardized linear scale developed by Me Caffery and Pasero (1999) it was adopted and utilized by the researchers to assess the pain intensity before and after intervention. At enrollment(late latent phase) and active

phase of labor, the remark was given by the women to take active part in the care while in transition phase of labor the remark was done by the researchers due to the severity of pain. It is 10 cm long horizontal line that indicates the subjective assessment of pain severity. It contains a 0-10 point numerical scale, the first part (0) indicates no pain, (1-3) represents mild pain, (4-6) indicates moderate pain, (7-10) shows severe pain.

Tool IV: State Trait Anxiety Inventory (STAI) [18]: The STAI-Y1 is utilized in order to assess the level of anxiety experienced by the laboring women. This tool is made up of 40 four-point Likert scale items that require self-reporting. It is divided to two parts: the first 20 items are concerned with situational or state anxiety (STAI-Y1), the other half of the scale focuses on trait anxiety (STAI-Y2). To serve the purpose of the current study only the first part of the scale was put into consideration. Situational/ State anxiety is defined by Spielberger as a group of disagreeable feelings fear, tightness, nervousness or distress combined in most cases with the autonomic nervous system stimulation. For scoring, each item representing the existence of anxiety was rated from 1-4, with 4 representing the greatest level of anxiety. The scoring is the opposite for items indicating the non-existence of anxiety. The scores ranged from 20-80. Receiving a high score in the scale reflects a high level of anxiety. The inventory was translated into Arabic.

Tool V: Satisfaction visual analogue scale (SVAS): This scale was put forward by Brokelman et al. (2012)[19] and utilized in the present study to assess the mothers' subjective satisfaction level. The scale is basically numerical and contains a pointed line that ranges from 0 to 10 cm. The 0 point represents the absence of satisfaction while the maximum value (10) indicates high satisfaction. Mother indicated their own response by drawing a vertical line at the point representing their feelings. The scale points are categorized in the following way: (0) represents no satisfaction at all. (1-3) indicates a mild level of satisfaction, (4-7) means a moderate level of satisfaction while (8-10) reflected the highest levels of satisfaction. The scale was implemented at the two hours postpartum.

Validity and reliability of the tools: The researchers ensured the tools content validity by showing them to 3 Obstetrical and Gynecological nursing specialists. They required no modifications of any of the items. The tools' reliability coefficient was accounted for by implementing the correlation coefficient Alpha (Cronbach). It indicated a fluctuation in the reliability coefficient value between 0.90 and 0.95, which are still statistically significant representing very high reliability.

Pilot study:

The pilot study was administered to 12 laboring women and excluded from the main sample. The pilot study was carried out, to assess the tools content, their objectivity, and feasibility, shape validity in addition to their applicability to manage any disagreements or conflicts in the tools. Minor modifications were required.

Administrative design and ethical considerations: To be able to implement the study in the selected hospital, the researchers wrote letters to the director of El-Nabawy El

Mohandes Hospital, economical part (public hospital in Fayoum) informing him about the study aim and procedures, as well as Head of the maternity department to obtain the permission and help to conduct the study. The study sample members were individually informed about the study aim to gain their verbal consent and willingness to share in the study before implementing the study. They were also assured about the confidentiality of the collected data and the non-existence of any harmful impact on them or their babies. They were permitted to stop sharing in the study without explanation if they feel the need to do so. The researchers informed the woman about her right to change her position if she felt unsafe or discomfort at any point of time non-affecting the level of care made available for her.

Procedure and field work:

To achieve the study aim, the researchers used a number of phases: Assessment, implementation, and evaluation. The previously specified phases were carried out from the beginning of August 2017 till the end of May 2018 for about ten months. The researchers visited the designated hospital three days/week.

Phase I: Assessment:

During that phase, the researchers interviewed the nulliparous women to gather the socio-demographic data by using tool I, The researchers screens all laboring women for primipara in the late latent phase and meets the eligible criteria were included in the study and randomly designated to either study or control group. The researchers started the interviews by welcoming the participating women, and then explained the study aim and took an oral consent for participation. The baseline data required about the labor status, for example dilatation of the cervix, fetus head descent were considered at enrollment in the two groups through the utilization of the second tool, recorded the pain level utilizing the third tool and assessed the anxiety level by using the fourth tool.

Phase II: Implementation:

Each woman in the study group was met individually during the late latent phase, meanwhile they were informed about the advantages of using the birth ball during the first stage of labor and video show of 15 minutes was shown to clarify how to use the birth ball with different positions throughout the first stage of labor followed by live demonstration by the researchers. The birth ball exercises suggested program was designed by researchers in light of the available literature. It introduced three variant types of positions suggesting six

exercises: The Sitting position (pelvicrocking -forward and back, side-to-side, and rocking);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 labor., the kneeling position (hugging the ball and pelvicrocking), and the squatting position (leaning against the ball on the wall). The introduced design was assessed by three professional in maternity field [Physical therapy for women health (Physiotherapy),Obstetric Medicine and Maternity Nursing].After the teaching session, during the start of the active stage of labor, the participants were motivated to adopt the types of birth ball exercises every hour at least 10-20 minutes up to 10 cm dilatation. In contrast, the women in the control group were not receiving any additional intervention, just receiving the routine care of the hospital.

Phase III: Evaluation:

The researchers follow and evaluated the labor progress (cervicdilatation, fetal head descent, duration of first, second stage of labor and labor mode) of women in both groups every hour by using the partograph (tool II). As well as using tool III and IV during first stage (at enrollment, active and transitional phase) to assess the level of pain and anxiety. Finally at the fourth stage of labor the researchers used (tool V) to assess the maternal satisfaction about the care received during the first stage of labor.

Statistical analysis:

Epi-Info 6.04 computer software package was used for data entry while Statistical Packages for Social Science (SPSS) version 18.0.was utilized for the statistical analysis. Coding and data entry were fully controlled to guarantee quality. Qualitative variables frequencies and percentages were utilized to represent descriptive statistics. On the other hand, quantitative variables were accounted for using means and standard deviation. Both chi-square and t-tests were used for comparing data quantitatively and qualitatively. Statistical significance was considered at p-value <0.05, highly significant difference obtained at P < 0.01.

RESULTS

Findings of this study were presented in three main parts: characteristic data of study sample, labor outcome, and women satisfaction regarding care received during first stage of labor.

Table (1): General characteristics of the women among the studied groups.

Items	Study group N=60	Control group N=60	t-test	P-value
	Mean±SD			
Age	25.91 ±4.97	26.01±3.51	2.29	0.458
BMI	25.35±4.28	24.92±4.77	3.21	0.571
Gestational age	37.41±0.78	38.01±0.54	3.58	0.91
	N (%)		X²	P-value
Education				
University	29(48.3)	32(53.3)	0.124	0.85
Basic/Intermediate	31(51.7)	28(46.7)		
Residence				
Urban	25(41.7)	22(36.7)	0.587	0.75
Rural	35(58.3)	38(63.3)		
Occupation				
Housewife	42(70)	37(61.7)	0.658	0.74
Working	18(30)	23(38.3)		
Receiving health education about alternative position by using birth ball in first stage of labor.				
No	60(100)	60(100)	--	--

Table (1) represents the studied groups regarding to their general characteristics. As regards the mean age of women was (25.91 ±4.97&26.01±3.51) in study and control groups respectively. As well as (31% & 28%) in the study and control groups respectively had Basic/Intermediate certificate. Also about slightly more than one third of the two groups from rural area. Regarding the gestational age,

the mean weeks was (37.41±0.78&38.01±0.54)among study and control group respectively. Furthermore, all the participants in the study and control group didn't receive any health education about alternative position by using birth ball in first stage of labor. However, there was no statistically significant difference between the groups in relation to their general traits and their gestational age.

Table (2): Distribution of the studied groups regarding to their mean cervical dilatation and fetus head descent during first stage of labor.

Items	Study group N=60	Control group N=60	t-test	P-value
	M±SD			
Cervical dilatation(cm)				
Cervical dilation (cm) at enrollment	3.05±0.15	2.69±0.89	3.14	0.14
1st hr.	4.71±0.91	3.28±0.64	10.25	0.001**
2nd hr.	5.97±0.89	4.01±0.51	14.25	0.001**
3rd hr.	8.59±0.35	6.87±0.58	24.57	0.001**
4th hr.	9.25±0.75	7.59±0.21	21.36	0.001**
Fetal head descent(fifth)				
Fetal head descent at enrollment	4.62±0.38	4.41±0.32	3.29	0.52
1st hr.	3.90±0.41	4.10±0.25	8.02	0.04*
2nd hr.	2.45±0.51	3.99±0.31	11.18	0.02*
3rd hr.	1.01±0.09	2.85±0.80	14.89	0.01*
4th hr.	0.52±0.01	2.00±0.05	16.25	0.001**

*Statistically significant difference (p < .05), **A highly statistically significant difference (p ≤ .001).

Table (2) Indicates absence of any statistically significant difference between the study and control groups concerning to cervical dilatation before intervention P= (0.14). On the other hand, a high statistically significant difference was evident between the two groups in the 1st, 2nd, 3rd, & 4th hours after intervention as the study group had a higher mean score of cervical dilatation compared to the control group in

each hour P= (<0.0001.*). The table indicates as well that no statistically significant difference was recognized between the study and control groups before intervention (P=0.52) regarding the fetus head descent. A slight improvement in the head descent was observed in the study group after 1st, 2nd, 3rd, & 4th hours after intervention in favor to the study group.

Table (3): Distribution of the studied groups regarding to their mean labor Pain & anxiety level during first stage of labor.

Items	Study group N=60	Control group N=60	t-test	P-value
	M±SD			
Pain level				
At enrollment /Late Latent phase(1-3cm)	3.9±0.6	4.0±0.5	15.06	0.07
Active phase (4-7cm)	5.9±0.8	7.06±1.0	8.04	0.01*
Transitional phase(8-10cm)	8.5±0.7	9.5±0.5	10.05	0.03*
Anxiety level				
At enrollment / Late Latent phase(1-3cm)	52.71±8.09	49.65±7.28	4.15	0.09
Active phase (4-7cm)	39.58±7.98	50.49±9.65	9.28	0.04*
Transitional phase(8-10cm)	37.14±5.01	52.56±8.69	15.28	0.02*

*Statistically significant difference ($p < .05$), **A highly statistically significant difference ($p \leq .001$).

Table (3) represents the data regarding the pain and anxiety level throughout the first stage of labor as the following; there was no statistically significant difference between the study and control group before the intervention $P = (0.07 \& 0.09)$ regarding the pain and anxiety level respectively.

However after intervention during the active and transitional phase the study group experiences less pain and anxiety level with a statically significant difference than the control group.

Table (4): Labor outcomes among the studied groups.

Items	Study group N=60	Control group N=60	t-test	P-value
Length of first stage labor (hours)	3.01±1.21	4.32±1.65	13.25	0.001**
Length of second stage labor (minutes)	25.32±12.51	29.65±11.54	15.64	0.001**
	N (%)		X²	P-value
Augmentation of labor during second stage				
Yes	13(21.7)	42(70)	35.24	0.03*
No	47(78.3)	18(30)		
Mode of delivery				
NVD without episiotomy	11(18.3)	9(15)	65.35	0.001**
NVD with episiotomy	45(75)	37(61.7)		
CS	4(6.7)	14(23.3)		

*Statistically significant difference ($p < .05$), **A highly statistically significant difference ($p \leq .001$).

Table (4) revealed labor outcome, that the mean duration of the first and second stage of labor was highly significantly shorter in the study group as compared to control group (3.01±1.21 & 4.32±1.65 hr., first stage for study and control group respectively) and (25.32±12.51 & 29.65±11.54 min., second stage for study and control group respectively).

As well as women who adopted birth ball needed less augmentation during second stage of labor with statically significant difference. Also the result revealed highly statistically significant difference among groups related to mode of delivery in favor to the study group less cesarean section rate.

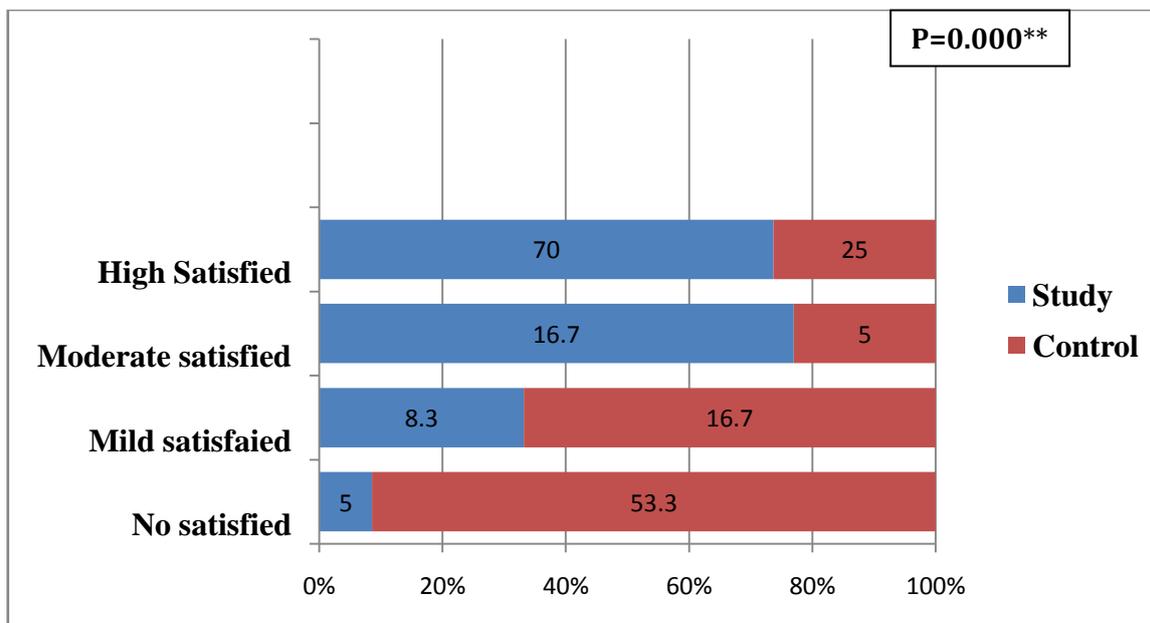


Figure (1). Women's satisfaction regarding care during first stage of labor among the studied group.

Figure (1). shows the women satisfaction regarding the care received in first stage of labor, 70% of women who practicing exercise by using birth ball during first stage compared to 25% of women in control group exhibit high satisfaction. On the other hand 53.3% of women who adopted birth ball during first stage compared to 5% in control group exhibit no satisfaction.

DISCUSSION

Although child birth creates a state of pleasure and enjoyment for the majority of women, it is characterized by pain and stress. However, these painful and stressful events may be heightened by the invasive procedures used in musicalized labor and delivery and to advocate this essence of normality, a key role for the midwives is to promote the use of non-pharmacologic pain relief measures for parturient women. [20] The WHO [21] proved that there is no proof supporting the idea of supine position during the first stage of labor. It was recommended that women encouraged assuming the most convenient position while inclusive recumbent and dorsal position should be avoided. For a long time, positions during labor were freely changed and modified according to parturient desires. [22, 23] Therefore, maternity nurses may suggest alternative position and support the women in choosing ones that are most conducive to her individualized needs and phase of labor. Laboring women usually respond to the signs given by their bodies by changing their positions between sitting upright, kneeling or any other posture in an attempt to discover the most comfortable and convenient for fitting the fetus through the pelvis.

In spite of the fact that the birth ball was introduced as a simple, comfortable and effective modality in clinical practice of promoting the progress of labor and relieving pain, previous studies investigating the connection between birth ball exercise and childbirth outcomes is sparse and controversial specially in the Egyptian country. Therefore, the aim of the present study was to study the effect of using the birthing ball during the first stage of labor and its effect

on the progress of labor and outcome among nulliparous women.

The results of the current research clarified that the study sample of both the study and control group were matching as there was no statistically significant difference in all aspects of their demographic characters and reproductive data. This similarity is highly valuable as it assisted the researchers in diminishing the effect of the extraneous variables that could contaminate the results of the dependent variable (the suggested program) on labor progress. These findings matched those of Gizzo et al., 2014 [24] who conducted a research about the positions women prefer during labor proving that both the study and control groups had no differences concerning age, education, BMI, and gestational age.

The current study represented the existence of a high statistically significant difference between both groups regarding the mean of cervical dilatation in the 1st, 2nd, 3rd, & 4th hours after intervention as the study group had a higher mean score in dilatation of the cervix compared to the control group $P = (<0.0001)$, although, this difference was absent before intervention $P = (0.14)$. This could be due to being different positions as sitting would make contractions stronger and more efficient. Also it will permit gravity to keep the fetal head pressed down, which will promote the cervix to dilate faster so that labor is speeded up.

These findings supported and congruent with recent study findings conducted in Alexandria by Zaky N., 2016 [25] 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 high statistically significant difference was found between both groups in the 2nd, 3rd & 4th hours after intervention as the study group had a higher mean score of cervical dilatation (5.89 ± 0.82) ,

9.65±0.74&10.00±0.00)compared to(3.94±0.76,4.45±0.86 & 5.38±1.12) the control group respectively P= (<0.0001).

A quantitative randomized control trial study by Amin 2013[26] was conducted to evaluate the effectiveness of birthing ball in reducing labor pain among primigravida mothers. The pre and post test scores were assessed cervical dilatation of 1-2cms, 2-3cms, and 5-6cms, and the result shows that the experimental group has shorten duration than control group.

On the other hand, the current study contradicts with Simin *et al.*, 2011 [27]who tried to study the impact of utilizing the birth ball on pain during the active stage of delivery and reported that using of birthing ball had no significant effect on the time of cervical dilatation and progress of labor.

Also the present study pointed out that there was a major improvement with a statistically significant difference in the head descent observed among the study group after 1st, 2nd, 3rd& 4thhours after intervention, this may be due to changing positions either sitting and kneeling or squatting throughout delivery affects the pelvic shape and size, that might assist the fetus head movement into the suitable position throughout the first stage of labor, and support and ease the baby's rotation and descent during the second stage.

This finding are in line with the results of Zaky, 2016[25] study who clarified that there was no statistically significant difference recognized between the study and control groups before intervention (P=0.639) concerning the fetus head descent. Nonetheless, a slight improvement in the head descent was noted among the study group after one hour with significant difference P=0.007. The difference was highly statistically significant (P= <0.0001) in favor of the study group after 2nd, 3rd, & 4thhours from intervention.

Similarly a descriptive study was carried out by Lawrence *et al.*, 2011 [28] who discussed the use of the Swiss ball when taking care of the delivering women in the obstetric care service and to specify the features of its utilization in helping delivering women by midwives. The study stated that all the centers of normal birthing and 40.9% of the obstetric centers had the Swiss ball and indicated that its use enhanced fetus descent(32.4%), relaxation(19.7%), delivery advance (17.1%), perineum exercise (14.5%), easing pain (11.8%), psychological advantage and maternal movement.

Iran Kopra *et al* 2015[29]indicated a significant difference between the two groups in terms of fetal head descent and rotation at the beginning of the active phase (dilatation: 3-5 cm) and second stage of labor (P<0.05) in their study regarding the effect of birth ball exercises during pregnancy ,also on mode of delivery among primiparous women.

Current obtained results that revealed that there was a statistically significant difference between the study and control group regarding the pain and anxiety levels. This may be due to practicing pelvic rocking, 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 will be. 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.

Consequent to these findings Zaky, 2016[25] demonstrated that there was no significant difference between the study and control group before intervention regarding to the pain and anxiety level. However after 1 hour after intervention the study group experience lower levels of pain and anxiety than that of the control group P= 0001. While there was a statically high significant difference between both groups after the 2nd,3rd,&4thhours from intervention (<0.0001), as the study group had less mean pain and anxiety score than the control group; the 2ndhour (6.97± 1.58& 8.50 ± 1.83) respectively, in the 3rdhour(7.57± 1.69&9.29± 1.10) respectively, and in the 4thhour (7.82±10.65&9.83±15.48) respectively.

The meta- analysis of three RCTs involving 220 women indicated that the birth ball work outs resulted in statistically significant improvements of delivery pain and anxiety (pooled mean difference - 0.921; 95% confidence interval - 1.28, - 0.56; P = 0.0000005; I2 = 33.7%), [Somayeh *et al* 2015].[30]. Moreover An experimental study was conducted by Jola 2011,[31] to evaluate the pelvic tilt exercise using birthing ball on physiological labor pain ,the study shows that significant reduction of pain score in the checklist national labor control and pain visual analogue scale of the experimental group also the study found that the pain level throughout the active stage of labor in the treatment group after 30, 60, 90, and 120 minutes exhibited less significance than the control group.

As regards to labor outcomes, the present study results put forward evidence that the mean duration of first and second stage of labor were significantly shorter in the study group when put against that of the control group. Additionally, women who adopted birth ball needed less augmentation during second stage of labor with a statically significant difference. Also, the gained outcomes indicated a significantly higher vaginal delivery rate and less cesarean section rate in mothers performing birth ball exercises with high statistically significant difference set side by side with the control group (P=0.001). This is encouraging since it may indicate the positive effects of the birth ball which paves the way for the use of the upright sitting , kneeling and with a meager pelvic rocking exercise; it also strengthens the pelvic floor muscles, specially the pubococcygeus and levatorani, and the fascia of the pelvis. The laboring women will be free to move, will do perineal exercises by using birth ball and consequently actively participate in the delivery process as it could 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 stages.

In agreement with these findings Zaky, 2016[25] 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 one. Also study by Rose, 2012[32] was conducted to evaluate effectiveness of the birthing ball among laboring women showed that the birthing ball group had a first stage labor time of 258.8 minute and control had 341.9 minute, difference of the 90 minute (0.006). The second stage duration was 21.3 minute regarding the experimental group and 43.5 in the control one and the difference was 22.3 minute.

In partial agreement with our findings study by Mathew, 2012[33] who stated that there is significant improvement in maternal outcome after the use of birthing ball therapy while 95% of birthing ball group underwent normal vaginal delivery. As well, the same outcomes indicated that, there is significant difference in second stage duration whereas no significant difference in first stage duration and cervical dilatation rate.

Conversely, These results are in consistent with other researches, for example Simin *et al.*, 2011[27] showed that there was no significant difference between the length of the active phase of labor or the spanseparating contractions of the uterus in the two groups ($P > .05$). And Roth *et al.*, 2016[34] found that the first stage of labor for multiparous women did not decrease and that applied as well to the pushing time in either primiparous or multiparous women. Moreover, Tsang *et al.* 2012[35] carried out a deliberate, clinical attempt to specify the impact of using the birth ball on labor results. The outcomes clarified that utilizing birth ball reflected no impact on the rate of vaginal delivery. This contradiction with the current results might be caused by a few elements for example; the different timing of using birthing ball and duration, subject's allocation, the exercise procedure, placement, and motion were not plainly specified; resulting in changing the study results.

Eventually our findings pointed to approximately 70% of the women who adopted birth ball during first stage were satisfied regarding the care received in first stage of labor, compared to 25% of women in control group exhibit high satisfaction. In concordance with these results Mathew , 2012[33] study concluded that 95% of mothers from ambulation group and 95% mothers from birthing ball group, were comfortable and satisfied and would like to recommend birthing ball use to others .

CONCLUSION

According to the current study findings, it could be concluded that the outcomes of the current research supports the current research hypothesis by means, using the birth ball during the first stage of labor exhibits effective maternal labor progress outcome (dilatation of the cervix and fetus head descent) faster than those who didn't assume such intervention, as well as exhibits shorter duration of the labor , reduction in pain and anxiety level during the labor and exhibit more satisfaction than those who didn't assume such intervention.

RECOMMENDATIONS

According to the results of the current research work, the researchers suggested the upcoming recommendations:

- Encourage women to use birth ball during the first stage of labor as one of the significant modalities to improve labor progress, manage pain, anxiety and attain more satisfactory birthing experience..
- Providing in-service training programs to maternity nurse concerning the benefit and how to utilize the birth ball during the first stage of labor with different anatomical position.
- Training program at the late third trimester for one of women's relative about the benefit and how to use the birth ball during first stage of labor with different anatomical position, but on other hand the health team administrators in the maternity department must give permission for those relative to attend the labor.
- Replicated the study on a larger sample for generalizing the findings.

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