

Effect of pelvic rocking exercise using sitting position on birth ball during the first stage of labor on its progress

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Abstract: The present study aimed to identify effect of pelvic rocking exercise using sitting position on birth ball during the first stage of labor on its progress. The study was carried out in the main Maternity University Hospital in Alexandria (El Shatby). A quasi experimental design was used. A purposive sample of 80 parturient women birth was included. The study subjects randomly assigned into two equal group collection of data covered a period of six months from the beginning of January to end of June 2015. Three tools were used to collect the necessary data. The Findings of the present results reveals a statistically positive correlations between the birth ball pelvic rocking 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/fifth among the study group. While the control group showed less progress with highly statically significant differences (<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. The researchers recommended that practicing pelvic rocking exercise while sitting on birth ball could be advocated as one of the significant modalities to improve labor progress, manage pain, as well as promote self-control and attain more satisfactory birthing experience.

Keywords: pelvic rocking exercise sitting position on birth ball, progress of labor

I. Introduction

Although childbirth is a natural physiological process, yet it is a life –changing events for many women. However, the care given to women during labor has the potential to affect them both physically and emotionally, likewise, short and long term labor and delivery management are the most common medical issues facing the health caregivers. Verily normal progress of labor 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 dehydration, exhaustion, uterine rupture, postpartum hemorrhage and puerperal sepsis^(1,2). Therefore, prevention and early detection of prolonged labor would significantly eliminate its sequelae. Eventually, of importance to reduce maternal mortality rate (MMR) by three-quarters is one of the Millennium Development Goals 5a (MDGs). Indeed in Egypt, significant successes have been made, where the average MMR reduced from 75 deaths per 100.000 live births in 2002 to 45 per 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⁾.

Enhancing the comfort and satisfaction of women giving birth figures among nurse-midwife care providers tasks. Significant practices with this goal are part of a contact marked by the valuable of physiological birth and the adequate use of labor and birth care technologies, which range from modifications in labor care environments to the use of non-pharmacological practices to enhance effective labor progress with pain relief. However reduce the incidence of health problems can grant women a greater feeling of comfort and control while giving birth. The introducing birth ball is a relatively new tool for improving the experience of labor. Use of the birth ball incorporates both rocking and movement, which, theoretically, helps the fetus find better fit through the pelvis as well promote labor progresses^(4,5).

Maternal positioning affects many aspects of the anatomy and physiology adaptations needed to influence all aspects of labor including powers, passage, passenger and psyche. Positioning during labor influences the characteristics and effectiveness of uterine contractions, fetal well-being, maternal comfort, and course of labor. Indeed Sitting upright on birth ball and practicing pelvic rocking exercise in first stage of labor helps the abdomen be a hammock, and encourages the baby to settle into an anterior position.⁽⁶⁾ As well as encourages rotation of a posterior baby, encouraging to incorporate movement while resting by leaning forward, pelvic rocking, swaying, doing hip circles and figure eights, and gently bouncing to help increase the pelvic outlet as much as 30%, which also permit baby's decent, eventually get the baby's head on the cervix. Moreover, pelvic rock can reduce tension in the lower back, 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.^(6, 7, 8)

Significance of the study

Most of the women are giving birth in health-care facilities in lying down position on the bed which is rooted as convenience methods by health care providers, which is not based on scientific research. Nowadays confinement is practiced by risk-focused management., it is unusual for a woman to be connected to a fetal monitor and intravenous (IV), further risk factors which detected during the intrapartum period relying on immobilization make many women potential candidates for induction of labor, assisted vaginal births, and Caesarean section. Today, 52 percent of women in Egypt give birth by C-section, according to 2014 Demographic and Health Survey (DHS). That rate is 3.5 times higher than it should be, considering the World Health Organization has set the target C-section rate at 15 percent. However, the rate of C-sections has nearly doubled since the last DHS survey in 2008, when it was estimated to be 27 percent. In contrast, the choice of movements sitting in birth ball and practice pelvic rocking exercise can play a key role as a non-invasive and non-pharmacological method of pain relief an increase sense of control, empowerment of women, as well as enhancing the positive birth experience by achieving good maternal and fetal outcome rising in the forthcoming years^(8,9)

Aim of the study

Assess the effect of pelvic rocking exercise using sitting position on the birth ball during the first stage of labor on its progress.

Research hypothesis :

1. Parturient women who follow up pelvic rocking exercise using sitting position on the birth ball during the first stage exhibits more strong uterine contractions than those who didn't assume such intervention
2. Parturient women who follow up pelvic rocking exercise using sitting position on the birth ball during the first stage exhibits faster cervical dilatation and effacement than those who didn't assume such intervention
3. -Parturient women who follow up pelvic rocking exercise using sitting position on the birth ball during the first stage exhibits faster fetal head descent than those who didn't assume such intervention
4. Parturient women who follow up pelvic rocking exercise using sitting position on the birth ball during the first stage exhibits shorter duration of the three stages of labor than those who didn't assume such intervention

II. Materials And Method.

Research design

A quasi experimental design was utilized in this study.

Materials

Setting :

This study was executed at the Labor and Delivery Unit at El-Shatby Maternity University Hospital in Alexandria.

Subjects:

A purposive sampling technique was used in collecting the data. A total of 80 parturient women. The subjects were assigned randomly into two equal groups. A study group (40 parturient women) and control group (40). Sample size has been calculated using the following equation: $N = (z^2 \times p \times q) / D^2$ at CI 95% and power 80%. The minimum sample size for this study was 36 in each grouping) primipara, at the active phase, 1st stage of labor. The inclusion criteria included aged between 20-34 years, nulliparous, full term, with a normal course of pregnancy, a single, a live fetus in cephalic presentation, with spontaneous onset of labor, free from any medical and obstetrical diseases, and accepting to participate in the study. The exclusion criteria were as follows: 1) medical problems or pregnancy-related complications during the study; 2) abnormal fetal presentation (during the study or labor); 3) childbirth before 36 weeks or after 42 weeks of gestation; 4) maternal weight of ≥ 90 kg during the study or labor; 5) neonatal weight of either ≥ 4000 g or < 2500 g; 6) diagnosis of cephalo-pelvic disproportion. Some participants (14) were removed from the study for various reasons including emergency caesarean section (5), epidural anesthesia (2), received oxytocin (n=4), premature rupture of membrane (3)

Tools:

Three tools were used in this study, as follows.

Tool I: Socio- demographic and reproductive data structure interview schedule questionnaire. This part was designed and used by the researchers to collect data about the subjects' general characteristics such as age, level of education, as well as their reproductive history.

Tool II: "The Partograph"⁽¹⁰⁾

This tool was adapted and used by WHO 1994⁽¹⁰⁾ to measure the progress of labor in term of cervical dilatation, effacement, descent of the fetal head, uterine contraction progress (duration, frequency, interval and intensity) fetal heart rate, duration of first, second and third stage of labor

Cardiotocography (CTG) was used to monitor fetal heart count. As well as uterine contraction (frequency, and intensity)

Tool three: Visual analog pain intensity scale (VAS).⁽¹¹⁾

It is a standardized linear scale developed by McCaffery and Pasero (1999) 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. It comprises 0-10 point numerical scale, the two opposite ends representing no pain to severe pain as follows: No pain, (0) Mild pain (<4), Moderate pain (4-6), Severe pain (7-10).

Methods:

1. Approval was obtained from the ethical committee of the faculty of nursing- Alexandria University and the responsible authorities of the study settings.
2. Tool 1 was developed by the researcher after the extensive review of the relevant and recent literature. While tool II & III was adapted and used by the researcher. Their content validity was assessed by 5 experts in the related field of Obstetric and Gynecologic Nursing and Obstetric Medicine. Tool III reliability was calculated on the basis of an expected correlation coefficient of 0.80 indicating reliability, a significance level of 0.05, a power of 0.90 and testing against the null hypothesis of a correlation coefficient of 0.5.
3. A pilot study was carried out on 8 of parturient women served to ensure clarity, feasibility, applicability, and time needed for data collection. Based on the pilot results; there was no need for amendment in the tools. The subjects of the pilot were excluded from the main study sample. Data collection covered a period of six months, from the begin of January to end of June 2015.

The study was conducted in three phases:

A--Pre assessment phase:

The researcher screens all parturient women for primipara in the active stage of labor 4cm and meets the eligible criteria were included in the study, consecutive sample was solicited. Then they were individually interviewed by the researcher to collect the basic data using (tool 1) and randomly assigned to either study (40) or control (40) group.

Ethical consideration:

For each recruited subject the following issues were considered: The nature and purpose of the study were explained to the participated subjects in the study. Securing the subjects informed written consent, keeping the subject's privacy, assuring the subjects of their data confidentiality and used only for the purpose of the study, and the right to withdraw at any time without penalty.

B-The implementation phase:

The baseline data, such as uterine contraction (duration, intensity, interval, frequency) cervical dilatation, fetal head descent/fifth were retrieved before commencing the birth ball pelvic rocking exercises for the study group. Each subject in the study group was individually met in the latent phase, meanwhile an explanation of the benefits of setting in the birth ball and video show 10 minutes to gain more confidence on how to do the pelvic rocking exercise during first stage of labor followed by live demonstration on sitting, swaying on birth ball from front to back or side to side and circle and pelvic tilt. After the teaching session, at the beginning of active phase of labor, the participants were encouraged to sit practice the all types of birth ball pelvic rocking exercise for 10-20 minute. However, the parturient women were encouraged to sit on the birth ball and follow-up pelvic rocking exercise every hour at least 5-10 minutes up to 10 cm dilatation. In contrast, the women in the control group were not receiving education or actual demonstration about pelvic rocking exercise.

C-The evaluation phase :

Evaluation of the effects of setting in the birth ball and practicing pelvic rocking exercise was measured by assessing the progress of labor every hour in terms of duration, interval, frequency, and intensity of uterine contraction, cervical dilatation, effacement, the descent of fetal head/fifth and pain intensity. Besides the duration of the first, second and third stage of labor for both the study and the control group until the end of the first stage.

Statistical analysis

Statistical analysis was performed using SPSS version 20 for Windows. Percentages, mean, standard deviation and chi-square test, Fisher exact test and t-test to find out the significant difference of the results at 5% which used to find out the variation between the study and control group progress of labor.

III. Results

Table (1) indicates an absence of any significant differences between the study and control groups in their age, the level of education, occupation, and residence as well as a number of antenatal visits, and receiving health education regarding labor preparation. Whereas, around half (50% &45%) respectively of both study and control group aged 20-<25years, while 50%&37.5%respectively of the study and control group were illiterate or just read and write. In addition the majority (87.5% &82.5%) respectively of both group were housewives, likewise sizable proportion 85% &87.5% were urban residents. Almost equal proportions of the study group (45%) and control group (50%) having less than 4 antenatal visits. Moreover, an equal proportion 65%& 62.5% of both the study and control group respectively didn't receive any health education about labor preparation. Furthermore, 70%&72.5% of the study and control group didn't receive any health education about pelvic rocking exercise while sitting on the birth ball in the first stage of labor. However by the 4h hours from intervention all the participant of the study group had already delivered while the control group delivered by the 7th and 8th hours. It is worth to be mentioned that no statistically significant difference was found between the study and control group before and after intervention in the 1st, 2nd, 3rd, 4th hours in relation to their mean fetal heart rate.

Table (I): Number and percent distribution of study subjects according to their socio-demographic characteristics and history of current pregnancy

Socio-demographic characteristics	Study group (n=40)		Control group (4=50)		F/ χ^2 (P)
	No	%	No	%	
Age:					
20-	13	32.5	10	25	3.83 (0.13)
25-	20	50	18	45	
30-35	7	17.5	12	30	
Mean &SD	26.56±4.34		27.89±63		
Level of education:					
Illiterate/Read & write	20	50	15	37.5	5.65 (0.15)
Primary & preparatory	11	27.5	8	20	
Secondary or its equivalent	9	22.5	14	35	
University	0.0	0.0	3	7.5	
Occupation:					
Housewife	35	12.5	33	82.5	0.98 (0.74)
Working	5		7	17.5	
Family type					
Nuclear	28	70	25	62.5	0.67 (0.64)
extended	12	30	15	37.5	
Residence:					
Urban	34	85	35	87.5	0.23 (0.89)
Rural	6	15	5	12.5	
Week of gestation					
38-	15	37.5	16	40	0.43 (0.85)
39-	12	30	13	32.5	
40	13	32.5	11	27.5	
Number of ante natal visit:					
None	12	30	11	27.5	1.67 (0.45)
> 4	18	45	20	50	
4+	10	25	9	22.5	
Receiving health education about labor preparations					
Yes	2	5	4	10	1.85 (0.16)
No	26	65	25	62.5	
Not applicable	12	30	11	27.5	
Receiving health education about birth ball with pelvic rocking exercise in first stage of labor					
No	28	70	29	72.5	0.01 (0.81)
Not applicable	12	30	11	27.5	

According to table (2) the mean duration of uterine contraction in seconds using CTG among the study and the control group was (19.45±06.45&19.32±08.68) before intervention with no statistically significant difference P=0.68), yet after intervention highly statistically significant difference between the study and control group in the1st hour was noticed26.74±07.83, 21.36±09.48, 2nd hour43.78±08.67&24.58±12.46 respectively ,3rd hours, 69.62±07.98&34.78±14.69 respectively and 4th hours 76.82±10.65&45.83±15.48 respectively. As the study group had a higher mean duration of uterine contraction than the control group P=<0.0001.*The table also clarifies that there was no statistically significant difference between the study and control group, regarding interval of uterine contraction in a minute using CTG, before intervention P=0.42. In

contrast in 1st hour after intervention statistically, significant differences were noticed among both groups for the favor of the study group 9.45 ± 0.74 who shows less interval than the control group 13.67 ± 32 , $P=0.056$. 2nd, 3rd, and 4th hours 2.12 ± 0.89 , 1.02 ± 0.51 , 0.93 ± 0.34 respectively, compared with higher mean score among the control group 12.65 ± 7.81 , 7.86 ± 6.22 & 2.75 ± 1.74 respectively with highly statistically significant differences between both groups $P < 0.0001$.

The table also portrays the mean number of uterine contraction/10 minutes using CTG. the relationship between the study and control group was not statistically significant before intervention 1.35 ± 0.52 & 1.56 ± 0.65 respectively $P=0.05$. However after one hour statistically significant difference between both group was noted $P=0.064$. also a highly statistically significant progress of the frequency uterine contraction /10 minutes was evident among the study group in 2nd hours 4.65 ± 0.87 , 3rd hours 5.25 ± 0.75 , and 4th hours 5.75 ± 0.85 . On the other hands the control group shows slow in progress of uterine contraction frequency in the 2nd, 3rd, and 4th hours (1.73 ± 0.87 , 2.53 ± 1.82 & 3.23 ± 0.89 respectively, $P < 0.0001$ *)

Table (2) Distribution of the study subjects according to the mean duration of their uterine contractions in seconds, mean interval of uterine contraction in minutes and mean number of uterine contractions /10 minutes.

1-duration of uterine contractions (seconds)	study group		control group		T-test (P)
	N=40	Mean &SD	N=40	Mean &SD	
Before intervention	40	19.45±06.45	40	19.32±08.68	0.48 (0.68)
1 st hour	40	26.74±07.83	40	21.36±09.48	4.47 (0.083) *
2 nd hour	40	43.78±08.67	40	24.58±12.46	8.59 (<0.0001)*
3 rd hour	40	69.62±07.98	40	34.78±14.69	12.62 (<0.0001)*
4 th hour	8	76.82±10.65	40	45.83±15.48	4.79 (<0.0001)*
2-Interval of uterine contraction (minutes)					
Before intervention	40	15.42±9.25	40	14.52±9.54	0.81 (0.42)
1 st hour	40	9.45±074	40	13.67±32	0.056
2 nd hour	40	2.12±0.89	40	12.65±7.81	8.83 (<0.0001)*
3 rd hour	40	1.02±0.51	40	7.86±6.22	6.27 (<0.0001)*
4 th hour	8	0.93±0.34	40	2.75±1.74	3.78 (0.001)*
3-Number of uterine contractions /10 minutes.					
Before intervention	40	1.35±0.52	40	1.56±0.65	1.80 (0.05)
1 st hour	40	2.67±073	40	1.97±0.76	2.93 (0.064)
2 nd hour	40	4.65±0.87	40	1.73±0.87	12.98 (<0.0001)*
3 rd hour	40	5.25±0.75	40	2.53±1.82	14.36 (<0.0001)*
4 th hour	8	5.75±0.85	40	3.23±0.89	6.88 (<0.0001)*

Table (3) shows no statistically significant differences between the study and control groups before intervention $P=0.45$, however after intervention, a highly statistically significant differences was obvious between both groups. The improvement in intensity of uterine contraction was evident among the study group. Notably, in 1st hour after intervention 45% & 25% of the study group had moderate and strong intensity compared to 32% & 10% of the study group. Moreover, marked progress in intensity among the study group 2nd, 3rd, and 4th hours 37.5% 80% 100% had strong intensity compared to 15%, 22.5% 42.5% respectively of the control group = < 0.0001 *

Table (3): Distribution of the study subjects according to their intensity of uterine contraction

Intensity of uterine contractions	Study group		Control group		F/ χ^2 (P)
	No	%	No	%	
Before intervention	35	87.5	34	85	0.85 (0.45)
Mild	5	12.5	6	15	
Moderate					
1st hour	12	30	23	57.5	23.64 (□ 0.0001)*
Mild	18	45	13	32.5	
Moderate	10	25	4	10	
Strong					
2nd hour	0	0.0	20	50	45.42 (□ 0.0001)*
Mild	25	62.5	14	35	
Moderate	15	37.5	6	15	
Strong					
3rd hour	0	0.0	18	45	54.32 (□ 0.0001)*
Mild	8	20	13	32.5	
Moderate	32	80	9	22.5	
Strong					
4th hour	N=8		N=40		16.58 (□ 0.0001)*
Mild	0	0.0	8	20	
Moderate	0	0.0	15	37.5	
Strong	8	100	17	42.5	

Table (4) Indicates absence of any statistically significant difference between the study and control group in relation to cervical dilatation before intervention $P= (0.568)$. However, a highly 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 $5.89\pm 0.82, 9.65\pm 0.74$ & 10.00 ± 0.00 respectively compared to $3.94\pm 0.76, 4.45\pm 0.86$ & 5.38 ± 1.12 respectively of the control group $P= (<0.0001.*)$. The table also illustrates that there is no statistically significant difference recognized between the study and control groups before intervention ($P=0.639$) regarding the fetal head descent/fifth. 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, &4th hours from intervention. Concerning mean score of pain, no significant difference between the study and control group before intervention $P= 128$. However after one hour from intervention the study group experience less pain than the control group $P= 0001*$. Astatically high significant difference between both groups after the 2nd, 3rd ,&4th hours from intervention $P= (<0.0001)*$ as the study group had less mean pain score than the control group. In the 2nd hour 6.97 ± 1.58 & 8.50 ± 1.83 respectively, in the 3rd hour 7.57 ± 1.69 & 9.29 ± 1.10 respectively, and in the 4th hour 7.82 ± 10.65 & 9.83 ± 15.48 respectively

Table (4): Distribution of the study subjects according to their mean cervical dilatation (cm), fetal head descent/fifth and mean Pain Scores.

1-Cervical dilatation (cm)	study group		control group		T-test (P)
	N=40	Mean &SD	N=40	Mean &SD	
Before intervention	40	3.56±0.56	40	2.87±0.53	0.54 (0.568)
1 st hour	40	4.53±0.72	40	3.56±0.47	5.72 (0.032) *
2 nd hour	40	5.89±0.82	40	3.94±0.76	14.23 (<0.0001)*
3 rd hour	40	9.65±0.74	40	4.45±0.86	26.68 (<0.0001)*
4 th hour	8	10.00±0.00	40	5.38±1.12	29.34 (<0.0001)*
3-fetal head descent/fifth					
Before intervention	40	4.97±0.63	40	4.89±0.78	$\chi^2=2.544; p 0.639$
1 st hour	40	3.85±0.83	40	4.21±0.73	3.67 (p =0.007*
2 nd hour	40	2.04±0.73	40	4.76±0.76	14.38 (<0.0001)*
3 rd hour	40	0.23±0.53	40	3.89±0.68	23.93 (<0.0001)*
4 th hour	8	0.01±0.21	40	3.48±0.72	13.63 (<0.0001)*
Mean Pain Scores					
Before intervention	40	8.57± 1.43	40	7.80 ± 2.31	0.128
1 st hour	40	6.93 ± 1.61	40	8.50 ± 1.83	.0001*
2 nd hour	40	6.97± 1.58	40	8.92 1.31	(<0.0001)*
3 rd hour	40	7.57± 1.69	40	9.29± 1.10	(<0.0001)*
4 th hour	8	7.82±10.65	40	9.83±15.48	(<0.0001)*

Table (5) illustrates the percent distribution of the study subjects according to the duration of the first, second and third stage of labor. Duration of the first stage was 8 to 10 hours among the entire study group (100%) compared to 57.5% of the control group. However, the duration of the second stage of labor was 10 to 30 minutes among 17.5% of the study group compared none of the control group. On the other hands, it was more than 30 minutes to I hour among the majority 82.5% of the study group compared to 62.5% of the control group with significant differences $P= <0.0001$. Furthermore, the duration of the third stage of labor was 10 to 20 minutes among the entire study subjects (100%) ,compared to 37.5% of the control group. There were statistically significant differences between the study and control group regarding 1st stage($P=0.000$)* ,2nd stage ($P=<0.0001$)* and 3rd stage ($P=0.000$)*

Table (5): Distribution of the study subjects according to duration of first, second and third stage of labor

Duration of labor stages	Study group(n=40)		Control group(n=40)		F/ χ^2 (P)
	No	%	NO	%	
1st stage(hours)	40	100	23	57.5	20.21 (0.000)*
8-10	0.0	00.00	17	42.5	
>10-14					
2nd stage(minutes)	7	17.5	0.0	0.0	29.76 (<0.0001)*
10-30	33	82.5	25	62.5	
>30-1hour	0.0	0.0	15	27.5	
3rd stage (minutes)	40	100	15	37.5	12.70 (0.000)*
10-20	0.0	0.0	25	62.5	
> 20-30					

IV. Discussion

The effects of different positions during labor on maternal and fetal outcomes are rarely in agreement. Emerging of evidence in this field is often controversial and meager. The WHO⁽¹²⁾ concluded that there is no evidence to support 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.^(13, 14) 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. Parturient women usually respond to her own body's cues, assuming upright positions or changing position frequently to find the best fit for the fetus through the pelvis. Although the 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, there have been few studies to substantiate this belief.^(8, 15) This study has shed some lights on the effects of practicing pelvic rocking exercise while sitting on the birth ball during childbirth. Its findings suggest that recourse to the birth ball could reduce pain and, improve the progress and shorten the first stage of labor, in addition, promotion of maternal comfort that women were satisfied with its use.

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. On measuring vital signs as a part of ongoing assessment no statistically significant differences between both groups was noted, however, a slight increase in temperature was noticed among the study group 2 hours after intervention. This might be possibly explained as increase heat production by increased number, frequency, intensity and duration of uterine contraction. Conversely, the finding Pullen *et al* (2012)⁽¹⁶⁾ demonstrated that the parturient body temperature increased with the length of labor. They explained this as long labor sustains an inflammatory process that may result in temperature. This was not true in the current study results, where the study group had significantly shorter duration than the control group.

It was obvious that Birth ball exercises improve the progress of uterine contraction, whereas no statistically significant differences between the study and control group before practicing pelvic rocking exercise while sitting on birth ball, 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 during the 2nd, 3rd, and 4th hours after intervention. Likewise, the control group shows less progress of uterine contraction. The effects of sitting position on the birth ball and doing pelvic rocking exercise are eminent, where the sitting positions use gravity effect which potentially reduces aorto-caval compression, resulting in strengthened uterine contraction. In addition, it aids descent of fetal head into the pelvis. As the head is applied directly and evenly 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.^(17, 18, 19)

Pelvic rocking exercise appears to be effective in reducing ligament pain intensity and pain duration. This exercise promotes patient comfort and facilitates self-care in pain relief during labor. Pelvic rocking, the form of swaying back and forth, allows the woman's pelvis to move and encourages the fetus to descend. It must be reinforced that in the upright position, gravity helps delivery of the fetus. These inexpensive non-pharmacologic methods can be combined or used sequentially to enhance the overall effect.^(20, 21)

On assessing cervical dilatation the study group shows significant improvement during the 2nd, 3rd and fourth hours after intervention than the control group. This can be interpreted as the effects of setting position and performing regular pelvic rocking exercise facilitate in the widening of the pelvic outlet which in turn aids fetus descent in the pelvis, as well as intensified uterine contraction. Subsequently exerts direct pressure on the cervix leading to progress in cervical dilatation and effacement.^(22, 23) The present finding is compatible with the results of Gauet *et al* (2011)⁽²⁴⁾ and Hau, *et al* (2012)⁽²⁵⁾ they emphasized that effective contraction is vital to aid cervical dilatation. However systematic review by Lawrence *et al* (2009)⁽²⁶⁾ elaborated that cervical dilatation was improved among women who assumed the upright position and frequently changing it during the first stage of labor than those who remained in a supine position.

It was evident that Fetal heart rate (FHR) had significant differences between the study and control group after practicing for the favor of the study group during 1st stage of labor. This implies that maternal practicing pelvic rocking exercise while sitting on birth ball significantly affect FHR, A woman's pelvic outlet increases as much as 30% when using sitting position and follow pelvic rocking exercise, offers optimal perineal stretching; less muscular effort; optimal oxygen and blood flow to the baby; and the most effective angle for descent of the baby so the baby may descend more easily during labor and birth. Conversely using supine position leads to Aortocaval compression syndrome whereas the gravid uterus compress the abdominal aorta and inferior vena cava causes low maternal blood pressure (hypotension), FHR deceleration and fetal distress. On the contrary, the current finding compatible with the results which carried by Lawrence *et al* (2009)⁽²⁶⁾,

Humphrey *et al* (2005)⁽²⁷⁾ and Athukorala *et al* (2006)⁽²⁸⁾ they clarified that supine position is associated with compression of inferior vena cava and impairment of fetal oxygenation. Ultimately the upright position improves fetal condition through supplying adequate oxygen. Moreover, the results of Lawrence *et al* (2013)⁽¹⁷⁾ and Zwelling E (2010)⁽²⁵⁾ declared that there were significant differences between the upright positions and recumbent position in terms of fetal heart rate and fetal distress which requiring immediate delivery.

Virtually it was obvious that significantly positive correlation between practicing birth ball exercise and fetal head descent/fifth among the study group during the 4th hour after intervention compared to the control group who manifest slow progress, 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 it help to guide the fetal head into the pelvis. Gizzo *et al* (2014)⁽¹⁵⁾ 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.

The duration of the 1st, 2nd, and 3rd stage of labor elucidates a high significantly shorter duration among the study group than the control group. It worth noting that study group was delivered after 4 hours from starting active phase while the control group needed 8 hours. This is encouraging since it may indicate the positive effects of the birth ball in labor which allows the adoption of the upright, seated and with a slight pelvic rocking exercise; it also strengthens the muscles of the pelvic floor, specifically the pubococcygeus and levatorani, and the fascia of the pelvis. The parturient will have freedom of movement, will do perineal exercises and as a result will be actively participating in the process of childbirth as it may facilitate the descent and rotation of the fetal, improvement in uterine blood flow, making contractions more effective and it also helps in cervical dilation. Eventually shortening the duration of labor stages. The results are in accordance with Rana K, *et al* (2013)⁽³⁰⁾ and Gizzo *et al* (2014)⁽¹⁵⁾ concluded that the mean duration of labor hours among the nulliparous women who assumed alternative upright position was significantly less than who are adopting supine or recumbent position.

The results showed that after controlling for several variables with potential effects on labor pain, scores were significantly lower in the intervention group. The quantitative pooling of the studies showed a statistically significant decrease in labor pain when the birth ball was used in the first stage of labor. There are some potential mechanisms to explain why using a birth ball might reduce labor pain. The first endogenous mechanism is gate control theory, which consists of applying non-painful massages to painful areas. This mechanism acts mainly on the sensory discriminative component of pain, by blocking part of the nociceptive message in the spine. Based on this theory, the birth ball may provide support for the perineum without applying significant pressure. Vaijayanthimala *et al* (2014)⁽²¹⁾, Humphrey *et al* (2005)⁽²⁷⁾ and Athukorala *et al* (2006)⁽²⁸⁾ Substantially the decrease in lumbar pain that occurs in the sitting position might be attributed to decreased pressure on nerve filaments that lie over the iliosacral joint and its immediate surrounding area. This hypothesis is supported by other studies that have found that during the contraction, the birth ball assists the laboring woman to tune out painful stimuli by distracting from the labor pain. Also seems that birth ball exercises during labor promote comfort and relaxation, which can build a woman confidence to cope with pain, thus, maintaining a sense of mastery and well-being, instead of passive compliance. This is also in agreement with the findings of Chaillet *et al* (2014)⁽³¹⁾ and Leung *et al* (2013)⁽³²⁾ indicated that women who underwent the early stage of labor in the upright position (sitting or standing) had less pain. Taavoni *et al* (2011) (33) and Zwelling *et al* (2010) (34) proposed that the sitting position offers an effective method of relieving lower back pain during cervical dilation.

V. Conclusion

Based on the finding of the present study, it can be concluded the results of the present study supports its hypothesis that is to say a positive significant correlation of sitting on birth ball, practicing pelvic rocking exercise during first stage and progress of labor was evident. Whereas significant worthy improvement in the progress of the first stage of labor was obvious among the study group than the control group in terms of stronger uterine contraction, faster cervical dilatation and effacement. As well as faster fetal head descent and shorter duration of the three stages of labor. A birth ball exercise also reflects statistically significant reduction labor pain level among the study group

VI. Recommendation

1. The birth ball exercise could be an effective adjunctive tool as non-pharmacological, complementary care strategies for supporting the women in labor
2. Practicing pelvic rocking exercise while sitting on birth ball could be advocated as one of the significant modalities to improve labor progress, manage pain, as well as promote self-control and attain more satisfactory birthing experience

3. Maternity nurses can educate women and their partner prenatally about how sitting on birth ball and practicing pelvic rocking exercise to be followed during first stage of labor need to be incorporated in ante natal classes
4. Poster, pamphlets and video illustrating the benefit of sitting on the birth ball, practicing pelvic rocking exercise in antenatal clinics and labor ward

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