

Effect of Birthing Ball Exercises during Pregnancy on the First Stage Progress of Labor

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Abstract

This study aimed to assess the effect of birthing ball exercises during pregnancy on the first stage progress of labor. **Methods:** This study followed a quasi-experimental research design. **Setting:** The study was conducted at the Antenatal clinic of Obstetrics & Gynecology Specialist center and labor unit at Mansoura University Hospitals from August 2017 to July 2018. The study sample was 150 pregnant females admitted to the antenatal clinic in the previously mentioned setting. **Tools:** **Tool I-** structured interview questionnaire to assess general characteristics of women and obstetrical data for women. **Tool II:** Exercise schedule card designed & used by the researcher which recorded time of total pregnancy visits, types ,times & numbers of birthing ball exercises that done in every session for pregnant women were practiced birthing ball exercises. **Tool III:** The Partograph: It was adopted& used by (WHO , 2015) to measure the progress of labor in term of cervical dilatation , effacement , descent of fetal head , & uterine contraction progress. **Tool IV:** The Bishop Score: It was adopted from (Newman et al., 2008). It was measured the readiness of the cervix for induction of labor. **Tool V:** Visual analog pain intensity scale (VAS): It was a standardized linear scale developed by (McCaffery & Pasero, 1999). It was be adopted and used by the researcher to assess the severity of pain. **Results:** **This study** showed there was no significant differences among control and intervention groups regarding general characteristics and obstetric history this mean that both groups were matched . Regarding effect of birthing ball exercises on first stage of labor : all items of Bishop score were significantly better in intervention group (t=2.758 p 0.007). Showed statistically significant differences (X²=24.960, MEP0.000) according maternal gestational age at delivery that progress at first stage of labor among control and intervention groups. Fluid use was significantly more in intervention group than control group (X² = 11.401 , p 0.001) . Oxytocin used was significantly higher in intervention group (X²= 27.170, P0.000). Uterine contractions were significantly sever in intervention group more than control group (X²=11.545 , P 0.003) . The duration of first stage of labor was reduced among intervention than control groups (X²=19.718 , MEP 0.000) . Maternal body mass index (**BMI**) at delivery was greater statistical significantly in intervention group than control group .regarding visual analogue pain intensity was significantly higher among intervention group (7.347±1.470)than in control group (6.216±1.940) the study subjects exercised using birthing ball during pregnancy with statistically significant correlation (X² 40.370 , MEP =0.000) with better outcome during first stage of labor and mode of delivery among control and intervention groups .**Recommendation,** study recommended performing birthing ball exercises during pregnancy in order to have better outcome on the first stage of labor.

Keywords: birth ball, exercise, pregnancy, first stage, labor.

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1. Introduction:

The Child birth is a natural process that can be generally managed without any medical interventions. Natural delivery is now recommended in many countries because it is cost effective, has shorter length of hospital stay, does not need anesthetic requirement and leads lower rates of infection and hemorrhage after delivery compared to cesarean section (**Mirzakhani et al., 2015**). Childbirth is a natural physiological process but it is also a life changing event for many women. 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. Improper management during this important event may result in prolonged and/or obstructed labor, which may result in maternal dehydration, exhaustion, uterine rupture, postpartum hemorrhage and puerperal sepsis. Therefore, prevention and early detection of prolonged labor would significantly eliminate these complications (**Zaky, 2016**). From a scientific point of view, there are many factors affecting the duration of labor, such as maternal characteristics or obstetric parameters (body mass index (BMI), maternal age, parity, oxytocin augmentation, epidural analgesia, induction). From a clinical point of view, childbirth has been divided into three stages with most studies indicating that the majority of perinatal complications are associated with prolonged stages of labor (**Barakat, Franco, Perales, López&Mottola, 2018**). The first stage of labor is defined as the duration from the beginning of labor until full cervical dilatation (**Tan, Tan, Tan, & Tan, 2019**).

There are 2 phases in the first stage of labor where the latent phase is time when the cervix dilates from 0 cm to 3-4cm and the active phase begins when the cervix dilates 3-4cm to 8-10cm. 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, effective labor pain management remains a crucial aspect of intrapartum care (**Chambers, 2015**). 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 (**Liu et al., 2013**). The introduction of birth ball is a relatively new 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 (**Zaky, 2016**). The use of a birth ball is considered one of the non-pharmacological methods of labor pain relief. Birth ball is also known as the fit ball, Swiss ball and Petzi ball. Its use is physically beneficial during pregnancy and labor (**Gallo, Santana, Marcolin, Duarte & Quintana, 2018**). The suggested benefits of using the birth ball during labor include reduced pain, reduction of anxiety level, less use of analgesics, easier fetal head descent and rotation, shorter duration of the first stage of labor and enhanced maternal satisfaction and wellbeing. Psychologically, exercising with the ball improves posture, balance, coordination, and body awareness as a result of its dynamic nature thus it helps the mother maintain control of her body and build body confidence (**Makvandi et al., 2015**). Sitting on birth ball will help to keep the woman's proper posture.

This is especially important in the last weeks of pregnancy. Also, sitting on birth ball may increase blood flow to the uterus, placenta and the baby, relief spinal pressure, provide comfortable support for knees and ankles, and give counter-pressure to the perineum and thighs (**Hau et al., 2012**). The birth ball is a relatively new tool for improving the experience of labor. Some studies suggest using the birth ball during labor (**Chambers et al., 2011**). However, the effectiveness of non-pharmacologic approaches such as the birth ball on obstetric interventions and outcomes has remained unclear. There are currently no clear evidence-based guidelines for the use of the birth ball. The difficulty in translating this approach into practice may be explained by the lack of a systematic reviews and case-control studies aimed at assessing the impact of using a birth ball on labor outcomes (**Mirzakhani et al., 2015**).

2. Significance of the study

Caesarean-Section prevalence is representative 52% among women in Egypt, Caesarean-Section rate is 3.5 times higher than it should be, and World Health Organization has set the target caesarean-section rate at 15%. The choice of movements in birth ball exercises can play a key role as a non-pharmacological method of pain relief, empowerment of women, as well as enhancing the positive birth experience by achieving good maternal and fetal outcome rising in the forthcoming years (**Egypt Demographic & Health Survey.,2014;Iliadou ,2012**). Birthing ball exercises during pregnancy can effect on labor progress and mode of delivery, also pregnant women who practice birthing ball exercises have a normal labor. In addition birthing ball exercises effect on postural corrections, relaxation, and muscle stretching and strengthening (**Simkin ,& Bolding ., 2014**). The upright posture works with gravity, which will encourage the descent of the fetus (**Hua, Tsang, & Cheung, 2012**).

Parturient women who practice birthing ball exercises during pregnancy exhibits more strong uterine contraction ,faster cervical dilatation and effacement ,faster head descent and shorter duration of first stage of labor than those who did not assume such intervention . Therefore, this study will be conducted to assess effect of birthing ball exercises during pregnancy on first stage of labor progress.

3.Aim of the Study :

This study aims to assess the effect of birthing ball exercises during pregnancy on the first stage progress of labor

4.Hypothesis:

Birthing ball exercises during pregnancy will improve first stage progress of labor among parturient women

5.Operational definitions: Birthing ball exercise:

Refers to exercise using a large air filled rubber ball of 55cm-75cm which is provided by the investigator to the primigravida mother in the first stage of labor to sit with leg bend at 90 degree and remain in the upright position for 20 minutes 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 (**Tussey et al., 2015**).

Labor: also, is called parturition, is the process by which sufficiently frequent and strong uterine contractions cause thinning (i.e., effacement) and dilatation of the cervix, thereby permitting passage of the fetus from the uterus through the birth canal (**Chestnut et al., 2014**).

First stage of labor: It refers to the period from the onset of the uterine contractions till the complete dilatation of the cervix (**Abalos et al., 2018**).

6.Subjects & method: Study design:

The current research utilized quasi-experimental research designed to assess the effect of birthing ball exercises during pregnancy on the first stage progress of labor. **Study setting:** This study was conducted at Antenatal clinic of Obstetrics & Gynecology Specialist center and labor unit at Mansoura University Hospitals. This clinic receives follow up cases for 5 days/ a week. **Sample size:** 150 pregnant women, who fulfilling the inclusion criteria admitted to the previously mentioned setting. **Inclusion criteria** included age range from 18-35 years, third trimester of gestational age from (32 - 42) weeks, primipara or multipara with singleton pregnancy, cephalic presentation, normal body mass index, uncomplicated pregnancy, normal fetus without complications, mother's inclination towards vaginal delivery, free from any medical or obstetric diseases, regular schedule of follow up visits, women's approval of labor in natal clinic at Mansoura University Hospitals. **Exclusion criteria** included 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 sample was estimated according to **Epi Info 7 sample size estimation program2013** using the following parameter: $N = (Z_{1-\alpha/2} + Z_{1-\beta})^2 \sigma_1 \sigma_2 / \delta^2$

The sample was divided into two groups: Intervention group (N=75) received birthing ball exercises .and Control group (N=75) did not receive birthing ball exercise.

Tools: five tools were used in this study as the following:

Tool I:structured interview questionnaire this tool included two parts: Part one: General characteristics of women (age, age, level of education, address, telephone number, occupation, place of residence, type of work, etc.,). Part two: Obstetrical data for women (date of last menstrual cycle, expected date of delivery, gravidity, parity, duration of pregnancy, etc.,).

Tool II:Exercise schedule card which recorded weight, height, body mass index and gestational age in every session for pregnant women, practice of birthing ball exercises was done in every session andwarning signs if appeared in birthing ball exercises done.

ToolIII: The Partograph: This tool was adapted and used by (**WHO, 2015**) .Firstly it was developed by **WHO 1994** 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). It is a graphic representation of the events of labor plotted against time in hours. **It consisted of three main components:**

- The fetal condition (the fetal heart rate, the liquor, and the molding of the fetal skull bones).

- The progress of labour at term of cervical dilatation, effacement, descent of the fetal head and uterine contraction (duration, frequency, interval and intensity etc.).
- The maternal condition (charting maternal temperature, pulse and blood pressure, and urinalysis). The partograph also contains a space to chart administration of drugs, IV fluids, and oxytocin if labor is augmented. The WHO Partograph begins only in the active phase of labor, when the cervix is 4 cm or more dilated. the observations were recorded and document.

Tool IV: The Bishop Score: It was adopted from (Newman et al., 2008). It is used to measure the readiness of the cervix for induction of labor.

Tool V: Visual analog pain intensity scale (VAS): It is a standardized linear scale developed by (McCaffery & Pasero, 1999). It was adopted and used by the researcher to assess the severity of pain. It is a self-reported 10 cm horizontal line.

- **Validity:** Tools were tested for content related validity by three experts (Jury) in the field of the study, three nursing professors of Woman's Health & Midwifery Nursing Alexandria University, Zagazig University, and Mansoura University. They reviewed the tool for clarity, relevance and applicability. Modifications were done accordingly.
- **Reliability** of the developed tool was estimated using the Cronbach's Alpha test, to measure the internal consistency of tools $r = 0.774$

Ethical considerations:

- Official approval was obtained from the director of Obstetrics and Gynecology clinic at Mansoura University Hospitals to implement the study after explanation of the aim of this study.
- Ethical approval was obtained from the Research & Ethics Committee at the faculty of Nursing, Mansoura University to implement the study.
- Written informed consents were taken from all the women participating in the study after the purpose of the study was explained to them.
- The participants were reassured about the confidentiality & privacy of the obtained information.
- The participants were informed about their rights to refuse participations or withdraw at any time.

Pilot Study:

- The study tools were applied on 10% of total sample size (15 pregnant women) before starting the data collection. The purposes of pilot study were to assess validity of study tool to determine feasibility and practicability understand ability of data collection and to detect any problems prior to data collection and to estimate the time needed to complete the tool. Sample size of pilot study excluded from the total sample size. **Field Work:** it included three phases; (assessment phase, implementation phase, and evaluation phase).

- Phase one; assessment phase:

During this phase, the researchers interviewed the women to gather the socio-demographic data by using tool I, The researcher screens all pregnant women and randomly designated to either intervention group or control group. 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 fourth tool, recorded the pain level utilizing the fifth tool.

- Phase two; implementation phase:

Based on the work completed in phase one, the researcher performed the procedure as follow after reviewing the current practice, the related literature and similar clinical practice for using the birthing ball (Kumar et al., 2017; Farrag & Omar, 2018; Beeson et al., 2018).

The researcher attended the previously mentioned setting three days per week from 9:00 am to 1:00 pm until the calculated and completed sample size was obtained at Antenatal clinic of Obstetrics & Gynecology Specialist center at Mansoura University Hospitals. This study was carried out in the period from August 2017 to July 2018. The researcher attended the previously mentioned setting founded in labor unit in any time per week during labor of sample cases. Firstly, the researcher introduced herself to all selected pregnant women and obtained their written informed consent to participate in the study after explanation of the aim for each pregnant woman.

The total study sample 150 pregnant women divided into equal number for two groups as follow: The first 75 pregnant women assigned to control group while the second 75 pregnant women assigned to an intervention group. The intervention group received birth ball exercises at Antenatal clinic of Obstetrics & Gynecology Specialist center at Mansoura University Hospitals. The researcher prepared training room at Antenatal clinic of Obstetrics & Gynecology Specialist center at Mansoura University Hospitals to demonstrate birthing ball exercises for pregnant women. The researcher prepared equipment that used to demonstrate birthing ball exercises for pregnant women. The researcher used birthing ball in a good material, chair, towel, hand watching, and baravan to keep privacy of pregnant women, juice and bottle of water. Birthing ball exercises consisted of 10 movements in 4 positions (sitting, standing, kneeling, and squatting). Firstly, women were given face-to-face instructions about how to utilize birthing ball for exercising and were provided with film presentations.

- Secondly, the researcher practiced birthing ball exercises in front of pregnant women in order to teach them how to do it and asked them to remonstrate the utilization of birthing ball in front of the researcher. Then, the researcher gave a birthing ball to every pregnant women to demonstrate birthing ball exercises at home and follow them by researcher phone. The researcher observed all interventional group during birthing ball exercises done to prevent any warning signs occur, if warning signs occur the researcher stopped exercises. In addition, an educational CD and an instructive brochure were given to pregnant women in the intervention group. The researcher interviewed the women of the interventional group from the eighth month up to birth date. The frequency of meeting to perform exercises ranged from three to five times until labor time. The researcher also followed all subjects by phone to ensure performing the exercises at home if they can. Women received routine care in control group only offering them but no birthing ball exercises. The researcher assured all cases whether in the intervention group or control group that they could contact her by phone anytime if they felt the pain of childbirth.

- **Phase three; Evaluation phase:**

The researchers follow and evaluated the labor progress (cervical dilation, 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 III), and Tool IV to assess The Bishop Score. As well as using tool V during first stage to assess the level of pain.

Data analysis:

Collected data were coded, computed and statistically analyzed using the SPSS (Statistical Package for Social Sciences) software program version 16.0. Data were presented in tables as frequency (number & percentage). Regarding comparison of groups, Chi-square (χ^2) tests were used to compare frequency of variables in groups they were modified to use Monte Carlo exact χ^2 when there were cells with expected frequency less than 5. Also Fisher exact test (FET) was used in 2 by 2 tables when expected frequency in one or more cells was less than 5. The difference was considered significant at $p \leq 0.05$.

7. Results:

Table (1): General characteristics among control and intervention groups

Items	Control		Intervention		Significance Test
	group (75)		group (75)		
	No.	%	No.	%	
Age groups:					X ² = 2.524 P 0.283
18 - 23	36	48.0	45	60.0	
24 - 29	26	34.7	22	29.3	
30 – 35	13	17.3	8	10.7	
Range	18-35		18-33		
Mean ± SD	26.5 ± 5.338		25.5 ± 4.589		
Education					X ² = 2.330 P 0.675
Read & write	1	1.3	1	1.3	
Primary	5	6.7	4	5.3	
Secondary	23	30.7	30	40.0	
University	45	60.0	40	53.3	
Post graduate	1	1.3	0	0.0	
Occupation	49	65.3	52	69.3	X ² = 0.273 P 0.601
Housewife	26	34.7	23	30.7	
Type of work:					
Cleaner	4	15.4	1	4.3	
Employee	5	19.2	7	30.4	
University student	4	15.4	2	8.7	
Teacher/skill work	13	50.0	13	56.5	
Residence					-----
Urban	33	44.0	33	44.0	
Rural	42	56.0	42	56.0	
BMI					t= 1.077 P 0.417
Range	19.10 – 33.0		15.80 -32.4		
Mean ± SD	25.32 ± 3.44		24.69 ± 3.72		

Table (1) shows the general characteristics among control and intervention groups. It was noticed that, the mean age was **26.5 ± 5.338 & 25.5 ± 4.589** in the control group and the intervention group respectively. It was found that most of pregnant women among control and intervention groups had university education level; (**60%**) in control group and **53.3%** in intervention group. Working women represented **34.7%** in control group and **30.7%** in intervention group.

As regard residence; **44.0%** in rural area and **56.0%** in urban areas in both group. The average body mass index is **25.32 ± 3.44** in control group and **24.69 ± 3.72** in intervention group. There was no significant difference between both groups as regard age, education, and occupation, type of work, residence, and body mass index. This means that both groups were matched as regard general characteristics.

Table (2): Obstetric history among control and intervention groups

Items	Control group (75)		Intervention group (75)		Significance Test
	No.	%	No.	%	
Gestational age at 1st visit	24.0 – 39.0		22.0 – 38.0		t= 1.846 P 0.078
Range	29.77 ± 2.73		30.69 ± 2.41		
Mean ± SD					
Gravidity					X2= 1.850 P 0.396
Primigravida	23	30.7	31	41.3	
2 -3	46	61.3	39	52.0	
≥4	6	8.0	5	6.7	
Parity					X2= 4.131 P 0.127
Nulliparus	40	53.3	50	66.7	
Primipara	20	26.7	18	24.0	
Multipara	15	20.0	7	9.3	
Abortion					X2= 4.169 P 0.194
Non	45	60	50	66.67	
1-3	23	30.67	25	33.33	
>3	7	9.33	0	0.00	

Table (2) shows obstetric history among control and intervention groups. The gestational age at first visit ranged from **24.0 to 39.0** weeks in control group and **22.0 to 38.0** weeks in intervention group. Primigravida represented **30.7%** in control group and **41.3%** in intervention group, while nulliparous represented **53.3%** in control group and **66.7%** in intervention group.

Regarding abortion, **60%** of the control group wasn't aborted and the intervention group was **66.67%**. There is no significant difference among control and intervention groups as regard gestational age at 1st visit, gravidity and parity. This means that both groups were matched regarding obstetric history.

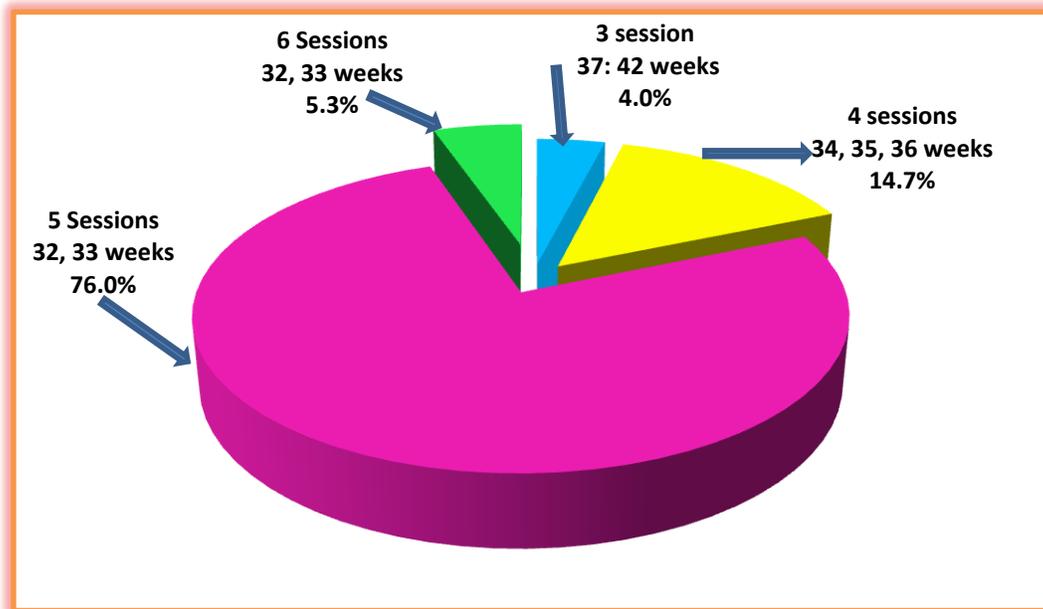


Figure (1): Number of birthing ball exercise sessions among intervention group

Figure (1) shows the number of birthing ball exercise sessions among intervention group. Most of the women practiced exercises five times (**76.0%**) within (**32, 33**) weeks of gestation, while 14.7% at (**34, 35, 36**) weeks gestation practiced 4 times, 5.3% at (**32, 33**) weeks practiced 6 times and 4.0% practiced three times within (**37: 42**) weeks.

Table (3): Characteristics of gestational age and body mass index of the participating pregnant women birthing ball exercises at all the five visits among intervention group:

Items	First Visit		Second Visit		Third Visit		Fourth Visit		Fifth Visit	
	No	%	No	%	No	%	No	%	No	%
Gestational age (weeks)										
32	37	49.3								
33	7	9.3	1	1.3						
34	25	33.3	36	48.0	1	1.3				
35	4	5.3	8	10.7	1	1.3	1	1.4		
36	2	3.7	27	36.0	35	46.7	1	1.4	1	1.6
37			2	2.7	14	36.0	2	2.8	3	4.9
38			1	1.3	22	29.2	38	52.8	13	21.3
39					2	2.7	12	16.7	26	42.6
40							16	22.2	6	9.8
41							2	2.8	12	19.7
42									1	1.6
Body Mass Index Kg/m² < 18.5	1	1.3	0	0.0	0	0.0	0	0.0	0	0.0
18.5 - < 25.0	43	57.3	42	56.0	36	48.0	32	44.4	23	37.7
25.0 - < 30.0	24	32.0	25	33.3	28	37.3	32	44.4	31	50.8
≥30.0	7	9.3	8	10.7	11	14.7	8	11.1	7	11.5
Mean ± SD	24.82 ± 3.69		25.156 ± 3.63		25.612 ± 3.76		25.670 ± 3.32		26.240 ± 3.14	
Range	18.2 – 34.1		19.0 – 34.10		19.0 – 35.80		19.4 – 34.40		19.8 – 34.40	

Table (3) Shows characteristics gestational age and body mass index of the participating pregnant women birthing ball exercises at all the five visits among intervention group. It shows that about half (**49.3%**) of them started practicing birthing ball exercises at **32** weeks of gestation and one third started at **34** weeks at the first visit. At the second visit **48%** of pregnant women were at **34** gestation weeks and **36%** at **36** weeks. About **46.7%** of them were at **36** weeks gestation at the third visit, and **36%** at **37** weeks. The highest proportion was **52.8%**; this represented all those at **38** weeks at the fourth visit. Regarding the fifth visit, **42.6%** returns of who were at **40** weeks gestation.

One half of the participants (**57.3%**) had an average body mass index, (**32%**) overweight and **9.1%** obese at the first visit. Near to these results were found at the second visit, as more than one half of them (**56.0%**) had an average body mass index, one third (**33.3%**) overweight and **10.7%** were obese. At the third visit, nearly one half of the participants (**48.0%**) had an average body mass index, more than one third (**37.3%**) overweight and **14.7%** obese. Less than one half of them (**44.4%**) had an average body mass index and overweight while, **11.1%** were obese at the fourth visit. Finally at the fifth visit, more than one third of them (**37.7%**) had an average body mass index, **50.8%** were overweight while, **11.5%** were obese.

Table (4): Characteristics of positions and durations of the participating pregnant women birthing ball exercises at all the five visits among intervention group:

Items	First Visit		Second Visit		Third Visit		Fourth Visit		Fifth Visit	
	No	%	No	%	No	%	No	%	No	%
Positions during practicing birthing ball exercises (Sitting-Squatting Kneeling- Standing).	75	100.0	75	100.0	75	100.0	72	100.0	61	100.0
Duration of birthing ball exercise										
< 5 minutes	16	21.3	16	21.3	17	22.7	13	18.1	12	19.7
= 5 minutes	41	54.7	41	54.7	43	57.3	39	54.1	35	57.4
> 5 minutes	18	24.0	18	24.0	15	20.0	20	27.8	14	23.0

Table (4): Shows characteristics positions and durations of the participating pregnant women birthing ball exercises at all the five visits among intervention group .All women in intervention group practiced 4 positions at all visits.

At the first visit, exercise less 5 minutes found in **21.3%**, 5 minutes in more than half of participants and more than 5 minutes in a quarter of them, at the second one exercise less than 5 minutes was illustrated in **21.3%**, 5 minutes in more than half of participants, and more than 5 minutes in **24.0%**. And exercise less than 5 minutes detected in **21.7%**, 5 minutes in **57.3%** and more than 5 minutes in **20.0%** at the third visit. Continuing to the fourth visit, **18.1%** exercised less than 5 minutes, half of participants exercised for 5 minutes, and **27.8%** exercised more than 5 minutes. Exercise is less than 5 minutes in about fifth of the pregnant women at the fifth visit, 5 minutes exercised by more than half of them, and more than 5 minutes in **23.0%**.

Table (5): Characteristics complaining of the participating pregnant women birthing ball exercises at all the five visits among intervention group:

Items	First Visit		Second Visit		Third Visit		Fourth Visit		Fifth Visit	
	No.	%	No.	%	No.	%	No.	%	No.	%
Chief complains										
Yes	11	14.7	6	8.0	11	14.7	11	15.3	14	23.0
No	64	85.3	69	92.0	64	85.3	61	84.7	47	77.0
Chief complains										
Headache	8	72.7	-	-	1	9.1	7	63.6	1	7.1
Back Pain	1	9.1	-	-	-	-	-	-	1	7.1
Nausea	1	9.1	-	-	-	-	-	-	-	-
Nausea and Headache	1	9.1	-	-	1	9.1	2	18.2	-	-
Back pain and headache	-	-	2	33.3	-	-	-	-	1	7.1
Muscle cramps	-	-	1	16.7	5	45.5	-	-	6	42.9
Abdominal pain	-	-	1	16.7	1	9.1	2	18.2	-	-
Sweating	-	-	1	16.7	-	-	-	-	-	-
Thirst sensation	-	-	1	16.7	-	-	-	-	-	-
False contraction	-	-	-	-	3	27.3	-	-	4	28.6
Headache and false contraction	-	-	-	-	-	-	-	-	1	7.1

Table (5): Shows characteristics complaining of the participating pregnant women birthing ball exercises at all the five visits among intervention group. It shows that at the first visit, warning signs were reported in **14.7%** of the studied women, they include: headache Three-quarters and **9.1%** for back pain, nausea and nausea & headache. At the second visit these signs were reported in only **8.0%** of the studied women, they included: back pain & headache was appreciated for one third and about one fifth for muscle cramps, abdominal pain, and sweating and thirst sensation. At the third visit nearly half of the participants complained of muscle cramps, one third of them complained of false

contraction and 9.1% for headache, abdominal pain and nausea & vomiting. All these were reported in only 14.7%. Completing to the fourth visit, signs were reported in 15.3% of the studied women. They included muscle & leg cramps within a percent higher than the half of the studied women, and 18.2% for false contraction and back pain only. Finally at the fifth visit, were reported in 23.0% of the studied women. And that was the highest percent all over the five visits. They included muscle & leg cramps in half of participants, one third for false contraction and only 7.1% for headache, headache & false contraction, back pain and back pain & headache.

Table (6):Bishop score among Control and Intervention Groups

Items	Control group (75)		Intervention group (75)		Significance Test
	No.	%	No.	%	
Cervical Dilatation					X²= 21.845, MEP 0.000
closed	2	2.7	0	0.0	
1-2	14	18.7	2	2.7	
3-4	13	17.3	35	46.7	
5	46	61.3	38	50.7	
Cervical Effacement					X² = 21.877, MEP 0.000
>4	1	1.3	0	0.0	
3-4	15	20.0	1	1.3	
1-2	14	18.7	34	45.3	
0	45	60.0	40	53.3	
Head Station					X² = 12.553, P 0.002
-3	0	0.0	0	0.0	
-2	18	24.0	3	4.0	
-1,0	23	30.7	31	41.3	
+1,+2	34	45.3	41	54.7	
Consistency					X²= 14.610, P 0.001
firm	0	0.0	0	0.0	
medium	19	25.3	6	8.0	
soft	27	36.0	18	24.0	
-	29	38.7	51	68.0	
Position					X² = 10.670, P 0.005
posterior	0	0.0	0	0.0	
midline	18	24.0	5	6.7	
anterior	24	32.0	21	28.0	
-	33	44.0	49	65.3	
Total score					t= 2.758 P 0.007
Range	3.0- 15.0		5.0-15.0		
Mean ± SD	11.21 ± 3.87		12.69 ± 2.58		

Table (6) shows the Bishop score at first stage of labor among control and intervention groups. All items of bishop score were significantly better in intervention group. The average total bishop score was significantly higher (**12.69 ± 2.58**) in intervention group in comparison to control group (**11.21 ± 3.87**).

Table (7): Maternal condition on First Stage of Labor progress according partograph among Control and Intervention Groups

Items	Control group except for elective Caesarian Section women (39)		Intervention group except for elective Caesarian Section women (70)		Significance Test
	No.	%	No.	%	
Gestational age at delivery	No.	%	No.	%	X² = 24.960, MEP 0.000
≥ 37	1	2.6	0	0.0	
38: 41	34	87.2	46	65.7	
≥ 42	4	10.2	24	34.3	
Uterine contraction					X² = 11.545, P0.003
Mild	6	15.4	2	2.9	
Moderate	15	38.5	18	25.7	
Severe	18	46.1	50	71.4	
Latent phase	No.	%	No.	%	X² = 0.935, P0.334
Normal	34	87.2	68	97.1	
Prolonged	5	12.8	2	2.9	
Active phase:					X² = 0.210, P0.646
Normal	29	85.3	65	95.6	
prolonged	5	14.7	3	4.4	
Pulse at delivery	60.20 –88.0		62.0 –92.0		t= 0.544 P 0.587
Range					
Mean ± SD	74.56 ± 7.36		75.21 ± 7.34		
Blood pressure at delivery	No.	%	No.	%	X² = 0.451 P0.978
Hypotension	9	23.1	16	22.9	
Normal blood pressure	26	66.7	48	68.6	
Hypertension	4	10.2	6	8.5	
Temperature at delivery	36.50 - 40.0		36.30 - 37.5		t= 1.186 P 0.238
Range					
Mean ± SD	37.708 ± 0.47		36.93 ± 0.47		
Respiratory rate at delivery	14.0 - 22.0		12.0 - 28.0		t= 1.116 P 0.266
Range					
Mean ± SD	17.95 ± 1.64		18.33 ± 2.51		
Fluid use	No.	%	No.	%	X² = 11.401, P0.001
Yes	35	89.7	70	100.0	
No.	4	10.3	0	0.0	
Type of fluid					X² = 2.432, P0.296
Ringer	8	22.9	21	30.0	
Glucose	21	60.0	33	47.1	
Saline	6	17.1	16	22.9	
Amount (ml)					X² = 16.193, MEP 0.001
250-1000	27	77.1	67	95.7	
1000-2000	8	22.9	3	4.3	

Table (8): Maternal condition on First Stage of Labor progress according partograph among Control and Intervention Groups (continued)

Items	Control Group except for elective Caesarian Section women (39)		Intervention group except for elective Caesarian Section women (70)		Significance Test
	No.	%	No.	%	
Drugs used	No.	%	No.	%	X²= 27.170, P0.000
1) Oxytocine:					
Yes	27	69.2	70	100.0	
No	12	30.8	0	0.0	
Amount					X²= 19.718, MEP 0.000
1 IU/ml	3	11.1	5	7.1	
5 IU/ml	1	3.7	24	34.3	
10 IU/ml	23	85.2	41	58.6	
2) Epidural injection					X²= 0.032, P0.849
Yes	10	25.6	17	24.3	
No.	29	74.4	53	75.7	
Amount					X²= 3.071, MEP 0.216
1 ml	7	70.0	16	94.1	
4 ml	2	20.0	1	5.9	
7 ml	1	10.0	0	0.0	
3) Antibiotic use:					FET, P0.500
Yes	36	92.3	66	94.3	
No	3	7.7	4	5.7	
4) Other drugs:					X²= 2.360, P0.124
Yes	16	41.0	21	30.0	
No	23	59.0	49	70.0	
Types					X²= 15.931, MEP 0.001
Zantac ampoule	3	18.75	6	28.6	
Voltaren ampoule	4	25.0	7	33.3	
Cataflam ampoule	0	0.0	5	23.8	
Lasix ampoule	3	18.75	3	14.3	
Fortacortin ampoule	6	37.5	0	0.0	
Doses					FET, P0.629
1 ampoule	15	93.8	20	95.2	
2 ampoules	1	6.2	1	4.8	
Urine Analysis					----- FET, P0.341 X²= 1.510,P0.219 ----- X²= 5.906,P0.014
Amount (Normal)	39	100.0	70	100.0	
Glucose in urine	1	2.6	4	5.7	
Protein in urine	4	10.3	11	15.7	
Acetone in urine	1	2.6	3	4.3	
Pus cells	1	2.6	11	15.7	

Tables (7&8) shows maternal conditions at first stage of labor progress among control and intervention groups. It was found that gestational age at delivery is earlier at **(36 & 37)** weeks of gestation among **2.6 %** of women in control group while all women among intervention group **(100 %)** having gestational age ranged from **38 to 42** weeks at delivery and the difference is statistically significant. It was also found that uterine contraction is significantly severe in intervention group. Pulse rate, blood pressure, temperature and respiratory rate are not significantly differing in both groups. Fluid use is significantly more in intervention **(100.0%)** then control group **(89.7%)**.

Oxytocine used is significantly higher in intervention group. While epidural injection, antibiotic use and percentage of use other drugs were not significantly differ among control and intervention groups. As regard urine analysis, percentage of pus cells is more in intervention group.

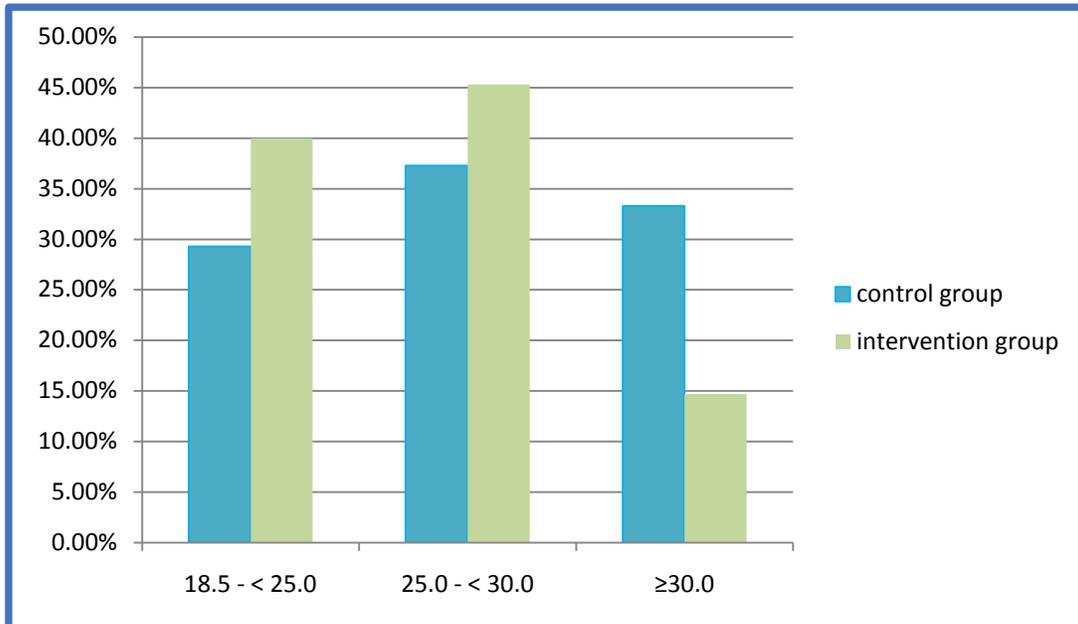


Figure (2): Maternal Body Mass Index at delivery among control and intervention groups

Figure (2) shows Maternal Body Mass Index at delivery among control and intervention groups. It was illustrated that percentage of obese women in control group (**33.3%**) was significantly greater than in intervention group (**14.7%**).

Table (9): Fetal condition on First Stage of Labor progress according partograph among Control and Intervention Groups

Items	Control Group except for elective Caesarian Section women (39)		Intervention group except for elective Caesarian Section women (70)		Significance Test
	No.	%	No.	%	
Fetal heart rate:					X²= 0.0453 MEP=0.834
bradycardia	5	12.8	10	14.3	
normal	34	87.2	60	85.7	
Liquor:					X²= 7.5842 P0.05543
Clear	29	74.4	65	92.9	
Passage of meconium	6	15.4	5	7.1	
Mild bleeding	3	7.7	0	0	
Heavier bleeding	1	2.5	0	0	
Molding:					FET,P 0.2578
Normal	37	94.9	70	100.0	
Abnormal	2	5.1	0	0.0	

Table (9) shows fetal condition at first stage of labor among control and intervention groups. Fetal heart rate was not significantly differing among control and intervention groups. Although, the percentage of passing meconium in liquor is higher in control group and percentage of passage of blood is more in control. Normal molding is more in intervention group.

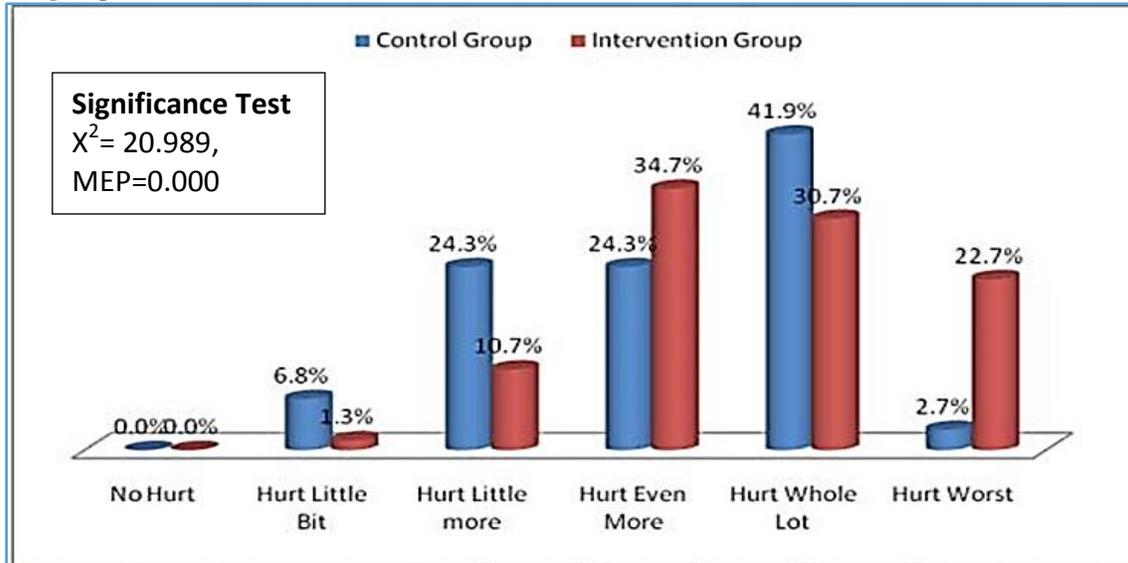


Figure (3): pain assessment scale among control and intervention groups

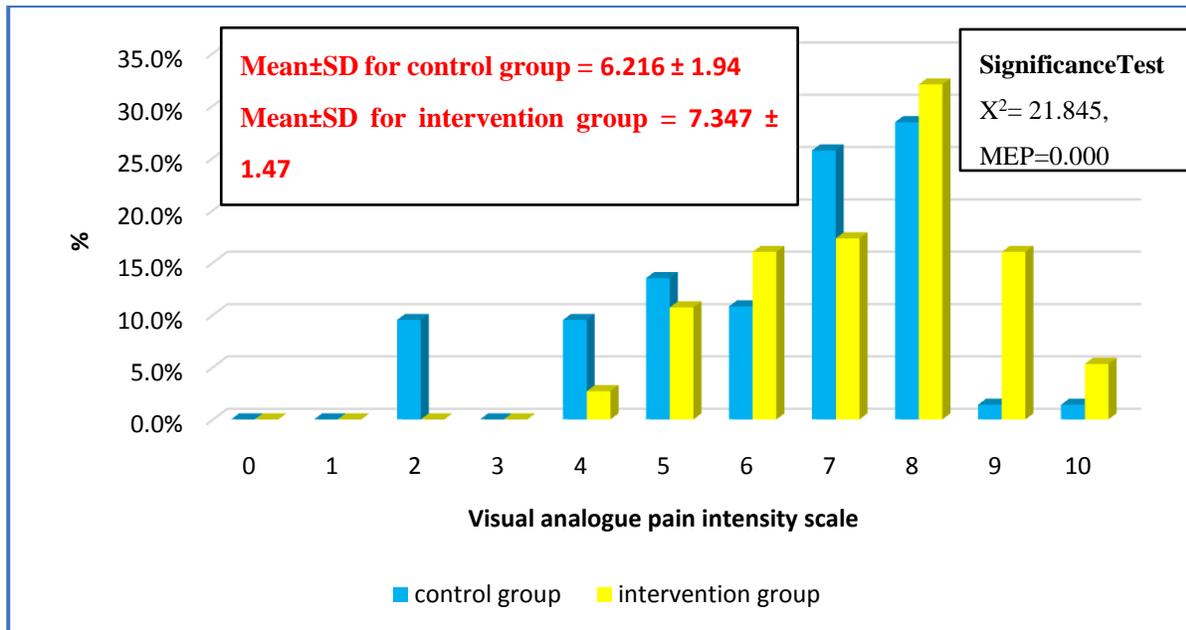


Figure (4): Visual analogue pain intensity scale among control and intervention groups.

Figure (3 & 4): show the visual analog pain intensity scale among control and intervention group. The average score of the visual analog pain intensity scale was significantly higher in intervention group (7.347 ± 1.470) than in control group (6.216 ± 1.940). Also, level of pain was significantly higher among intervention group. This may be explained by the difference in type of delivery among control and intervention groups. The percentage of normally delivery is greater in intervention group which is accompanied by severe pain.

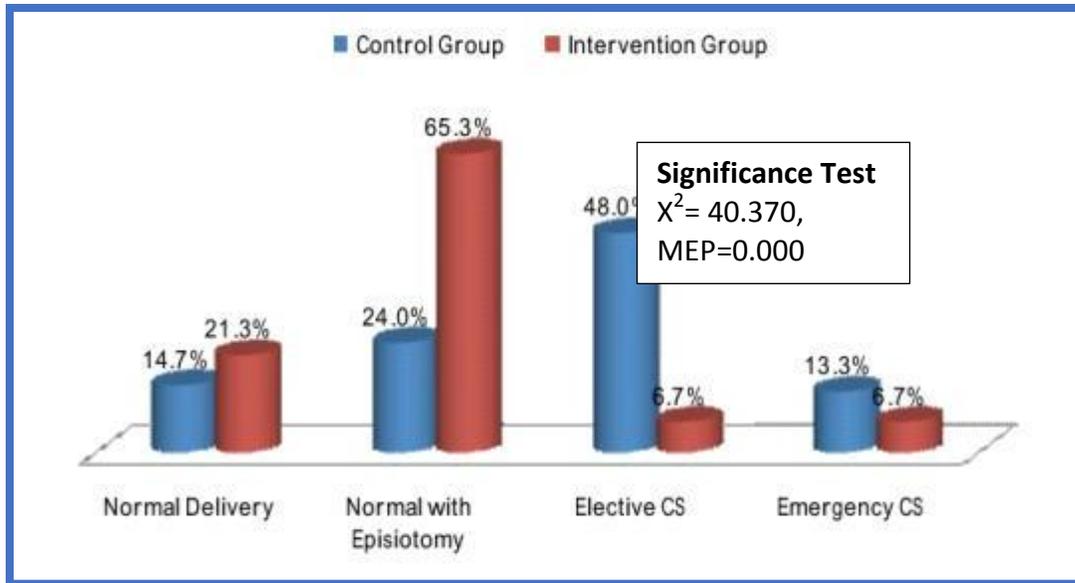


Figure (5): Types of deliveries among control and intervention groups

Figure (5) shows the type of delivery among control and intervention groups. The percentage of normal delivery and normal delivery with episiotomy is greater in intervention group while, the percentage of elective and emergency CS is greater in control group. The difference is statistically significant.

8. Discussion:

The current study was aimed to assess the effect of birthing ball exercises during pregnancy on the first stage progress of labor. This aim was realized through the present study findings which revealed that practicing birthing ball exercises during pregnancy improved first stage progress of labor among parturient women as the average total Bishop score was 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. Hence, the study hypothesis; (Birthing ball exercises during pregnancy will improve first stage progress of labor among parturient women) was accepted. This may be due to the birthing ball exercises promote spinal flexion, increasing the utero-spinal angle and the pelvic diameters to facilitate occiput posterior rotation which results in a widened pelvic outlet and the intertuberous diameter.

Beginning with, The baseline data for comparison between both groups (the control and intervention group), some great significant results were detected, and this indicated that the birthing ball exercises were of great value. Accordingly, general characteristics as a baseline for comparison, significant differences were not elicited in both groups as regarding age groups, education, occupation, type of work, residence and, body mass index(BMI) . Both groups were matched as obstetric history. There is no significant difference among control and intervention groups as regard gestational age at first visit, gravidity and parity. This was on line with a study by **Mirzakhani et al., 2015**; who illustrated that no significant differences were found regarding age groups, education, occupation type, and body mass index (BMI) in the study titled "The effect of birth ball exercises during pregnancy on mode of delivery in primiparous women". Both groups are matched regarding obstetric history, Primigravida is one third in control group and near to half in intervention group, while nulliparous were more than half of the participants in control group and more than two-thirds in intervention group. Regarding abortion, two-thirds of the control group wasn't aborted and slightly more than them of the intervention group. There is no significant difference among control and intervention groups as regard gestational age at first visit, gravidity and parity.

Regarding to the gestational age of the pregnant women, gestational age at first visit ranged from 32.0 to 36.0 weeks among intervention group. The intervention group, most of the women practiced exercises five sessions were about three-quarters within 32, 33 weeks gestation, while s practiced three sessions within 37: 42 weeks, more than one tenth in 34, 35, 36 weeks gestation practiced 4 sessions and only in 32, 33 weeks practiced 6 sessions. **Gau, Chang, Tian& Lin, 2011** in their study; "Effects of birth ball exercise on pain and self-efficacy during childbirth" included women beginning with 30 weeks gestations.

In contrast, the inclusion criteria of the study by **Taavoni, Sheikhan, Abdolahian & Ghavi, 2016** included pregnant women with one pregnancy, 38-40 weeks of gestation. This present study tested birthing ball exercises during subsequent five visits. Noticeable differences were elicited regarding gestational age, body mass index, practicing of birthing ball exercises, duration of birthing ball exercise, warning signs, what warning signs?by whom were these characteristics assessed? Number of participants differed along the study. All participants were seventy-five pregnant women.

Beginning with gestational age per weeks, about half of them started practicing birthing ball exercises at 32 weeks of gestation and one third started at 34 weeks at the first visit. This was on line with **Gau et al., 2011** in their previously mentioned study, as half of their participants started practicing birthing ball exercises at 32 weeks. At the second visit near to half of pregnant women were at 34 gestation weeks and about one third at 36 weeks. About half of those participants were at 36 weeks gestation at the third visit, and one third at 37 weeks. The highest proportion was about half of them; this represented all those at 38 weeks at the fourth visit. Finally, regarding the fifth visit, less than half returns of who were at 40 weeks gestation.

The proportion of women with an adverse maternal outcome increased with increasing maternal body mass index (BMI). Less than one-third of non-overweight/non-obese women, near to half of overweight women, and more than half of obese women experienced an adverse maternal outcome (**Short et al., 2018**). On the pace of a study by **Schummers et al., 2015** titled "Risk of adverse pregnancy outcomes by pre-pregnancy body mass index: a population-based study to inform pre-pregnancy weight loss counseling", the researcher examined analysis by body mass index (BMI) category according to the following categories: underweight (BMI<18.5), normal weight (BMI 18.5 to 25), overweight (BMI 25 to <30), and obese (BMI≥30).

On comparing BMI along the five visits, it was detected that more than one half of the pregnant women had an average body mass index, about two-thirds were overweight and one tenth of them were obese at the first visit. Near to these results were found at the second visit, as more than one half of them had an average body mass index, one third overweight and one third were obese. At the third visit, nearly one half of the pregnant women had an average body mass index, more than one third overweight and more than one tenth were obese. Less one half of them had an average body mass index and overweight while, one tenth were obese at the fourth visit. Finally, at the fifth visit, more than one third of them had an average body mass index, half of them were overweight while, only one third were obese. On the contrary, the use of the birthing ball exercises allowed the pregnant women to use positions that encourage activity, pelvic mobility and to shift their weight for comfort. The birthing ball exercises further promote a desirable upright posture, allows for the relief of pressure and decreased muscle strain (**Littleton & Engebretson, 2012**). Exercises included 10 movements in 4 positions (sitting, standing, kneeling, and squatting) (**Mirzakhani et al., 2015**).

All studied women practiced sitting positions, squatting, kneeling and standing positions at the fourth visit. Finally, at the fifth visit, the studied women practiced all positions. There are multiple benefits associated with maternal position changes, including decreased pain, increased maternal–fetal circulation, improved quality of uterine contractions, decreased length of labor, and facilitation of fetal descent (**Dean & Kattankulathur, 2014**). The most preferred positions in this study were sitting and squatting.

"An overview of maternal and fetal short and long-term impact of physical activity during pregnancy" was a study by **Leite et al., 2017**. They trained pregnant women with birth ball three times a week, lasting 20 min each session, with total duration of 6–8 weeks. In present study, time allowed was 5 minutes per session.

In the present study, at the first visit, exercise less 5 minutes found in one fifth of the studied participants, 5 minutes in more than half of them and more than 5 minutes in a quarter of them, at the second one exercise less than 5 minutes was illustrated in one fifth of them, 5 minutes in more than half of participants, and more than 5 minutes in about one quarter of them. And exercise less than 5 minutes detected in one fifth, 5 minutes in more than one half and more than 5 minutes in about one fifth of the mat the third visit. Continuing to the fourth visit, near to one fifth of the participants exercised less than 5 minutes; half of them exercised for 5 minutes, and near to one third exercised more than 5 minutes. Finally, at the fifth visit, exercise is less than 5 minutes in about fifth of the pregnant women, 5 minutes exercised by more than half of them, and more than 5 minutes in near to one quarter of them.

On the other hand, a study by **Makvandi, Mirzaiinajmabadi, Mirteimoori and Esmaily, 2017** titled "Effect of physiological delivery program in mother-friendly hospitals on duration of labor "participants of the intervention group attended in these classes start from the beginning of the 20th week of pregnancy in eight sessions over a period of ninety minutes per session. And this was different from this present study. Also, participants of **Baker, 2015** in his study "The Influence of Pre-Pregnancy Activity Level on Birth Weight "began the first week with 15 minutes training sessions, increased to 30 minutes the second week, and completed the adaptation period with 45 minutes training sessions starting the third week and continued throughout the remainder of the program.

Concerning, warning danger signs along the five visits, it was found that warning signs weren't commonly presented in this study. At the first visit, warning signs were reported in more than one tenth of the studied women, they include: headache Three-quarters and one tenth of them for back pain, nausea and nausea & headache. At the second visit these signs were reported in only less than one tenth of the studied women, they included: back pain & headache was appreciated for one third and about one fifth for muscle cramps, abdominal pain, and sweating and thirst sensation.

At the third visit nearly half of the participants complained of muscle cramps, one third of them complained of false contraction and near to one tenth of them for headache, abdominal pain and nausea & vomiting. All these were reported in less than one fifth of them. Completing to the fourth visit, signs were reported in more than one tenth of the studied women. They included muscle & leg cramps within a percent higher than the half of the studied women, and less than one fifth for false contraction and back pain only.

Finally, at the fifth visit, were reported in near to one quarter of the studied women, and that was the highest percent all over the five visits. They included muscle & leg cramps in half of participants, one third of them for false contraction and less than one tenth for headache, headache & false contraction, back pain and back pain & headache. **Koyyalamudi et al., 2016; Mwilike et al., 2018; Bintabara, Mpembeni, and Mohamed, 2017; August et al., 2016** are on agree with this recent study, as they estimated the warning signs when exercising with the birth ball with low ratios, and assured that the birthing ball is of a great benefit, and most of practicing exercise done under supervision of the researcher along the visits. Their studies titled "New labor pain treatment options.

Current pain and headache reports", "Knowledge of danger signs during pregnancy and subsequent health care seeking actions among women in Urban Tanzania: a cross-sectional study", "Knowledge of obstetric danger signs among recently-delivered women in Chamwino district, Tanzania: a cross-sectional study", and "Effectiveness of the home based life is saving skills training by community health workers on knowledge of danger signs, birth preparedness, complication readiness and facility delivery, among women in Rural Tanzania" respectively.

Concerning maternal progress, and it was cleared that there was a statistically significant difference between the two studied groups; as it was found that gestational age at delivery is earlier in less than one tenth of women in control group, it was at 36 & 37 weeks of gestation, while a great majority of women in intervention group almost all of them had gestational age ranged from 38 to 42 weeks at delivery. Similarly, **Kwan, Chan & Li, 2011** proved that in a study named "The birth ball experience: outcome evaluation of the intra-partum use of birth ball".

This study focused on the first stage progress of labor as this was its aim, first was the Bishop's score or cervix score. It is a pre-labor scoring system to assist in predicting whether induction of labor will be required. It was predominantly influenced by the degree of cervical dilatation, effacement, length of cervix, station, consistency, and position (**Ishaqui et al., 2018**). Bishop's score cervical scoring system will used to assess the maternal outcome of the first stage of labor (**McCarthy & Peralta, 2018**).

Concerning to first stage progress of labor, Firstly, Bishop Score in the current study, and results showed that all items of bishop score were significantly better in intervention group. The average total bishop score was significantly higher in intervention group in compared to control group. This illustrated the great effect of birthing ball exercises during pregnancy on the first stage progress of labor. A controlled chart analysis by **Ogunyemi et al., 2018** in a study titled "Using a multifaceted quality improvement initiative to reverse the rising trend of cesarean births "demonstrated that a strong significant value detected between birthing ball exercises .

Concerning duration of the first stage of labor progress, the current study revealed intervention group had shorter duration compared to control group, This was similar to the study results by **Fournier, Feeney & Mathieu, 2017** titled "Outcomes of Exercise Training Following the Use of birthing ball exercises during Pregnancy and delivery" as it was shown to be effective at reducing the duration of the first stages of labor. Also an Egyptian study named "Using of Birthing Ball during the first Stage of Labor: Its Effect on the Progress of Labor and Outcome

among Nulliparous Women" by **Farrag& Omar, 2018** put forward evidence that the mean duration of first stage of labor progress were significantly shorter in the study group when put against that of the control group.

On the other hand, regarding maternal body mass index at delivery the prevalence of maternal overweight and obesity is increasing and has important consequences for the health of mother and child at delivery (**Price et al., 2018**). In the present study percentage of obese women in control group was about one third of the mind it was significantly greater than in intervention group. This was on line with **Willcox et al.,2017** who demonstrated a significantly lower gestational weight gain in the intervention group in their study "A mobile health intervention promoting healthy gestational weight gain for women entering pregnancy at a high body mass index".

In contrast, a randomized controlled trial of exercise training in pregnancy for the women with body mass index $> 28\text{kg}/\text{m}^2$ by **Garnæs et al., 2017** in "Effect of supervised exercise training during pregnancy on neonatal and maternal outcomes among overweight and obese women " reported that no effect of offering regularly supervised exercise training during pregnancy on neonatal and maternal outcomes at delivery.

Furthermore, on completing the first stage of labor progress, it was illustrated that uterine contractions were significantly better and severe among intervention group than control group. In the same line,. Regarding uterine contractions, **Tseng, 2010** in a study titled" a birth education program for expectant fathers: effect on their attitude and experiences" found that the birth ball let the women in labor more easily rock her pelvis naturally and increases the force of uterine contractions, thus augment labor process. Conversely, a newly done study by **Mercier & Kwan, 2018** concluded that use of the birthing ball does not significantly increase rates of uterine contractions, cervical dilation or decrease time in active labor in the study about "Impact of peanut ball device on the duration of active labor". However, it was also found that fluid use was significantly more in intervention than control group, but types of fluids; ringer, glucose and saline wasn't significantly different in both groups, the amount used was significantly greater in control group. Depending on Oxytocin was significantly higher in intervention group and this was a good sign that the birthing ball may have augmented labor and improves contractions.

While epidural injection, antibiotic use and percentage of use other drugs were not significantly differ in both groups, fortacortinewas used more in control group and cataflam was used higher in intervention group. This was because of the severity of painful contractions. **Tussey et al.,2015's** study; "reducing length of labor and cesarean surgery rate using a peanut ball for women laboring with an epidural" concluded that the birthing ball is potentially a successful nursing intervention to help progress labor and support vaginal birth for women laboring, proved that the birthing ball is potentially a successful nursing intervention to help progress labor and support vaginal birth for women laboring.

As regard urine analysis, percentage of pus cells was more in intervention group. **RanjanSridhar, Matta, Chokkakula, Ansari, 2017** studied the"Prevalence of UTI among Pregnant Women and Its Complications in Newborns" explained that the increased incidence during third trimester may relate to increased mechanical obstruction due to gravid uterus and the prevalence rate of urinary tract infection (UTI) during pregnancy is very high, was more than one third of the participants. Concerning the fetal condition ,**Simkin et al., 2016** in their book "Pregnancy, childbirth, and the newborn: The complete guide" stated that birthing ball exercises don't have significant risks on fetal conditions including fetal heart rate, liquor, and molding . This was almost the same of this present study; as the fetal heart rate wasn't significantly differing in both groups. Although, the percentage of passing meconium in liquor was higher in control group and percentage of passage of blood was more in control but the difference wasn't significant. Normal molding was more in intervention group.

Regarding to mode of delivery, more than two thirds of the participants delivered with normal vaginal delivery with episiotomy, less than one quarter delivered with normal vaginal delivery. Conversely, the control group about half of the participants delivered with Elective cesarean section, and about one quarter of them delivered with normal vaginal delivery with episiotomy. After testing "Using of birthing ball exercises during the first Stage of Labor: Its Effect on the Progress of Labor and Outcome among Nulliparous Women by **Farrag& Omar, 2018**, they revealed highly statistically significant difference among control group and the intervention group using birthing ball in relation with the mode of delivery in favor to the study group less cesarean section rate.

The results of the present study were also similar to results of **Farrag& Omar, 2018**, who revealed highly statistically significant relation between birthing ball and the mode of delivery in a study titled; "Using of Birthing Ball during the first Stage of Labor: Its Effect on the Progress of Labor and Outcome among Nulliparous Women". Mothers should be advised to perform birth ball exercises during prenatal classes and consultation sessions.

Regarding to the level of pain among parturient woman during first stage of labor, the mean score of pain showed a significant difference between both groups. In agreement with an experimental study was conducted by **Foy, 2011** on title "The effect of pelvic tilt exercise using birthing ball on physiological labor pain in primigravida mothers". It showed that significant reduction of pain score in the checklist national labor control and pain visual analogue scale of the experimental group.

Also, **Farrag & Omar, 2018** in their previously mentioned study found that the pain level throughout the active stage of labor in the treatment group exhibited less significance than the control group. The study by **Taavoni et al., 2018** named "Effect of Pelvic Movements using Birth Ball and Listening to Nature sounds and Honey Syrup Consumption on Labor Pain in Nulliparous Women" to assess the effect of natural sounds on the first stage of labor pain and anxiety in nulliparous women revealed that had mild pain, one third of them had moderate pains, and severe pain. Statistically significant difference in pain between the groups was reported.

The administration of drugs might not only cause side effects but also can disturb a mother's active cooperation during labor. In pharmacological terms, the pain feeling would be reduced physiologically, but the psychological and emotional conditions of the mother are ignored (**Makvandi et al., 2015**). Non- pharmaceutical methods of labor pain relief are frequently applicable and cheap, and can be used as a successor or supplementary treatment with other drugs (**Gabbe et al., 2016**).

The strong persistent pain associated with labor may negatively affect both mother and fetus, often changing the course of childbirth. The precepts of healthcare humanisation recommend that women in labor should have the opportunity to relieve their pain with pharmacological and non-pharmacological resources (**Kelly, 2018**).

In the current study and on monitoring the visual analogue scale, it was detected that more than one third of the intervention group complained with grade 8 on the scale, more than one tenth complained with grade 6, 7 & 9, only 5.3% complained with grade 10. These scores were almost near to the scores of the control group.

The visual analog scale may be categorized from 0 to 10 as (0-No hurt, 1-2, Hurts little bit, 3-4 Hurts little more, 6- 7, Hurts even more, 8-9 Hurts whole lot, 10- Hurts worst). And more than one third of the intervention group participants were representing for hurt even more, and hurts whole lot. Also, less than one quarter for hurt worst. The recommendation from a World Health Organization (WHO) conference in 1985 that 'Countries with some of the lowest perinatal mortality rates in the world have caesarean section rates of less than one tenth and the higher percent is for normal mode of delivery (**MacFarlane et al., 2016**).

Conclusion

Based on the results of the present study, the following can be concluded: It could be concluded that the outcomes of the current research supports the current research hypothesis, using the birth ball during the first stage of labor exhibits effective maternal labor progress outcome (facilitating dilatation of the cervix and improving and enhancing the uterine contractions,, prevented the prolonged latent phase, improved the normal vaginal delivery, helped in reduction of pain level during the labor.

9. Recommendations

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

- Providing in-service training programs to maternity nurse concerning the benefits and how to utilize the birth ball during pregnancy with different anatomical positions.
- Training program at the late third trimester for women and their relatives about the benefits and how to use the birth ball during first stage of labor with different anatomical positions.
- Suggest a protocol to utilize birthing ball exercise for pregnant women in maternity services hospitals in Egypt.
- Healthcare providers especially nurse staff should receive the appropriate training to perform birthing ball exercises simply and effectively.
- Increasing awareness among healthcare providers especially specialist nurses about the importance of practicing birthing ball exercises during pregnancy and labor must be put in consideration.
- Birthing ball exercises should be performed to all the pregnant women presenting to outpatient gynecological clinics to improve maternal labor progress and provide better pregnant women counseling.
- **Further studies:**
- Replicated the study on a larger sample for generalizing the findings.

- Providing in-service training programs to maternity nurses concerning the benefits and how to merge exercise during pregnancy in routine nursing care plans.
- Further multicenter studies are needed to establish the true prevalence of birthing ball exercises and its correlates in Egyptian pregnant women and to evaluate the use of birthing ball exercises on a larger scale.
- Video-assisted teaching method about birthing ball exercises can be extended to other maternity nursing procedures.

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Limitations of the current study:

- Our sample comprised of 150 pregnant women, where a larger sample would have been more appreciate, but wasn't feasible due to time limitation and the number of women who didn't complete the sessions due to their desire, or due to emergent Caesarian Section. The sample was drawn from one hospital on one geographical area in the Arab Republic of Egypt that restricts generalization of findings.

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