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Effect of Birth Ball Abdominal Core Training on Fatigue and Low Back Pain among Primigravida

Hanan Abd El Rahman Kandeel[1], Nadia Youssef Abd-Ella[2] & Neama Saad Mahmoud Shoukhba [3]
[1.] Assistant Professor of Obstetrics & Gynecologic Nursing, Alexandria University, Egypt.
[2.] Assistant Professor of Woman's Health & Midwifery Nursing, Mansoura University, Egypt.
[3.] Lecturer of Obstetrics & Gynecologic Nursing, Alexandria University, Egypt.

Abstract
Background: Pregnancy generates a strong stress response in women, which makes the burden on their lower backs heavier and increases their sensation of fatigue. **Aim:** The current study **aims** to evaluate the effectiveness of birth ball abdominal core training on fatigue and low back pain among primigravida. **Subjects and Method:** Non randomized a quasi-experimental research design was used to conduct the current study at the New Obstetric and Gynecologic Hospital in Mansoura, Egypt. 100 third-trimester pregnant women were divided into control and study groups. Three tools were used for data collection: **tool I:** structured interview for basic and clinical data. **Tool II:** Visual Analogue Scale for pain measurement and **Tool III:** Fatigue Assessment Scale for evaluating fatigue level. R**esults**: At the beginning of the study, pain scores for low back pain were similar between the two groups. After the intervention, the study group showed a significant reduction in low back pain at the first, second, and third follow-ups compared to the control group (first follow-up: p = 0.001; second follow-up: p = 0.001; third follow-up: p = 0.001). Additionally, there was no significant difference in fatigue levels between both groups before the intervention, but the study group had a significantly lower fatigue level after intervention compared to the control group (before intervention: p = 0.181; after intervention: p = 0.001). **Conclusion:** Birth ball abdominal core training is an effective intervention for managing pregnancy-related fatigue and low back pain. **Recommendations:** Birth ball abdominal core training should be utilized by maternity nurses as a part of routine antenatal care.

Keywords: Birth ball, Fatigue, Low back pain &Pregnancy.

Introduction
Pregnancy is a pivotal event in the lives of women; it poses a substantial challenge to the various body systems of women. Its progressive physiological, psychological, social, and emotional changes are vital in safeguarding and supporting the developing fetus while preparing the woman for childbirth. The normal physiological modifications during pregnancy can exert a considerable burden on already compromised systems, thereby jeopardizing the well-being of both the mother and the fetus **(Al-Mutawtah et al., 2023)**.
As a result of the anatomical and hormonal alterations that occur during pregnancy, it is customary for pregnant women to encounter physiological changes throughout the entire pregnancy. During the first trimester, pregnant women are likely to undergo changes accompanied by discomforts such as morning sickness, frequency of micturition, and weakness. As the uterus expands in the second and third trimesters, the expectant mother will experience pain in the lower back, along with the emergence of additional discomforts, including breathlessness, fatigue, varicose veins, hemorrhoids, constipation, and sleep disturbances **(Cunningham et al., 2014)**.
Low back pain in pregnancy is a pain that occurs in the lumbosacral region. The incidence of low back pain among expecting mothers is estimated to be around 40.5%. As pregnancy advances, this discomfort tends to escalate due to the realignment of the body's center of gravity and postural adjustments. Inadequate posture imposes additional strain and fatigue on the body, particularly the spinal region, resulting in back pain among pregnant women. The emergence of pain in the lower back could be attributed to the expansion of the uterus, which applies pressure to the superior vena cava, thus resulting in increased venous congestion in the lumbar spine and pelvic region. In addition, hormonal alterations, including elevated progesterone and relaxin levels, might trigger back pain during pregnancy **(Stapleton et al., 2002; Salari et al., 2023)**.
Several factors determine how the low back pain during pregnancy is managed. Such factors include the trimester of pregnancy, causes of pain, aggravating factors, and the presence of other medical conditions. The main goals of treating low back pain in pregnant women are to help them maintain a maximum level of functioning throughout pregnancy and minimize discomfort. Potential treatment and management options encompass the correction of posture, the utilization of support for side sleeping,

the implementation of a lumbar roll while seated, the restriction of standing and walking, the utilization of a birth ball, and the performance of antenatal exercises. Furthermore, it is acceptable for healthy pregnant women to engage in exercise for a minimum of 150 minutes per week or engage in 20–30 minutes of moderate-to-intense aerobic fitness activities **(Department of Health and Human Services [DHHS], 2018**).

The utilization of the birth ball for abdominal core training exercises is a non-pharmacological management of low back pain and fatigue during pregnancy. The abdominal core refers to a collection of muscles that are responsible for maintaining the stability of the spinal column, with particular emphasis on the rectus abdominis, obliques, and lumbodorsal muscles. By stabilizing the vertebrae and regulating intrauterine pressure, it is possible to keep vertebral axis neutrality within its physiological range of alignment and movement. Engaging in abdominal core training exercises with the aid of a birth ball is well-suited to augment the capability of the muscle structures located in the core regions, leading to enhanced stability and control of the lumbar vertebrae. Furthermore, this training method also has a restorative and exercising impact on the lumber and dorsal muscle **(Zhang et al., 2022)**.

Pregnancy or delivery may harm pelvic floor tissues in primipara; however, this damage can be reduced to a greater extent if regular and scientific exercises are carried out, and it may also help the recovery of such muscles. Additionally, it has the benefit of reducing discomfort during pregnancy, improving spontaneous vaginal delivery rates, and facilitating postpartum recuperation. **(Sheishaa et al., 2019).**

Additionally, the use of birth ball exercises may provide relief from fatigue during the second and third trimesters. As the gestational week progresses and weight gain occurs, pregnant women experience an increase in organ load, resulting in an increase in heart output and a decrease in internal blood flow. This leads to a mild level of fatigue in primigravidae. Research has indicated that engaging in some light to moderate strength training during the second trimester can be a great way for pregnant women to combat feelings of weakness and fatigue, ultimately enhancing their energy levels. Moreover, the integration of ball exercises into the regimen of expectant mothers may improve internal blood flow and reduce tiredness during the later stages of pregnancy **(Niu et al., 2013; Akmeşe & Oran, 2014)**.

Significance of the study

Research suggests that maintaining an exercise routine during pregnancy is safe for both mother and fetus and is one of the most effective non-pharmacological methods for managing stress during pregnancy and delivery. A study conducted by **Woodley & Hay-Smith (2021)** found that training the abdominal core with a birthing ball can significantly increase core muscle strength, improve stability and control of the lumbar vertebrae, and have therapeutic effects on the lumbodorsal muscles. Regular, structured exercise can also reduce harm to the pelvic floor and aid in the recovery of abdominal muscles in primiparas. Additionally, **Solihah et al. (2023)** concluded that using a gym ball can relax the mother's muscles, reducing back pain, accelerating labor, and improving the quality of her sleep. Therefore, the researcher decided to examine the effect of birth ball abdominal core training on fatigue and low back pain among primigravida.

Aim of the study:

The aim of current research work is to evaluate the effectiveness of birth ball abdominal core training on fatigue and low back pain among primigravida.

Hypothesis of the study:

Pregnant women who practice birth ball abdominal core training exhibit a lower fatigue level and low back pain intensity than those who do not participate in such training.

Subjects and Method

Research design

Non randomized a quasi-experimental research design was employed to attempt to establish a cause-and-effect relationship between an independent variable (i.e., birth ball abdominal core training) and a dependent variable (i.e., fatigue level and back pain intensity) .

Study setting:

The research was executed at the antenatal clinic of the New Obstetric and Gynecologic Hospital in Mansoura, Egypt. This hospital was designated for the research as it serves as the main maternity health agency in Mansoura City and has a high turnover of women seeking obstetric and gynecological health care services.

Study subjects:

- The study subjects comprised 100 conveniently selected pregnant women.These women attended the aforementioned setting, and the criteria for study inclusion are as follows: typical pregnancy pathway, being in the third trimester of pregnancy, maternal age between 20 and 35 years, body mass index not exceeding 30, primigravida with a singleton pregnancy and cephalic presentation, free from any chronic diseases such as cardiac diseases, diabetes mellitus, or kidney diseases, and free from any gynecological problems.
- Inclusion criteria were ensured by reviewing women documented medical and obstetrical health records.

- Researchers calculated the sample population using the Epi-Info program's results. They plugged in these numbers: a population of 830 over a three-month period, an expected frequency of 50%, an error margin of 10%, and a 95% confidence level. This calculation determined a minimal sample size of 59 women, leading to a final sample size of 100 women.
- The study participants were split into two equal groups:
  - Study group (50 women) who used a birth ball for abdominal core exercises.
  - Control group (50 women) who didn't use a birth ball for abdominal core exercises.

Recruiting sample

In order to avert any potential impact of testing on the individuals in both the study and control groups, a straightforward allocation approach was employed, founded on adherence to inclusion criteria and attendance: the initial 50 participants were assigned to the control group, while the subsequent 50 participants were recruited for participation in the birth ball intervention group. Initially, 100 pregnant women who consented were extended an invitation to partake in the research. Nevertheless, 5 women opted out due to discomfort with the exercises, leading to their exclusion and subsequent replacement. Throughout the monitoring phase, six subjects from the control group were lost, prompting their substitution, culminating in a statistical analysis conducted on the final cohort of 100 subjects. A schematic representation of the allocation and progress of participants in the study is delineated in Figure 1.

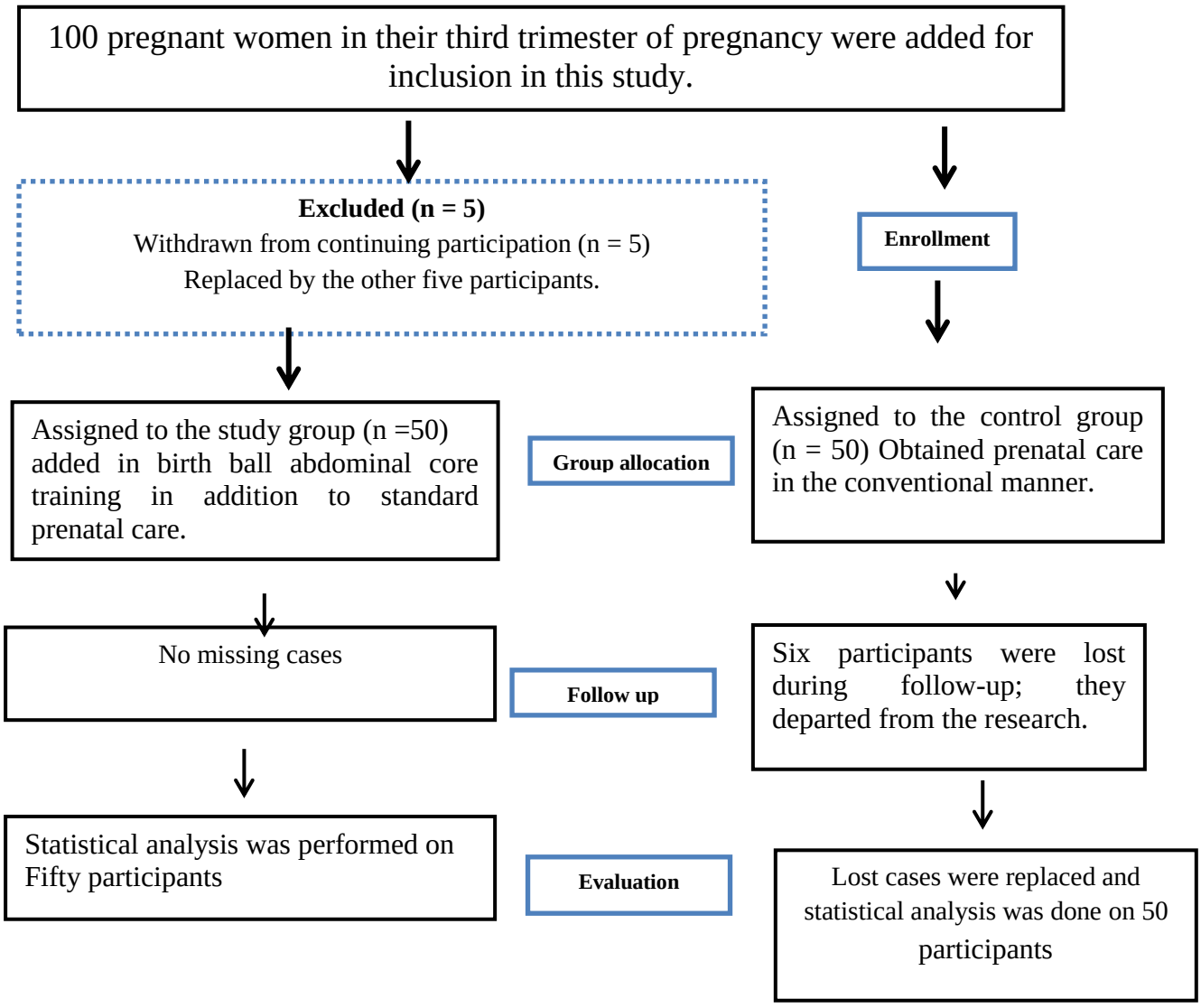

Figure (1): Allocation of the study subjects

Tools of data collection:

Three tools were used to collect the necessary data in the current study:

Tool I: Structured interview for basic and clinical data This instrument was developed by the researcher based on relevant literature (**Zhang et al., 2022)** and consists of three sections:

Section one: Socio-demographic data such as age, level of education, occupation, current residence, as well as family type.

Section two: History of current pregnancy such as weeks of gestation wanted/ planned pregnancy as well as number of antenatal visits.

Section three: Clinical assessment sheet that records baseline data such as physiological measurements, fetal heart beats, height, and body weight for the computation of body mass index (BMI).

Tool II: Visual Analogue Scale (VAS):

The Visual Analogue Scale (VAS) was initially developed by **Woodforde and Merskey in 1972** and was later adopted by researchers for assessing the severity of low back pain in expectant mothers. This self-administered tool comprises a horizontal line ranging from 0 to 10 centimeters. The scale delineates various levels of pain: 0 signifies the absence of pain, 1-3 indicates mild pain, 4-6 indicates moderate pain, 7-9 indicates severe pain, and 10 indicates unbearable pain.

Tool III: The Fatigue Assessment Scale (FAS):

This tool developed by **Drent et al. (2012)** and adapted for this study, is a self-reported questionnaire designed to measure the severity of fatigue symptoms during pregnancy. It comprises two domains with 10 items in total, focusing on physical fatigue (five items) and mental fatigue (five items). Each item is evaluated using a five-point Likert scale, ranging from 1 (indicating "never") to 5 (indicating "always"). The cumulative scores varied within a range of 10 to 50. Based on the total scores, each subject's rating and average symptoms are categorized as follows:

- Mild fatigue from 10 < 22.
- Moderate fatigue from 22 < 35.
- Extreme fatigue from 35 – 50.

Methods

- The research process began with obtaining approval from the Research Ethics Committee at the Faculty of Nursing, Mansoura University. Subsequently, Letters from the Vice Dean of Graduate Studies at El-Mansoura University were formally sent to the relevant authorities at the study site to request permission for data collection and to describe the study's purpose and objectives.
- In the tool development phase, the researcher reviewed relevant literature to develop Tool I. Tool II was adopted while, tool III was adapted and modified as necessary to suit the study's requirements. To confirm the tools were both effective and reliable, a panel of three experts in the field carefully reviewed and validated them, who provided valuable suggestions and recommendations that were incorporated. The assessment of the tools' reliability was conducted through internal consistency tests. specifically, Cronbach's α and the results were highly reliable (tool 1=0.96 & FAS= 0.93).
- Following tool development and validation, a pilot study was conducted involving ten pregnant women. The pilot study had three main objectives: to ensure that the tools were both clear and relevant, to identify any potential obstacles that might arise during data collection, and to estimate how long the data collection process would take. Based on the results of this initial phase, several important adjustments were made to the tools, as some sentences were omitted and another sentence was added. It is also important to emphasize that the female participants from this phase were not included in the final study sample.

Ethical Considerations:

In this research, ethical considerations were carefully addressed for each recruited subject. Firstly, the subjects' written informed consent was secured after a thorough explanation of the research purpose, ensuring that they fully understood the nature of their participation. Privacy measures were implemented to protect the identity and personal information of all study participants. Additionally, confidentiality protocols were strictly adhered to in order to maintain the privacy of the collected data.

Participants were directly acquainted with the voluntary nature of the study and the fact that they could withdraw from the study at any time without facing any negative consequences derived from that decision. This ensured that their autonomy and freedom of choice were respected throughout the research process. Furthermore, upon completion of the study, the control group received comprehensive counseling on birth ball abdominal core training as part of an effort to address any issues or concerns identified during the study.

Filed Work:

Data collection took place over six months, starting in July 2023 and finished at the end of December 2023. Each participant was interviewed for about 15 to 20 minutes during their third trimester of pregnancy.

The study was organized into distinct phases, which are detailed below:

Assessment phase:

- In this phase, the researcher established a rapport with the study subjects. Basic data were then collected, followed by a physical examination of the pregnant women, which included weight and height measurement. The body mass index (BMI) was calculated through the division of the weight by the height in meters squared (wt./Ht2). Pregnant women with a body mass index greater than 30 kg/m2 were ruled out from the study. Additionally, an abdominal palpation was performed to determine the fundal level, lie, presentation, attitude of the fetus, and fetal heart rate using tool I.
- To keep the control group uncontaminated, the first 50 pregnant women who met the inclusion criteria were assigned to the control group, and the remaining 50 were assigned in the study group. These women were then provided with a comprehensive explanation regarding the purpose and design of the study, as well as their role as participants. The explanation was delivered through a PowerPoint presentation held at the clinic, with small groups of 5-10 women in attendance at each session.

Preparatory phase:

In this phase, the focus was on enhancing the subjects' knowledge and performance in birth ball abdominal core training exercises. It consisted of two main parts:

a. Theoretical Part (Didactic): This component covered theoretical aspects such as definitions, types, indications, advantages, and disadvantages of birth ball abdominal core training exercises.
b. Clinical Part (Clinical Training Environment): The researcher prepared a clinical training environment, ensuring safety and providing necessary equipment such as birth balls, mattresses, and instructional videos. This allowed for hands-on practice and application of the theoretical knowledge gained in a safe and controlled setting.

Implementation phase:

- For the control group, participants received only routine antenatal care without any additional interventions. In contrast, for the study group, the training was conducted as follows:
- Study group: was divided randomly into ten subgroups; each included 5 pregnant women and the following program was executed.

Theoretical part: it was carried out in one session combined with power point presentation about birth ball abdominal core training exercises. All didactic content was front-loaded, covering indications, benefits, advantages and disadvantages, and techniques of the birth ball abdominal core training exercise.

Fig (2):Birth ball (Shutterstock, 2020)
https://www.shutterstock.com/image-vector/beautiful-young-pregnant-woman-exercises-fit-1706585662

Training exercise:

- Following the didactic session, participants were introduced to the clinical training environment and the resources available.
- The training skills were done in 3 sessions over 3 days per week. 1 session per day, with each session scheduled in the morning and lasting one hour each.
- The participants in the study group were engaged in a demonstration and re-demonstration of the exercise steps, allowing for hands-on practice under the guidance of the researcher. This structured approach ensured that participants in the study group received comprehensive theoretical knowledge followed by practical training to enhance their understanding and proficiency in performing the exercises.

The training for the study group was structured as follows:

Pranayama guidance: Participants were asked to sit on the front half of the ball with bent knees, making sure their spine was aligned and their shoulders remained relaxed. They were then instructed to maintain regular breathing throughout the exercise. This guidance was repeated twice, with each session lasting 2 minutes. The aim was to promote proper posture and breathing techniques while using the birth ball, contributing to the overall effectiveness of the training program.

Stretching exercise: The researcher instructed each study woman to perform a series of movements. First, they started by placing one elbow on the same-side thigh and reaching the other arm upwards. Then, they leaned to the side and looked up at a 45-degree angle, as if viewing a high point at the side, and then repeated the same movement on the other side. Additionally, from behind, the researcher assisted each participant in bending to the side in the opposite direction, offering support to ensure the stretch was

effective. This exercise routine was practiced three times, with each session lasting 1 minute. Its purpose was to promote lateral flexibility and stretching, ultimately enhancing overall mobility and comfort during pregnancy.

Rotation exercise: The researcher requested the female participant to extend her lower limbs and assume a seated position on the ball. Subsequently, the researcher positioned themselves in front of the pregnant woman and provided manual assistance with bilateral hand support. Clear directives were given to the pregnant participant to engage in rotational movements originating from the hip region, with a suggested repetition of two to three cycles in each direction. The prescribed exercise regimen was upheld for a duration of 2 minutes. Its purpose was to promote rotational mobility and flexibility, with the researcher providing support to ensure safe and effective execution of the movement.

Balance exercise: The researcher directed every female participant in the study to assume a seated position on the ball and extend both arms sideways. Aligning with the respiratory pattern, she was instructed to elevate one foot's sole and subsequently replicate the movement on the opposite side. During the entirety of this physical activity, the researcher positioned herself behind the expectant woman to safeguard her equilibrium. This routine was conducted thrice, with each session lasting a duration of 1 minute. Its purpose was to improve balance and stability, with the researcher providing support to mitigate any potential risk of imbalance or falls.

Bounce exercise: Each participant in the research was directed to position herself with her feet at hip-width distance and to place her arms on each side of the exercise ball. She was then instructed to sustain a slight bounce of approximately 15 cm while keeping her hips stable on the ball. Throughout the activity, the researcher stood in front of her, offering assistance with both hands. This routine was carried out continuously for a duration of 3 minutes, with the goal of enhancing pelvic stability and fortifying the core muscles, while ensuring correct posture and safety measures.

Upper-limb exercise: The pregnant woman and the researcher faced each other. She was directed to raise the ball slowly as she breathed in and hold a modified squat position. After staying in this position for two breaths, she went back to the initial position. This routine was repeated triple times, with each session lasting 1 minute. Its purpose was to enhance upper-limb strength and coordination, with the researcher providing guidance and support to ensure correct posture and breathing throughout the exercise.

Hip exercise: The pregnant woman sat on the floor, extending her legs out in front of her. She was then directed to lower her body and push the birthing ball ahead. This routine was repeated thrice, each session lasting for 1 minute. The aim was to enhance flexibility and strength in the hips.

Back exercise: the pregnant mother knelt on the floor, her knees apart at the width of her pelvis, creating 90-degree angles. Balancing herself, she gripped the ball with both hands and rested her trunk upon it. A researcher aided by offering a soothing massage on her flanks. This routine was repeated thrice, each round lasting 2 minutes. Its purpose was to alleviate low back tension and enhance relaxation, with the researcher's support ensuring proper technique and comfort.

Foot exercise: The study participant was requested to recline against the ball. Extend the toes, followed by bending the feet backward. Sway the feet in a left and right motion, then rotate the ankles. Repeat this process three times, each lasting for a minute.

Whole- body relaxation: the study participant was placed either on her left side or in a partially seated position with support for her back. She was instructed to close her eyes and place her hands on her abdomen. Following meditation guidance, she then relaxed her entire body. This practice aimed to provide comprehensive relaxation and reduce stress, facilitating a calm and restful state for the pregnant woman.

Teaching methods and aids:

Different teaching strategies were implemented, including lectures, group work, group discussions, videos, posters, simulated real-life situations, demonstrations, and re-demonstrations. These strategies utilized interactive educational approaches to enhance learning and engagement.

Evaluation phase:

Low back pain intensity and fatigue were evaluated for the study group 6 times as a pre- and post-assessment):

At the first week:

- The first evaluation was conducted before applying the exercise session (pre-test).
- The second one took place immediately after the first exercise session (post-test).

At the second week:

- The third evaluation was conducted prior to the second exercise session (pre- test).
- The fourth evaluation was conducted immediately after the second exercise session (post-test).

At the third week:

- The sixth evaluation was carried out immediately following the third exercise session (post- test).

Statistical analysis

- A computer was utilized to input data through the IBM SPSS software program version 24.0. The homogeneity of the data was assessed using the Shapiro-Wilk test. The results revealed p-values above 0.05 for both the Shapiro-Wilk and Kolmogorov-Smirnov tests, indicating that the data was parametric. Upon calculating the questionnaire's Cronbach's alpha, a value of 0.86 was derived, demonstrating its stability and reliability.
- Numerical and percentage descriptions of the qualitative data were provided. The Chi-square test was used to compare several groups with respect to categorical variables. For regularly distributed data, the mean and standard deviation were used to characterize quantitative data. The independent t-test was used to compare two independent populations of properly distributed data. The significance of the acquired results was assessed at the 5% level, and the significance test results were reported as two-tailed probabilities.

Results:

Table (1): Distribution of the both study and control groups according to their general characteristics

Variables	Study group"n=50"		Control group"n=50"		X^2 P value
	No	%	No	%	
Age group (years)					
- 20 – 25	12	24.0	20	40.0	
- 21 – 30	6	12.0	3	6.0	
- 26 – 30	23	46.0	20	40.0	8.31
- 31 – 35	9	18.0	7	14.0	0.061
- **Range**	**20-35**		**20-34**		
- **Mean±S.D.**	**28.0±3.73**		**26.5±3.38**		
Level of education					
- Illiterate/reads	1	2.0	0	0.0	
- Primary	6	12.0	4	8.0	3.390
- Secondary	24	48.0	26	52.0	0.495
- University or above	19	38.0	20	40.0	
Occupation					0.469
- Worker	26	52.0	30	60.0	0.273
- Not working	24	48.0	20	40.0	
Current residence					
- Urban	29	50.0	33	66.0	1.207
- Rural	21	36.0	17	26.0	0.547
Type of family					3.467
- Extend	15	30	17	34	0.483
- Nuclear	35	70	33	66	
Wanted /Planned pregnancy					0.122
- Yes	46	92.0	45	90.0	0.500
- No	4	8.0	5	10.0	

Table (2): Comparison of Maternal and Fetal Clinical Characteristics Between the Study and Control Groups

Variables	Study group"n=50"	Control group"n=50"	T test P value
Maternal weight			
- Range	65.0-85.0	60.0-87.0	0.535
- Mean± SD	75.5± 5.9	77.8± 6.4	0.466
Maternal height			
- Range	148.0-172.0	165.0-171.0	0.485
- Mean± SD	164.1± 4.6	168.0± 2.1	0.488
Maternal BMI (kg/m2)			
- Range	23.7-29.8	21.8-29.8	0.146
- Mean± SD	28.0± 1.8	27.6± 2.2	0.703
Maternal pulse			
- Range	74.0-90.0	66.0-88.0	0.005
- Mean± SD	80.8± 4.1	80.7± 6.4	0.941
Maternal systolic blood pressure			
- Range	110.0-124.0	110.0-126.0	0.067
- Mean± SD	114.3± 4.9	114.5± 5.2	0.796
Maternal diastolic blood pressure			
- Range	70.0-82.0	68.0-88.0	3.748
- Mean± SD	75.9± 4.3	77.8± 5.4	0.056
Maternal temperature			
- Range	36.50-37.50	36.50-37.50	0.863
- Mean ± SD	36.8± 0.3	36.9± 0.3	0.355
Maternal respiratory rate			
- Range	15.0-19.0	14.0-20.0	0.148
- Mean± SD	17.3± 1.0	17.2± 1.6	0.701
Fetal heart rate			
- Range	120.0-155.0	120.0-150.0	0.111
- Mean± SD	135.7± 9.2	136.3± 7.5	0.740

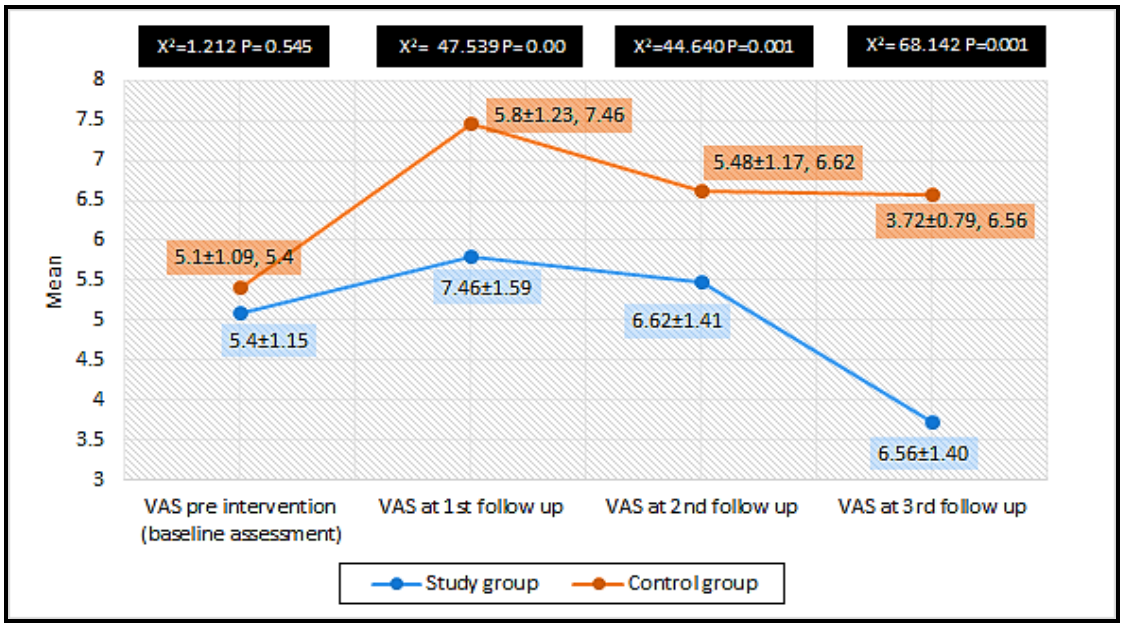

Figure (1): Comparison of Visual Analog Scale (VAS) Scores between study and control groups at pre intervention and different follow-up intervals

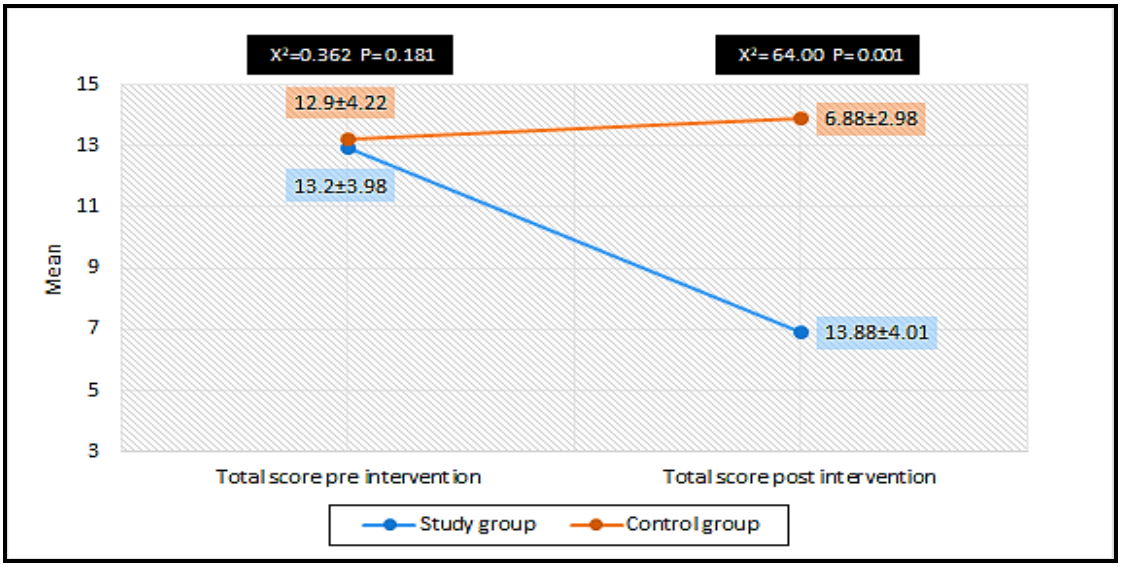

Figure (2): Comparison of Fatigue Assessment scale (FAS) between the study and control groups at before and after the intervention

The general characteristics of the study participants (n = 100) were explained in **Table (1):** No significant differences (P > 0.05) were observed between the study and control groups in terms of age, education, occupation, current residence, family type, and monthly income. Likewise, there was no significant difference (P > 0.05) in the planned or wanted pregnancy. In addition, it was elucidated that the mean was 75.5 ± 5.9 and 77.8 ± 6.4 among the study and control groups, respectively, for maternal weight, 164.1 ± 4.6 and 168.0 ± 2.1 for maternal height, and 28.0 ± 1.8 and 27.6 ± 2.2 for maternal BMI.

Concerning clinical data about mothers and fetuses, **Table (2):** Presented the study and control groups' mean maternal weight was 75.5±5.9 &77.8±6.4 respectively; mean maternal height was164.1±4.6&168.0±2.1 respectively; mean maternal BMI was 28.0±1.8& 27.6±2.2 respectively; mean maternal pulse was 80.8±4.1& 80.7±6.4 b/m respectively; mean maternal systolic BP was 114.3±4.9 & 114.5±5.2 mm Hg respectively; mean maternal diastolic BP was 75.9±4.3& 77.03 ± 77.8±5.4 mm Hg respectively; mean maternal temperature was 36.8±0.3 & 36.9±0.3 ° C respectively; mean maternal respiration was 17.3±1.0 & 17.2±1.6 breaths/m respectively; and mean FHR was 135.7±9.2 & 136.3±7.5 b/m respectively. Nevertheless, the two groups were homogenous, and the relationship between their clinical data was not statistically significant.

Figure (1): Illuminates the comparison of Visual Analog Scale (VAS) scores between the study and control groups at pre-intervention and various follow-up time points. Prior to the intervention, no statistically significant difference in pain levels existed between the two groups (p = 0.545). However, a remarkably significant difference was observed at each subsequent evaluation. The study group surpassed the control group at all three subsequent follow-ups (p = 0.00, p = 0.001, and p = 0.001, respectively). This indicates the efficacy of the intervention in diminishing pain levels over time within the study group in contrast to the control group.

Figure (2): Displays a comparison of fatigue assessment scales (FAS) between the study and control groups before and after the intervention. Pre-intervention, the distribution of fatigue levels was similar between the two groups, with no significant difference (p = 0.181). Following the intervention, a difference of statistical significance (p = 0.001) emerged between the experimental and control groups, favoring the former. This indicates the efficacy of the intervention in diminishing fatigue levels over the course of time within the experimental group as opposed to the control group.

Discussion

During pregnancy, almost all women experience pregnancy-related symptoms such as low back pain, which is considered the most common musculoskeletal pain during pregnancy that may affect mothers quality of life and prevent them from doing daily activities **(Salari et al., 2023)**. Fatigue is another complaint of pregnant women that depletes them of physical energy and muscle strength and

increases rates of pregnant morbidity, cesarean sections, preterm birth, and even postpartum depression **(Baattaiah et al., 2023)**. Pregnancy exercise with a ball is an effective way to reduce back pain and fatigue in late pregnancy **(Zhang et al., 2022; Solihah et al., 2023)**.

Overall, the study findings show that sociodemographic and clinical data for the studied groups were similar. This indicates that most women attending the study sitting share a similar socioeconomic status. The homogeneity of the participants' profiles was advantageous in minimizing extraneous factors that could influence the effect of the intervention on post-pain intensity. This consistency also contributed to a clearer understanding and ensured the credibility and reliability of the research findings.

This research aims to evaluate the effectiveness of birth ball abdominal core training on fatigue and low back pain among primigravida. The present study's results demonstrated a noteworthy decrease in VAS pain scores at each of the three pain intensity evaluation points and reduction in fatigue, as reflected in the FAS scores in the intervention group when compared to the control group, thereby fulfilling the study's aim. Consequently, the study hypothesis is accepted.

Due to the spine changes and pressure on the nervous system, it is believed that physiological and hormonal changes are the main cause for low back pain during pregnancy **(Tavares et al., 2020; Solihah et al., 2023)**. Previous studies reported the efficacy of ball exercise, which improved posture, muscle alignment, and the center of gravity during pregnancy. Therefore, it reduces lower back pain **(Izahar et al., 2020; Solihah et al., 2023)**.

In the present research work, the VAS scale was used to evaluate the severity of low back pain before and after birth ball abdominal core training. Following birth ball training, the current study's post-interventional analysis revealed a statistically significant reduction in pain intensity, with a p-value of 0.001 (>0.05), proving that birth ball exercise in late pregnancy had a beneficial effect in reducing low back pain. This result is consistent with the findings of **(Izahar et al., 2020**).

Moreover, birth ball exercise strengthens the core muscles and stabilizes the trunk, which reduces the likelihood of back injuries and also reduces back pain, which correlates with the findings of **Yan et al. (2014)**. Again, the same conclusion was provided by **Zhang et al. (2022)**, evaluated the effect of birthing ball training on low back pain in mid- and late pregnancy. It was found that in the intervention group, there was a significant reduction in back pain compared to the primigravida in the control group.

Along these similar lines, **Rasyid & Igirisa's (2019)** quasi-experimental study shows that birth ball training has been shown to be successful in helping third-trimester pregnant women with their back pain. The research results indicate that back discomfort varied between pre- and post-birth ball training. The current study finding could be explained as birth ball abdominal core training can improve blood circulation, strengthen stomach and back muscles, and help to distribute body weight more evenly, which can relieve spinal pressure and relieve back pain.

In addition, birthing ball training maintains correct back posture, reducing mechanical stress on the spine, and plays an important role in managing back pain **(Kripa & Kaur, 2021)**. Therefore, using birth ball abdominal training to train the abdominal core is an effective method to strengthen muscles in the core areas, improve stability and control of the lumber vertebrae, and provide specific rehabilitative and training effects on low back muscles during pregnancy **(Woodley & Hay-Smith, 2021)**.

Fatigue during pregnancy is associated with an increase in gestational week, weight gain, a proportional rise in the organ load of pregnant women, an increase in heart output, a decrease in internal blood flow, and a depletion of physical energy and muscle strength **(Mortazavi & Borzoee, 2019)**. Studies have shown that physical activity during pregnancy can alleviate weakness and fatigue in pregnant women and boost their energy levels **(Cilar et al., 2022 &Yan et al., 2024)**. Pregnancy ball exercises can improve blood circulation and reduce fatigue during pregnancy. However, the current study showed a significant reduction in fatigue level that was considerably lower in the intervention group than in the control group, revealing that ball exercise could effectively relive fatigue among pregnant women. The current results are similar to those of **Zhang et al. (2022)**, found that women's perceptions of fatigue were much lower in the birth ball group than the control group. The results of the current study can be explained by the fact that birth ball training is effective in improving the self-efficacy of a primigravida woman. It is not only to reduce pain but also to improve the upbringing components, which are emotional and psychological. Women engaged in birthing ball training feel empowered physically and psychologically as they take an active role in their own care during pregnancy, which helps them improve control over their body posture, avoid unnecessary efforts, and save energy, which eventually reduces fatigue and exhaustion during pregnancy.

Addressing low back pain and fatigue during pregnancy is a priority of maternal intervention, while

the ball exercise can prove to be an important tool for the same. Thus, the study findings stressed that birth ball abdominal core training was an effective method that can be utilized by maternity nurses as one of the nursing strategies that manage and decrease low back pain intensity and fatigue during pregnancy.

Conclusion

In conclusion, the present study has shown that birth ball abdominal core training during the 3rd trimester of pregnancy reduces low back pain intensity and fatigue level. Therefore, birthing ball training can prove to be a simple and effective intervention that can be used to reduce low back pain and fatigue during pregnancy.

Recommendations

In the light of the study findings, the following recommendations are recommended;

- Birth ball abdominal core training should be utilized by maternity nurses as a part of routine prenatal care to reduce low back pain and fatigue.
- Further studies are needed to assess parturient women's satisfaction regarding the use of birth ball core training.

Reference

- **ACOG (2020):** Physical activity and exercise during pregnancy and the postpartum period: ACOG Committee Opinion, Number 804. Obstetrics and Gynecology, Vol.(135), No.(4), Pp.e178-e188.
- **Akmeşe, Z. & Oran, N. (2014):** Effects of progressive muscle relaxation exercises accompanied by music on low back pain and quality of life during pregnancy. Journal of Midwifery & Women's Health, Vol.(59), No.(5), Pp.503-509.
- **Al-Mutawtah, M., Campbell, E., & Kubis, HP. (2023):** Women's experiences of social support during pregnancy: a qualitative systematic review. BMC Pregnancy Childbirth 23, 782. https://doi.org/10.1186/s12884-023-06089-0
- **Baattaiah, B., Alharbi, M., Babteen, N., Al-Maqbool, H., Babgi, F. & Albatati, A. (2023):** The relationship between fatigue, sleep quality, resilience, and the risk of postpartum depression: an emphasis on maternal mental health. BMC Psychology, Vol.(11), No.(1), Pp.10.
- **Cilar Budler, L. & Budler, M. (2022):** Physical activity during pregnancy: a systematic review for the assessment of current evidence with future recommendations. BMC Sports Science, Medicine and Rehabilitation, Vol.(14), No.(1), Pp.133.
- **Cunningham, F., Leveno, K., Bloom, S., Spong, C., Dashe, J., Hoffman, B., Casey, B. & Sheffield, J. (2014):** Williams Obstetric, 24th ed. New York: McGraw-Hill Companies.
- **Doula Association. (2023):** Pregnancy, Birth & Postpartum Doulas. from https://nmdoula.org/what-is-a-doula/pregnancy-birth-postpartum-doulas/. [Accessed in: July, 2024]
- **Drent, M., Lower, E. & De Vries, J. (2012):** Sarcoidosis-associated fatigue. The European Respiratory Journal, Vol.(40), No.(1), Pp.255-263.
- **Izahar, F., Naqvi, Q. & Aftab, A. (2020):** Effectiveness of stability ball exercises and ergonomics training in pregnancy related low back pain. T Rehabili. J, Vol.(4), No.(02), Pp.172-178.
- **Kripa, S. & Kaur, H. (2021):** Identifying relations between posture and pain in lower back pain patients: a narrative review. Bulletin of Faculty of Physical Therapy, Vol.(26), Pp.34.
- **Mortazavi, F. & Borzoee, F. (2019):** Fatigue in pregnancy: the validity and reliability of the Farsi multidimensional assessment of fatigue scale. Sultan Qaboos University Medical Journal, Vol.(19), No.(1), Pp.e44.
- **Niu, H., Han, H. & Ren, T. (2013):** Analysis of factors related to fatigue during pregnancy. Chinese Folk Medicine, Vol.(22), No.(21), Pp.75.
- **Rasyid, P. & Igirisa, Y. (2019):** The effect of birthball training to back pain in third trimester pregnant women in Kabila Community Health Center. Health Notions, Vol.(3), No.(4), Pp.173-177.
- **Salari, N., Mohammadi, A., Hemmati, M., Hasheminezhad, R., Kani, S., Shohaimi, S. & Mohammadi, M. (2023):** The global prevalence of low back pain in pregnancy: a comprehensive systematic review and meta-analysis. BMC Pregnancy and Childbirth, Vol.(23), No.(1), Pp.830.
- **Sheishaa, D., El-Mashad, H. & Khedr, N. (2019):** Effect of birthing ball exercises during pregnancy on the first stage progress of labor. International Journal of Nursing, Vol.(7), No.(2), Pp.47-67.
- **Shutterstock. (2020):** Beautiful young pregnant woman exercises with fit ball in the gym. from https://www.shutterstock.com/image-vector/beautiful-young-pregnant-woman-exercises-fit-1706585662. [Accessed in: July, 2024]
- **Solihah, R., Nurherliyany, M., Sandriani, S. & Putri, N. (2023):** The Effect of Gym Ball on Reducing Low Back Pain, Labor Pain, and Progress in Primigravida Labor. Nurul Ilmi: Journal of Health Sciences and Midwifery, Vol.(1), No.(1), Pp.30-36.
- **Stapleton, D., MacLennan, A. & Kristiansson, P. (2002):** The prevalence of recalled low back pain during and after pregnancy: a South Australian population survey. The Australian & New Zealand

Journal of Obstetrics & Gynaecology, Vol.(42), No.(5), Pp.482-485.

- **Tavares, P., Barrett, J., Hogg-Johnson, S., Ho, S., Corso, M., Batley, S., Wishloff, K. & Weis, C. (2020):** Prevalence of low back pain, pelvic girdle pain, and combination pain in a postpartum ontario population. Journal of Obstetrics and Gynaecology Canada, Vol.(42), No.(4), Pp.473-480.
- **U.S. Department of Health and Human Services [DHHS] (2018):** Physical activity guidelines for Americans, 2nd ed. Washington, DC: DHHS.
- **Woodforde, J. M. & Merskey, H. (1972):** Some relationships between subjective measures of pain. Journal of Psychosomatic Research, Vol.(16), No.(3), Pp.173-178.
- **Woodley, S. & Hay-Smith, E. (2021):** Narrative review of pelvic floor muscle training for childbearing women-why, when, what, and how. International Urogynecology Journal, Vol.(32), No.(7), Pp.1977-1988.
- **Yan, C., Hung, Y., Gau, M. & Lin, K. (2014):** Effects of a stability ball exercise programme on low back pain and daily life interference during pregnancy. Midwifery, Vol.(30), No.(4), Pp.412-419.
- **Yan, S., Jiang, H., Yang, Z., Tang, X., Chen, Z., Chen, Z., Liu, H. & Zhang, F. (2024):** Physical activity trajectory during pregnancy and associations with maternal fatigue using a growth mixture modeling approach. Scientific Reports, Vol.(14), No.(1), Pp.1020.
- **Zhang, R., Xiao, Y., Wei, W. & Wu, B. (2022):** Effect of birth ball abdominal core training on pregnancy fatigue, waist pain and delivery outcomes. International Journal of Gynaecology and Obstetrics, Vol.(158), No.(3), Pp.613-618.