Effect of Practicing Pelvic Tilt Exercise on the Intensity of Lumbopelvic Pain among Pregnant Women

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Abstract

Background: Lumbopelvic pain is the most common musculoskeletal complaint facing pregnant women which negatively affects their daily activities and quality of life. Pelvic tilt exercise helps in decreasing lumbopelvic pain that often occurs during pregnancy. **Aim**: The study aimed to evaluate the effect of practicing pelvic tilt exercise on the intensity of lumbopelvic pain among pregnant women. **Subject and method**: A quasi -experimental design was applied on 100 pregnant women having lumbopelvic pain who chosen by purposive sampling technique according to inclusion and exclusion criteria and was equally divided into two groups (study group = 50 women who was practice setting pelvic tilt exercise and control group=50 women who received routine hospital antenatal care. **Setting**: The study was carried out at outpatient clinic at Suez Canal University hospitals in Ismailia Governorate in Egypt. **Tools**: Three tools were utilized. *Tool 1:* Structured interviewing sheet. *Tool 2*: Pain Numeric Rating Scale (NRS). *Tool3*: Modified Oswestry Disability questionnaire (MODI). **Results**: The mean pain score and Modified Oswestry Disability pain were significantly decreased in the study group compared to the control group after 2 weeks of application of sitting pelvic tilt exercise ($P \leq 0.001$). **Conclusion**: Sitting pelvic tilt exercise was effective in reducing Lumbopelvic pain in pregnant women. **Recommendations**: Pelvic tilt exercise should be performed regularly as a part of routine antenatal care and designing of brochure about sitting pelvic tilt exercise for all pregnant women as a part of the routine antenatal care.

Keywords: Lumbopelvic pain, Pregnant women, Pelvic Tilt Exercise.

1. Introduction

Pregnancy is a very important and special time in a woman's life. The changes occurring during the course of pregnancy concern not only the development of the fetus but mainly the adaptation of the woman's body to motherhood. Natural body adaptations as a consequence of pregnancy development on hormonal and anatomical changes often lead to pain ***(Baran et al., 2022).***

Pregnancy-induced biomechanical, hormonal and vascular changes are likely to cause a broad range of musculoskeletal problems. Since the most common musculoskeletal problems associated with pregnancy affect

the well-being of the pregnant women is low back pain, low back pain condition has acquired increasing interest around the world ***(Tomaszewska et al., 2021).***

Lumbopelvic pain (LPP) is the most common pregnancy related musculoskeletal complaint. LBP is usually defined as pain between the twelfth rib and the gluteal fold, while pain experienced between the posterior iliac crest and the gluteal fold particularly near to the sacroiliac joints is defined as Pelvic Girdle Pain (PGP) ***(Hu, et al., 2020).***

Low back pain (LBP) during pregnancy is a syndrome characterized by the main symptom of discomfort in the back of the body starting from the last rib or 12th thoracic vertebra to the buttocks or anus due to the influence of hormones cause disorders of the spine, the pain is intermitted and aggravated by doing activities with same position in a long time, usually happens in 30 minutes like walking, sitting and standing ***(Yuningsih et al., 2022).***

Low back pain (LPB) is commonly experienced during pregnancy, affecting approximately 50% of pregnant women associated with significant morbidity in pregnant and post-partum. Despite prevalence, LBP during pregnancy is often considered a normal phenomenon. Benign neglect can contribute to physical inactivity during pregnancy, resulting in a higher incidence of obstetric complications ***(Bailly et al., 2021).***

Moreover, several factors have been associated with the development of low back pain during pregnancy. More specifically, hard work, a history of low back pain before pregnancy, previous history of pregnancy-related low back pain, number of pregnancy, pain catasttrophizing, thereby causes abnormal strain on the axial low back elements ***(Berber and Satılmış, 2020).***

Non-pharmacological interventions are very important in the management of musculoskeletal conditions as providing reduction of pain, psychological distress, and disability with little or no risks/side effects on pregnant women. These interventions may include physical activity and women education programs, psychological interventions, relaxation techniques and exercises **(*Ninot, 2021).***

Other alternative methods such as pelvic tilt exercise, nerve stimulation, physiotherapy, yoga, stabilization belts, relaxation, pharmacological treatment, and massage are

the gold standards conservative treatment of LPP ***(Sharaby & Abd Ellatef, 2019).*** Also, pelvic tilt exercise can be a preventive measure to reduce the occurrence of LPP or to decrease the pain intensity and the possibility of disability ***(Zakaria, Tompunuh & Porouw, 2019).***

A pregnant woman should do the pelvic tilts in several positions: lying on back or side, sitting on chair or ball, or kneeling on all fours Since the aorta and inferior vena cava may be occluded by increased weight and size of the uterus, developing the supine hypotension or inferior vena cava syndrome when the back lying position is assumed. Pregnant women whose gestational age is more than 6 months should not be allowed to do prolonged exercise in the supine position. So, pelvic tilt exercise in sitting position is preferred ***(Augustina et al., 2020).***

Nurses play an essential role in improving the quality of antenatal care, which provides pregnant women with education and support regarding the conservative treatment of back pain during pregnancy as performing sitting pelvic tilt exercise to alleviate pain and stiffness, strengthen core and prevents long-term issues by encouraging neutral alignment in the pelvic. Nurses educate women about technique of sitting pelvic tilt exercise; proper body mechanics and support correct posture, which is vital to avoid excessive stress in supporting structures (***Klankhaihon and Sthien, 2022).***

Significance of the Study:

Lumbopelvic pain is the most common dysfunction affecting the musculoskeletal system during pregnancy. Worldwide, according to most studies report, the average of LPP prevalence is 50%. LPP is associated with functional disability which has a significant effect on pregnant women choice for elective caesarean sections before 39 weeks of pregnancy to alleviate LPP ***(Acharya et al.; 2019; Vermani, Mittal &Weeks, 2010; Meucci 2020)***.

Among the most effective strategies to reduce the LPP is the pelvic tilt exercise which increases the flexibility of the muscles needed to compensate the large abdominal mass and maintains normal posture during pregnancy. In Egypt, national study conducted at El-Menofia revealed that 61.1% of the primigravida suffer from back pain compared to 41.4% among multigravida in their pregnancy ***(Ayoub & Awed, 2018).*** **Besides**, there is no previous study was done

at Suez Canal University Faculty of Nursing addressed effect of sitting pelvic tilt exercise on low back pain during pregnancy. Therefore**,** this study was performed to evaluate the effect of practicing pelvic tilt exercise on the intensity of lumbopelvic Pain among pregnant women at Suez Canal University Hospitals.

The Aim of the study:

The current study aimed to evaluate the effect of practicing pelvic tilt exercise on the intensity of lumbopelvic pain among pregnant women.

Research questions:

Hypothesis I Pregnant women who practice pelvic tilt exercise will experience less intensity of lumbopelvic pain compared to those who do not practice.

Hypothesis II Pregnant women who practice pelvic tilt exercise will experience less disability score in performing daily activities compared to those who do not practice.

2. Subject and Method

Study design: A Quasi–experimental design was utilized in this study.

Study setting: The study was conducted at outpatient clinics for antenatal care at Suez Canal University Hospitals in Ismailia Governorate, Egypt.

Sample type: A purposive sample.

Sample size:

100 pregnant women having lumbopelvic pain was selected according to inclusion and exclusion criteria and was equally divided into two groups (study group = 50 women who was practice setting pelvic tilt exercise and control group=50 women who received routine hospital antenatal care. The sample size was calculated according to the following equation:

$$n = 2\left[\frac{(Z_{\alpha/2} + Z_{\beta}) * \sigma}{\mu_1 - \mu_2}\right]^2$$

(Dawson,2004)

Where n= sample size**,** Z α/2 = 1.96, Zβ = 0.84, σ = the estimate of the standard deviation (10.9)**,** µ1 = mean post intervention (38.7), µ2 = mean pre intervention (34.4) (**Marzouk and Fadel, 2020).**

Inclusion criteria:

- In third trimester
- Singleton pregnancy
- Have Normal pregnancy without any medical disease.

- Body Mass Index (less than or equal 24.9)

Exclusion criteria

- **F**ibromyalgia
- High risk pregnancy
- Usage of any analgesics
- History of spinal and rheumatologic disorders
- Women with history of any vertebral spine fracture or surgery
- Chronic back pain for more than 3 months and back pain after trauma

Tools of data collection:

Three main tools were utilized to collect data for the current study.

Tool (1): A structured interviewing questionnaire: This questionnaire was developed by the researcher after extensive reviewing of recent and relevant literature **(Ather et al., 2020; Rahmawati et al., 2020; Weis et al., 2020**). It was written in in the form of closed ended questions and It consists of three parts:

Part 1: General characteristics data of the studied pregnant women and composed of 4 closed ended questions included: age,educational level, occupation and residence.

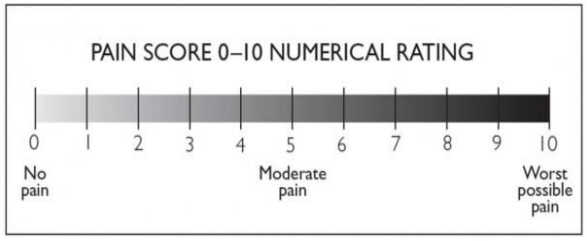
Part 2: Obstetric history of studied pregnant women and composed of 5 closed ended questions included; gravidity, parity, gestational age, number of living children and mode of previous deliveries.

Part 3:

A: characteristics of back pain and pelvic gridle pain (location, radiation, quality duration, frequency, onset, duration, time of worst pain, aggravating factors and alleviating factors)

b: lifestyle and job pattern that require activities such as regular bending, standing long periods, using stairs regularly, regular lifting**.**

Tool (2): Numeric Rating Scale (NRS): This tool was adopted from **Jensen & McFarland (1993)** to assess the intensity of lumbopelvic pain. It is the most frequently assessment tool used in the clinical setting with constant scale paces, a straight line with symbols spaced (1) cm distant. It is a subjective assessment tool, the pregnant women will have the option to verbally rate their pain intensity as a number or put a dot on the line. It consists of 11-point ranging from (0 -10) where zero was no pain and 10 the worst possible pain.



(Jensen & McFarland, 1993).

Tool (III): Modified Oswestry Disability Pain Index (MODI): It was adopted from **Fritz and Irrgang, (2001)** it was translated into Arabic language by the researcher to evaluate how was low back pain limits ability of a studied pregnant woman to achieve daily living activities. It comprised of ten items (intensity of pain, personal care such as washing or dressing, lifting, walking, siting, standing, sleeping, social life, travelling and employment, home making)

Scoring system:

Each item was evaluated by selecting one out of six options ranged from 0 which mean woman's ability to perform daily activities and did not have LBP to 5 which representing the greatest disability because of LBP. The total score was (50) and multiplied by 100. Disabilities classified as the following:

0-20% means Minimal disability

21-40% means Moderate disability

41-60% means severe disability

61-80% means Crippled disability

81-100% means Bed-pound disability

Tool validity and reliability:

Tools of data collection were reviewed by three panel expertise of Obstetrics and Gynecological Health Nursing Faculty of Nursing Suez Canal University to test content validity. Modifications were made in the light of valuable comments. Questionnaires were modified related to clarity of sentences, consistency and appropriateness of content, the sequence of items, and accuracy, and relevance, comprehensiveness of tools. Reliability of tools was done Cronbach's alpha for test internal consistency for Numeric Rating Scale 0.90 **(Jensen & McFarland, 1993)** and for Modified Oswestry Disability pain index0.87 **(Fritz and Irrgange, 2001).**

Field of work:

The present study was carried out from the beginning of January 2023 and completed at the end of June 2023 covering six months. The researcher visited the previously mentioned setting three days/week (Saturday, Monday and Wednesday) from 9.00 Am to 3.00 pm.

For both groups at the beginning of the interview the researcher greeted the pregnant women and introduced herself then the purpose of the study was explained by the researcher. The researcher provided the pregnant women with all information about the study (purpose, duration, and benefits) and took written consent of participants in the study.

Initial assessment (pretest) was done which took around 30 minutes included of the structured interview questionnaire sheet took 5 minutes, Numeric Rating Scale (NRS) took 5 minutes and Modified Oswestry Disability Pain Index was taken 10 minutes. Tools were completed through face-to-face interviews in a private room in order to minimize distraction and ensure privacy in both groups by the researcher. The data obtained constituted the baseline for further comparison to evaluate the effect of sitting pelvic tilt exercise on lumbopelvic pain.

For the study group:

The researcher divided the pregnant women in the study group into 13 subgroups; each group included 4-5 women per day of data collection. Each group attended 3 sessions, the duration of each session 30-45 minutes. The researcher divided these sessions into 2theoritical sessions and 1 practical session. Women's telephone numbers were taken to ensure contact and follow up.

First theoretical session the researcher discussed all items of physiological changes during pregnancy on musculoskeletal system and it's effect on pregnant women, general knowledge about low back pain, causes of low back pain, signs and symptoms and adverse effect of low back pain on pregnant women during pregnancy.

Second theoretical session the researcher illustrated to the pregnant women about benefits of sitting pelvic tilt exercise, the position of sitting pelvic tilt exercise and precautions for exercising during pregnancy. Also, contraindications and danger signs to stop exercise.

Third practical session the pregnant women were instructed and trained about how to apply sitting pelvic tilt exercise. The women advised to sit on a firm surface edge of the bed, or chair (sitting clear of the back), sit upright with shoulders relaxed, head level and eyes looking straight. Drop the trunk down from a point on the breast bone while letting the pelvis tip down and back, Then sit up straight, tilting the pelvis slightly forward and bringing the breast bone up and forward,

making stretch back upright, head should remain level with eyes focused should feel that weight comes forward over the hips, Repeat 2-3 times/day. The pregnant women received redemonstration about sitting pelvic tilt exercise technique. After the end of the session, each pregnant woman was asked to re-demonstrate the sitting pelvic tilt exercise. the researcher used distributed Arabic brochure containing colored picture that clarified the steps of exercise, followed by watching an educational video on laptop. Then, the pregnant women were instructed to do it at home two to three times per day with 10 repetitions in each time. and to perform exercise for two consecutive weeks. Women were followed and encouraged for compliance with sitting pelvic tilt exercise through telephone calls and during antenatal follow up visits at Suez Canal University hospitals.

Technique of sitting pelvic tilt exercise on chair
Adopted from (Kenneth, A. (2021). Manual Physical Thereby of the Spine E- Book, 3rd ed, Elsevier, 466.

For the control group:

The pregnant women were received the routine antenatal care. The researcher started with control group and interviewed 2-3 women per day. There was no structured plan for the education. Otherwise, the researcher answered any women's questions about the educational topic as needed.

Evaluation phase:

After 2 weeks, both groups Were reassessed through post-test (NRS) (tool II) and (MODI) tool (III) by the researcher to evaluate the effect of sitting pelvic tilt exercise on lumbopelvic pain.

Pilot study:

The pilot study was conducted over a period of one month, from the beginning of December 2022 up to the beginning of January 2023. The pilot study was carried out on ten percent of total sample (10 women) to test the clarity, feasibility and applicability of the study tools. Also, detect any obstacles that face the researcher during the study and estimate the time needed to fill tools. No required modifications were done. pilot study was excluded from the study sample.

Ethical considerations:

The study proposal was approved by the Research Ethics Committee at Faculty of

Nursing Suez Canal (committee no. 157/7.2022). After obtaining the official agreement from the ethical committee of faculty of nursing, Suez Canal University, the researcher explained the nature of the study and reassured women's that the obtained data will be confidential and used only for the purpose of the study. They informed about their right to withdraw from the study at any time she wants. No harm or any physical, social or psychological risk for participants. Each woman was informed about the purpose and benefits of the study. Maintain confidentiality, self-esteem and dignity of studied women. Then researcher obtained a written consent from the selected women who meet the inclusion and exclusion criteria mentioned .

An official permission letter directed from the Dean of the Faculty of Nursing at Suez Canal University to the director of Suez Canal University Hospitals to obtain their permission to conduct the study after illustrating the title and its purpose.

Data analysis:

The study was conducted using the Statistical Package for the Social Sciences (SPSS) Version 27 for Windows. Data analysis: Descriptive statistics are important for describing patient characteristics and baseline measurements. Group differences can be analyzed using the Least Significant Difference (equivalent to no adjustments for multiple comparisons) or chi-squared tests, including Monte Carlo and Fisher exact tests for categorical variables and analysis of variance (Repeated Measures ANOVA) for continuous variables. Cohen's d was used to estimate the magnitude of the difference between means and standard deviation units. Partial Eta Squared is a commonly used method in ANOVA to quantify the proportion of variance explained. Linear regression was used to develop predictions about pain and disability. The P-value was <.05, indicating significance.

3. Results

Table (1): shows that more than half of control and study groups, their age ranged from 21 to less than 25 years old (54% and 58 % respectively) and around two third of them had university education (62 % and 68 % respectively). Also, more than half (58%) of them were working. Regarding residence more than half of both groups were living in

rural areas (58% and 54% respectively). differences observed were not statistically significant.

Table (2): reveals that there was no statistically significance difference between both groups regarding pain score before application of sitting pelvic tilt exercise (P> 0.05), on the other hand, the mean pain score was significantly decreased in the study group 4.36 ± 1.35 after 2 weeks of application of sitting pelvic tilt exercise compared to 7.36 ± 1.40 in the control group (P ≤ 0.001). indicating significant improvement after intervention.

Figure (1): Demonstrates that slightly more than three quarters (76%) of the study group and slightly less than three quarters (74%) of control group had severe pain level before sitting pelvic tilt exercise application while after intervention. One quarter of the control group had severe pain level (24%) and no woman complain from severe pain of study group.

Table (3): Describes that, before exercise there were no significant difference between the groups. After 2 weeks, the study group showed a significant reduction in overall disability score 17.52 ± 4.68 compared to the control group 26.40 ± 4.31, with a mean statistical difference (p <.001). Significant improvement of total mean of pain was observed in the study group after 2 weeks of exercise (p <.001)

Figure (2): demonstrates that slightly more than three quarters(76%) of the study group and slightly less than three quarters(74%) of control group had sever disability level pre intervention .while after 2weeks of sitting pelvic tilt exercise application less than one tinth of the study group had sever disability level (8%) compared by more than four fifth (82%) of control group complain from severe disability.

Table (4): reveals the relationships between total pain and total disability in both the study and control groups. In the study group, strong positive correlations were identified between total pain and total disability at both pre- and post-intervention assessments (p <.001) demonstrating that higher levels of pain were correlated with greater impairment.

4. Discussion

During pregnancy, many discomforts are experienced by pregnant women. The

effects of discomforts on daily living activity of pregnant women are usually minor and self-limiting. Musculoskeletal complaints such as low back pain are described as minor discomforts or unpleasant symptoms; however women may suffer considerable levels of pain and disability with social and economic consequences **(Devkate et al., 2022).**

Exercise during pregnancy as sitting pelvic tilt very important for strengthening the abdominal muscles and for reducing the possibility of back pain. Exercise restores the muscles and nerves to normal function. Potential benefits of exercise during pregnancy includes a decrease in pregnancy related discomfort, boosts energy level, reduce fatigue, shortened labor and perhaps an increase in the likelihood of vaginal delivery **(Afzal et al., 2022).**

The current study aimed to evaluate the effect of pelvic tilt exercise on the intensity of lumbopelvic pain among pregnant women.

Regarding characteristics of studied pregnant women: the result of current study shows that, more than half of control and study group, their age ranged from 21 to less than 25 years old (54% and 58 % respectively).

Regarding educational level, around two third of them had university education (62 % and 68 % respectively). Also, more than half (58%) of them were working. Regarding residence, more than half of control and study group were living in rural areas (58% and 54% respectively).

These findings were in the same line with a study of **Wissel et al., (2019)** which entitled "the effect of sitting pelvic tilt exercise on low back pain and sleep disorder in primigravidae in the third trimester" and was conducted in Irain and reported that, more than half of the study and control groups were in age group 20-<25 years old with mean 22.25 SD ±2.81 years and 23.64 ±3.28 years and added, more than half of the study and control groups had secondary education, more than two thirds of study groups and more than half of control group were working and nearly two thirds of study group and more than three quarters of control group were living in rural areas .

While, these findings were in contrast

with study of **Runjati, (2020)** entitled "Utilization of Back Movement Technique to Intensity of Low Back Pain in Third Trimester Pregnant Women" and was conducted in Indonesia and found that the mean age of women in study group was 25.9 ± 7.9 years and in control group was 32.9 ± 7.9 years. Also reported that more than half of study and control groups had university education. In term of occupation, more than three quarters of study group and more than half of control groups were housewives. According to residence in study group and in control group was living in urban areas. This difference with present results may be due to differences in culture and setting of studied women of study.

The results of this study may be due to the homogeneity of the women in the term of age were due to this is the age of marriage in Egypt. As regard occupation, due to the difficulty of economic life requirements. While regard residence, due to the sample was collected from Suez Canal University Hospitals, which serves most of the villages of Ismailia.

Regarding low back pain intensity of studied pregnant women before and after application of sitting pelvic tilt exercise this current study revealed that there was no statistically significance difference between both groups regarding pain score before application of sitting pelvic tilt exercise (P> 0.05), on the other hand, the mean pain score was significantly decreased in the study group compared to the control group after 2 weeks of application of sitting pelvic tilt exercise on study group ($P \leq 0.001$). That which supported Hypothesis I which named Pregnant women who practice pelvic tilt exercise will experience less intensity of lumbopelvic pain.

These findings were in the same line with **Nooman et al., (2023)** entitled " Effect of Sitting Pelvic Tilt Exercise on Low Back Pain among Primigravidae Women " in Egypt which reported that mean of pain in study group before application of sitting pelvic tilt exercise was 7.53 ± 1.48 and post exercise application was 4.93 ± 1.69. Mean of pain in control group was 7.38 ± 1.45but post test were 7.46 ± 1.53, there were highly statistically significant deference between study and control groups regarding mean pain score pre and post intervention of study group than the control group ($p<0.001$).

Also these findings were agree with study of **Kurniyati and Bakara, (2021)** entitled "Pelvic Tilt Exercise against Lower Back Pain for Third Trimester Pregnant Women" and a study of **Wijayani, (2022)** entitled "The effect of Lumbopelvic Exercise on Low Back Pain in Pregnant Mother" which reported that mean of pain in study group before application of sitting pelvic tilt exercise was 6.80 ±1.38 and post exercise application was 3.92 ±1.63. Mean of pain in control group was 7.38 ±1.03 but post test were 6.55 ±1.82 there were highly statistically significant deference between study and control groups regarding mean pain score pre and post intervention of study group than the control group ($p<0.001$).

Additionally, **Ariendha et al., (2022)** study entitled "The Effect of Pregnancy Exercises on Low Back Pain in Pregnant Women" and showed that that mean of pain in study group before application of sitting pelvic tilt exercise was 6.90 ±1.74 and post sitting pelvic tilt exercise application was 4.58 ±1.03. Mean of pain in control group during pretest was 7.15 ±1.73 but posttest was 6.05 ±1.38 there were highly statistically significant deference between study and control groups regarding mean pain score pre and post intervention in study group than control group ($p<0.001$).

This study finding may be due to the effective of sitting pelvic tilt exercise on low back pain that helps to mobilize the lumbar joints and restore normal vertebral motion create cyclical interstitial pressure changes within the muscles and passive tissues of the spine and in sequence decrease low back pain.

Regarding Distribution of the studied women in the study and control groups according to pain score before and after 2 weeks of exercise application, The findings of the present study illustrated that, slightly more than three quarters (76%) of the study group and slightly less than three quarters (74%) of control group had sever pain level before sitting pelvic tilt exercise application while after sitting pelvic tilt exercise application about one quarter of the control group had sever pain level (24%) . and no woman complain from severe pain of study group.

These findings were in agreement with the study of **Nengsih et al., (2021)** titled "The Effectiveness of Pregnancy Exercise in

Relieving Back Pain during Third Trimester of Pregnancy" who reported that less than three quarters of study group had severe pain score before sitting pelvic tilt exercise application compared by 19.1% after exercise application. While more than two thirds of control group had severe pain score during pretest compared by more than two thirds after posttest.

Also, These findings were in agreement with **Nooman et al., (2023)** which reported, less than three quarters of study group had sever pain score before exercise application compared by 17.1% after 4 weeks of exercise application. While more than two thirds of control group had severe pain score before exercise application compared by more than two thirds after 4 weeks of exercise application.

This could be related to the sitting pelvic tilt exercise increase flexibility to prevent lumbar extension and strengthen abdominal and gluteal muscles to overcome low back pain.

Regarding modified oswestry disability pain score before and after applying sitting pelvic tilt exercise. This current study clarified that there were no statistically significant difference between study and control groups regarding all items of Modified Oswestry Disability pain score before sitting pelvic tilt exercise application. While, after 2 weeks of sitting pelvic tilt exercise application on study group all items of Modified Oswestry Disability pain score named (pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling and employment/ home making). Were significantly decreased in the study compared to the control group. That which supported Hypothesis II which named Pregnant women who practice pelvic tilt exercise will experience less disability score in performing daily activities compared to those who do not practice.

These findings were supported by **Marzouk and Fadel, (2020)** Study which entitled "effect of lumpobelvic belt exercise versus pelvic strengthening exercise on the level of pregnancy-related low back pain" in Egypt and formed that were no statistically significant difference between study and control groups regarding all items of Modified Oswestry Disability pain score before sitting pelvic tilt exercise application. While there was significance decrease of all

items of Modified Oswestry Disability pain score in study group compared to control groups after sitting pelvic tilt exercise application on study group ($P \leq 0.001$).

Also, **Sureshbabu and Shobana, (2022),** who study "Pelvic tilt exercises in different positions for alleviating lumbar pain during pregnancy" in India and with **Haslia. (2022),** study which entitled "The Effects of Lumbopelvic Exercise on Functional Activities in Pregnant Women with Conditions Low Back Pain at Sudiang Raya Health Center in Makassar City" and reported that was significance decrease of all sub scale of Modified Oswestry Disability pain score in study group compared to control groups after sitting pelvic tilt exercise application on study group ($P \leq 0.001$).

From researcher point of view the improvements of Modified Oswestry Disability pain score due to effect of sitting pelvic tilt exercise on low back pain which lead to improve the woman's ability to perform daily activities.

Regarding Correlation coefficient between total pain and the Modified Oswestry Disability score of the studied pregnant women before and after 2 weeks of sitting pelvic tilt exercise application this current study indicated that there were highly significant positive correlations regarding total pain and the Modified Oswestry Disability score between study and control groups before and after 2 weeks of sitting pelvic tilt exercise application on study group.

These findings were in the same line with **Abadi et al., (2019)** study intitled "the effect of back exercise program on low-back pain disability in pregnant women" and reported that there were highly significant positive correlations regarding total pain and the Modified Oswestry Disability score between study and control groups before and after exercise application on study group ($P \leq 0.001$). **Lestarl, (2020),** study intitled "The Effectiveness of Pelvic Rocking Exercises on low back pain in III Trimester Pregnant Women "and formed that there were highly significant positive correlations regarding total pain and the Modified Oswestry Disability score between study and control groups before and after sitting exercise application on study ($P \leq 0.001$).

5. Conclusion:

The findings of the present study were concluded that sitting pelvic tilt exercise was effective in reducing lumbopelvic pain in pregnant women. Therefore, the study aim was achieved and the study hypotheses were supported.

6. Recommendations:

In the light of the findings of the current study, the following recommendations were suggested:

- The pelvic tilt exercise should be performed regularly as a part of the routine antenatal care.
- Designing and distributing of brochure about the sitting pelvic tilt exercise for all pregnant women who attended the antenatal clinics as a part of the routine antenatal care.
- Applying research study to compare the pelvic tilt exercise in different position for reliving low back pain.
- Replicate the same study in large sample size and different study setting.

Table (1): Percentage distribution of the control and study group according to socio-demographic characteristics. (n =100)

Items	Control group n= 50		Study group n=50		X^2	P value
	N	%	N	%		
Age (years)						
a) Less than 21	5	10.0	5	10.0	306.	.972 mc
b) 21 < 25	27	54.0	29	58.0		
c) 25 < 30	15	30.0	14	28.0		
d) Above 30	3	6.0	2	4.0		
Education						
c) Secondary level	19	38.0	16	32.0	396	.529 mc
d) University level	31	62.0	34	68.0		
Occupation						

a) House wife	21	42.0	21	42.0	Equal	
b) worker	29	58.0	29	58.0		
Residence						
a) Urban	21	42.0	23	46.0	1.44	.317#
b) Rural	29	58.0	27	54.0		

X^2 is Pearson chi-square test &^{mc} is montercarlo chisqaure test & $^{\#}$= Fisher exact test, $ is independent t test; **P** value is significant <. 05

Table (2): Comparison of mean pain score of pregnant women in the control and study groups before and after 2 weeks of sitting pelvic tilt exercise application. (n=100)

Time / Measure	**Control**	**Study**	**Sig.[b] &delta**
	Mean (SD)	**Mean(SD)**	
Before application	**7.30(1.33)**	**7.16(1.27)**	**.539(.591) &.1**
2 weeks after	**7.36(1.40)**	**4.36(1.35)**	**12.003(<.001)(2.22)**
Sig.[a], (pvalue) (d2)	**.573 (.569), d2(.08)**	**25.3 (<0.001), d2(3.06)**	

Sig.a is paired t test, P value is significant <.05, d is cohens d effect sizee, Sigb is independent t test & delta is Glass delta effect size

Figure (1): Percentage distribution in the study and control groups according to the Pain severity before and after 2 week of sitting pelvic tilt exercise application (n=100)

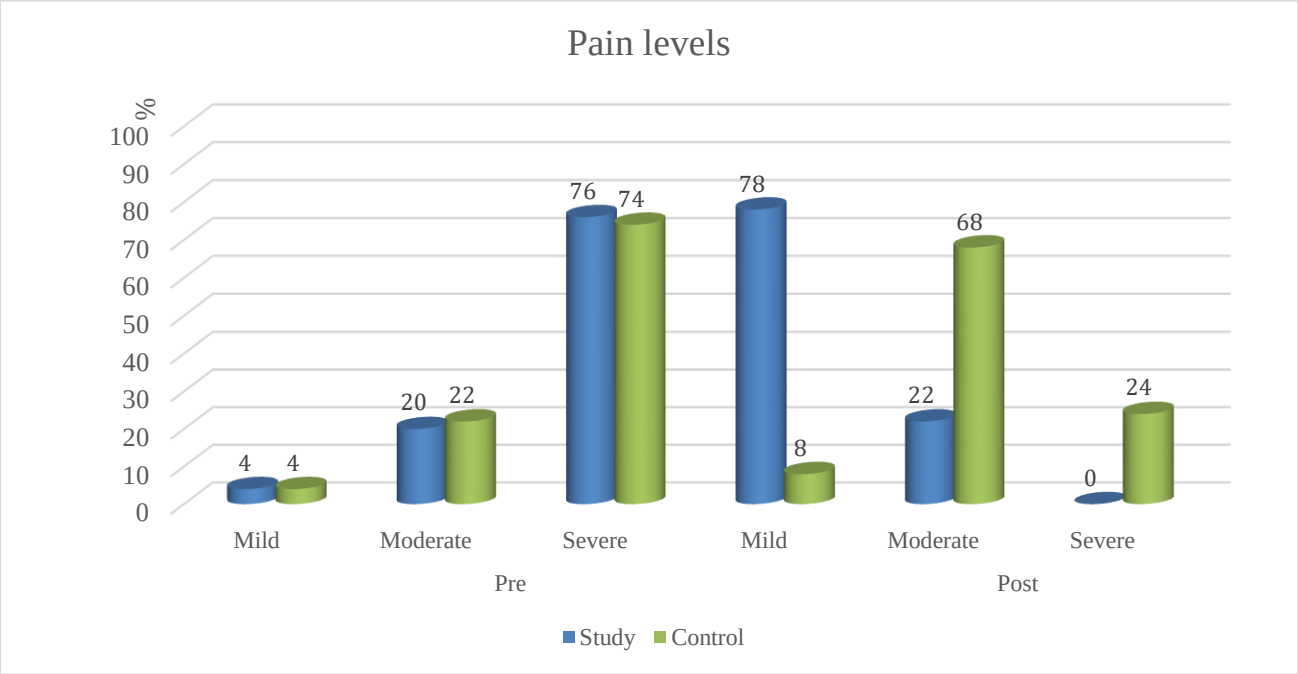


Table (3): Comparison of mean Modified Oswestry Disability pain score of pregnant women in the control and study groups before and after 2 weeks of sitting pelvic tilt exercise application (n=100)

Time / Measure	Control (n=50)	Study (n=50)	Sig.[b] &delta
	Mean(SD)	Mean(SD)	
Before exercise	25.84(4.69)	26.22(5.27)	.381(.704) &.07
2 weeks after	26.40(4.31)	17.52(4.68)	9.87(<.001)&1.90
Sig.[a], (pvalue) (d2)	4.07 (.<001), d2(.6)	19.44 (<0.001), d2(2.73)	

Sig.a is paired t test, P value is significant <.05, d is cohens d effect sizee, Sigb is independent t test & delta is Glass delta effect size

Figure (2): Distribution of the studied pregnant women in the study and control groups according to the Modified Oswestry Disability Pain score before and after 2 week of sitting pelvic tilt exercise application (n=100)

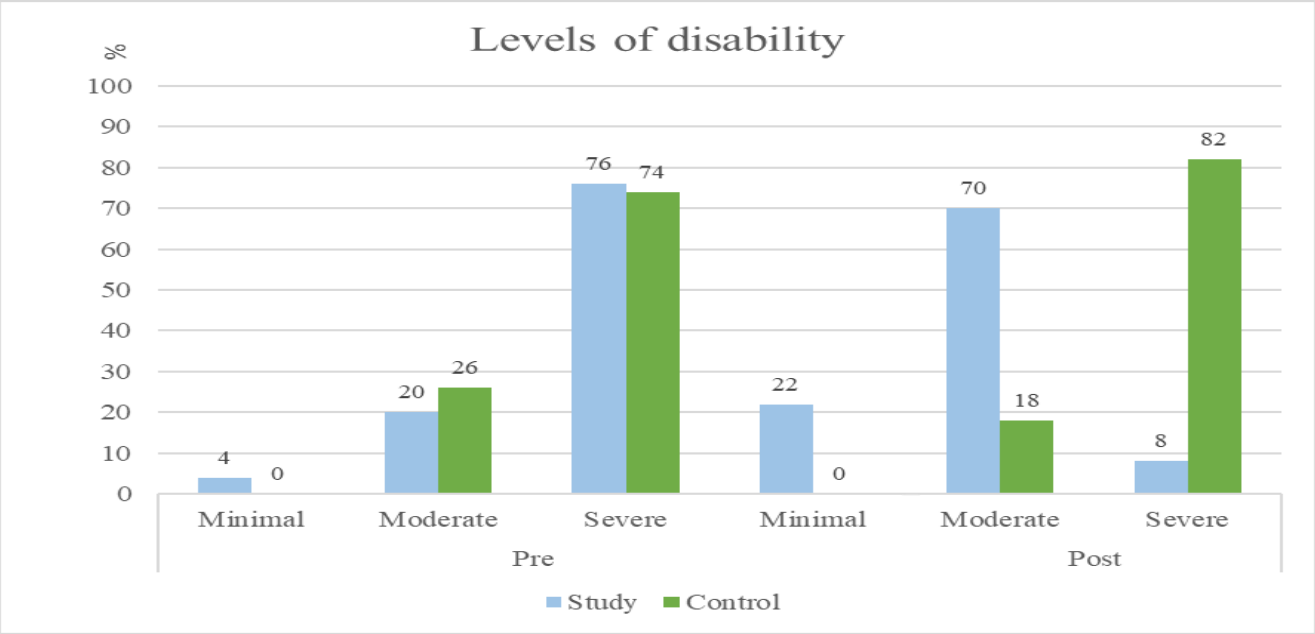


Table (4): Correlation between total pain and the total Modified Oswestry Disability score of the study and control groups women before and after 2weeks of sitting pelvic tilt exercise application (n=100)

Items	Timing	Total disabiliy			
		Study (50)		Control (50)	
		R	Sig.	r	Sig.
Total pain	Pre	.836	**<.001**	.821	**<.001**
	Post	.827	**<.001**	.910	**<.001**

r is pearson correlation test & P is signficant <.05

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