

## The Effectiveness of Pilates Exercise Program during pregnancy on Maternal Outcomes at Assiut City

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### Abstract:

**Background:** Pregnancy is one of the most anticipated moments in women's lives. However, biological and physiological changes cause a lot of discomfort. Pilates exercise one of the fastest-growing modalities of exercise relief and welfare to these women. **Aim of the study:** Evaluate the effectiveness of Pilates exercise program during pregnancy on maternal outcomes in maternal and child health care centers at Assiut City. **Setting:** The study was carried out in two maternal and child health care centers which selected randomly namely El-waledia and Gharb El-bald health care centers. **Methods:** A Quasi experimental research design (pre and posttest) and Purposeful sample were utilized in this study; A total of 53 pregnant women. **Tools of the study:** Interviewing questionnaire; it included three tools: **Tool I:** divided into three parts: personal data, medical and obstetrical history, current pregnancy and labour data. **Tool II:** Visual Analogue scale to assess back and leg pain. **Tool III:** Revised Urinary Incontinence Scale. **Results:** 50.9% of studied sample aged  $\geq 30$  years old, 73.6%, and 45.1% of them were multigravida and primipara respectively. 69.8% didn't practice exercise and the mean  $\pm$ SD of gestational weeks was  $(27.23 \pm 2.18)$ . There was statistically significant relation between leg pain, urinary incontinence before and after exercise ( $P$  value=0.000) among studied sample. **Conclusion:** The Pilates exercise program had significant effect on improving maternal outcomes. **Recommendations:** Health care providers should encourage pregnant women to engage in physical activity including Pilate's exercise which have been shown more benefits for most women.

**Keywords:** *Exercise, Maternal, Outcomes, Pilates & Pregnancy*

### Introduction

Pilate's method is a type of exercise established by German Joseph Hubertus at the turn of the twentieth century, it is one of the most popular techniques based on the six key concepts of breath, focus, flow, accuracy, centering, and control so it was called «Contrology». It seeks to achieve muscular balance by strengthening weak muscles and stretching tight ones. Pilates is a safe and effective exercise method that prepares and strengthens pregnant women from the first to the last month of their pregnancy (Dilek 2018 & Sarpkaya., 2018).

Internationally, Pilates is a type of mind body exercise for improving physical, psychological, and motor functions included breathing technique which worked on respiratory muscles, abdominals to stabilize the pelvis, Pelvic floor muscle exercise to strengthens it and prevents complications during and after childbirth as perineal tear and urinary incontinence, Deep tummy strengthening and upper back stretch for increases back and leg support, thigh

stretching exercises and Pelvic tilt exercises which helps to activate the deep stabilizing muscles, especially the transverses abdomen is in relation to the pelvis, which enhances the strength of the pelvis and the trunk also regular training has been shown to strengthen the pelvic floor muscle and increase its structural function (Ghandali et al, 2021).

Pregnancy is a joyful period for most women, the physiological, anatomical, and biochemical changes can create stress among mothers. Postural alterations, weaker ligaments, back pain, sacroiliac joint discomfort, muscle cramps, low back pain (LBP) linked with lower limb pain, and pelvic pain (PP) are all common during pregnancy; with over two-thirds of women experiencing low back pain (LBP). Exercise has been linked to better maternal outcomes. Despite the physiologic and anatomic changes in the maternal body, physical activity should be promoted throughout pregnancy, according to the American College of Obstetricians and Gynecologists (ACOG) (Yaman et al., 2020)

Many studies concluded that Pilates is an effective, healthy, and feasible method of reducing pain in pregnancy, and is therefore a beneficial alternative workout for the suppression of pain in the third trimester of pregnancy (Oktaviani, 2018, Motaghi, et al., 2021 & Sonmezer, et al., 2021).

According to previous study reported that modern Pilate's workout programs are useful and beneficial for increasing feelings of happiness and well-being, reducing anxiety and stress, gaining muscular strength and flexibility and improving posture and a supervised Pilate's workout is an effective and achievable exercise method decreasing caesarean delivery and assisted vaginal delivery with episiotomies or vacuum extraction (Kirici et al., 2021).

The nurses have essential roles in maternal and child health whereas encourage and teach the women to continue or to commence exercise as an important component of optimal health. The nurse explained that Physical activity and exercise in pregnancy are associated with minimal risks and have been shown to benefit most women, although some modification to exercise routines may be necessary because of normal anatomic and physiologic changes and fetal requirements (ACOG, 2020).

### Significant of study

Reproductive process as pregnancy and birth are the most common risk factors for female pelvic floor (PF) weakness and/or pelvic floor dysfunction (PFD), also women are more likely to experience stress and urge urinary incontinence and perineal trauma, which are two of the most common complications associated with birth and the subsequent appearance of PFD, and have a negative impact on female quality of life (Feria-Ramírez, et al, 2021).

Much evidence suggests that the Pilates method is the most common effective exercise based on control, strength, and flexibility of abdominal and pelvic muscles that focuses on developing the musculature of the transverse abdomens and pelvis in order to decrease intra-abdominal pressure when used by pregnant women to improve the physical and psychological outcomes of pregnancy, and consider as a primary prevention of PFD that helps to reduce disproportion and reduces the risk of perineal damage and urine incontinence during the third trimester of pregnancy and after labour, as well as having a good impact on all prenatal and delivery outcomes (Leon-Larios, et al, 2017 & Feria-Ramírez, et al, 2021).

Pilates is effective for training the core muscles and stabilizing the hip joint by strengthening the deep muscles adjacent to the spine. It also develops basic

physical strength through a combination of aerobic and anaerobic activity. As a result, physical discomfort such as low back pain, pelvic pain, is relieved and visual analogue scale scores are reduced significantly (Rahul & Pravin, 2020). So this study aims to evaluate the effectiveness of a Pilates exercise program during pregnancy on maternal outcomes.

### Aim of the study

To evaluate the effectiveness of Pilates exercise program during pregnancy on maternal outcomes in maternal and child health care centers at Assiut City

### Research Hypothesis:

**Null hypothesis:** Pilates exercise program will not be improving maternal outcomes.

**H1.** Pilates exercise program during pregnancy will be significant effect on improving maternal outcomes (as improve back pain, leg pain, urinary incontinence, perineal tear and postpartum hemorrhage and types of labour).

### Subject & Methods

#### Research design

A Quasi-experimental research design (pre and posttest) was utilized in this study.

#### Setting of the study

The total number of Maternal and Child Health Care centers (MCH) at Assiut city are 19 which divided into 11 centers in East city and 8 centers in West city; the present study carried out in two centers which selected randomly from East and West namely El-waledia and Gharb El-bald health care centers to be representative sample.

#### Sampling:

Purposeful sampling was used in this study to select the pregnant women. The total number of them who is attending the previous selected center during the last six months according to centers-based rates was 867 women. Sample size was calculated with software EPI /Info, version,3 with 95 % confident interval (CI), the calculated sample size was 267; the program was applied on 20 % (53) from these number. This sample restricted to these number due to some women they don't meet the inclusion criteria also a lot of them refuse to participate the program for they believe that exercises cause harm during pregnancy.

#### Inclusion criteria

The pregnant women in around 20 weeks of gestation, able to communicate, no partial or absolute exercise contradictions during pregnancy (such as vaginal bleeding, preterm labor twin pregnancies, severe obesity, very low weight of the mother (BMI less than 15), and having willingness to participate in the study

**Tools of the study:**

Interviewing questionnaire was designed and developed by the research team after reviewing of different literatures. It was included three tools:

**Tool I: divided into three parts**

**Part 1: Personal data:** it included age, educational level, occupation, residence and practicing exercise before the program

**Part (2): Obstetrical and Medical data:** it included questions such as Gravity, parity, gestational age, number of children, type of last delivery, and complications of previous pregnancy. Medical as DM, hypertension, anemia, musculoskeletal problems and chest disease.

**Part (3): Current pregnancy data:** it included; hypertension during pregnancy, gestational diabetes, oligohydramnios, and **labour data for measures effect of program on childbirth** as is types and complications during labour (tears and post-partum hemorrhage).

**Tool II: Visual Analogue scale (VAS)** used for assessment the intensity of back and leg pain; 10 cm blank line used to describe the extremes of pain. The participants were asked to place mark on the line that indicate the pain experienced.

**Scoring system:** The scoring system; Zero (0) indicate no pain, graded from 1-3 cm reflect mild pain, graded from 4-7 cm for moderate pain and graded from 8-10 cm for severe pain (Bikmoradi, et al, 2014).

**Tool III: The Revised Urinary Incontinence Scale (RUIS),** this scale used to assess urinary incontinence among study participants. It was originally developed by (Sansoni, et al., 2011). It was five-point Likert scale ranged from 0-5; the researchers done modification to the scale became three-point ranged from 0-3 degree as the following; 0 (none of the time), 1(rarely) and 2 (often).

**Scoring system:** Responses to items 1to 3 are summed for subscale of stress score; and responses to items 4 to 6 are summed for subscale urge score. Then total score of RUI summed to calculate incontinence severity index. The scale graded from 0-6 (Mild urinary incontinence) 7-12 (moderate)  $\geq$  13 (sever).

**Tool II and III** were used before implementation of Pilates exercise then re-used after 8 weeks later to assess effectiveness of Pilates exercise on reducing pain and improve the incontinence.

**Administrative design:** An official approval letter containing brief explanations of the purpose of study was signed from the Dean of the Faculty of Nursing-Assiut University and sent to general director of maternity and child care at the directorate of health affairs in Assiut and then sent to directors of selected settings for permission to carry out the study and participation with obstetrician physician to facilitate pilates program and follow up with the researchers.

**Ethical consideration:** The research proposal was approved by Ethical Committee of the Faculty of Nursing at Assiut University. There was the minimum risk on the study participants during application of the research. The study followed common ethical principles in research; informed consent was received from the study sample who accepted to participate in the study after explaining the nature and aim of the study. Confidentiality and anonymity were assured, and study subjects had the right to refuse the participation or withdraw from the research at any time without giving reasons.

**The pilot study:** A pilot study was done on nearly 10% of the participants in the study sample. The purposes of the pilot study were to ensure the clarity of items, to test for the comprehension, applicability and relevance of the tools and estimate the time required for study sample collection. This pilot excluded from the sample for presence some modification.

**Validity of the tools:** The tools were translated to Arabic language and reviewed to ascertain their validity by three experts in medical and nursing sciences, who reviewed the instrument for clarity, relevance, comprehensiveness, understanding and applicability.

**Reliability of the tools II and III:** A reliability test was carried out by the researchers in order to examine the internal consistency of the scales. It was done during the pilot study before starting of data collected on 10% of participants. The value of Cronbach's alpha was = 0.86, and 0.83.

**The educational program:** The educational program has been developed by the researchers' team and according to the assessment.

**Assessment phase:** In the first contact, the researchers introduced themselves for participants, explained the nature and purpose of the study and participation approval was obtained. Personal data were collected using tool I (before the program only) as previous mentioned then the researchers conducted the tools II, and III namely VAS and

RUIS respectively were done before and after exercise.

**Planning phase:** Facilities were checked and arranged during this phase as the teaching place, audiovisual aids and handout, teaching methods and materials.

**Teaching place** the program was conducted in available places (counseling or nursery room) in selected center. This arrangement was done with the director of the center and participating doctor.

**Teaching methods and materials:** It was prepared before implementing the educational program. The teaching methods were used; as lecture, discussion, demonstration and re-demonstration and used media as picture and video about steps of pilates exercise.

#### **Implementation phase**

- The researchers began the session with explaining the importance of Pilate's exercises to the participants, give instructions about the components of each exercise.
- Pilates exercises is a simple and easy to apply at home; its included Pelvic floor muscle exercise, Deep tummy strengthening, upper back stretch, cat stretch, thigh stretch, Pelvic tilts and breathing exercise. In addition, position to support leg and back.
- The explanation done by watch video about the exercises then distributed illustrating Arabic brochure and finally apply that to each individual.
- The researchers spent about 40:50 minutes for exercise demonstration and re-demonstration to ensure the participants apply the exercises in a right manner.
- The researchers encourage the participants to done the exercises twice per week and continue in practicing that for 8 weeks to complete the Pilates exercises program.
- The researchers were collect data and done the exercise program (two days/week) with average number 4-5 participants. The exercise beginning around 20 weeks of gestation for at least 8 weeks and ended at 36 for physiological exhausted and increase urinary frequency.
- The researchers carried the program during the period from 1<sup>st</sup> of January 2021 until the end of September 2021.

#### **Evaluation stage:**

- The research team follows the participants every week by telephone to ensure make the exercise and monthly during the visit to MCH for another re-demonstration in front of the researchers for ensure the correct of exercises and if woman stopped and don't complete the program excluded from the study and replaced by another woman.

- Also; the evaluation was done after two months by using VAS and RUIS to determine the impact of the exercise and advanced her to complete the breathing, pelvic floor exercise and back & leg support even after birth for their ease and effective role during and after childbirth.

- After labor the research team follows the participants during the visit or by telephone to evaluate the maternal outcomes during labour as type of delivery, women's tears and post-partum hemorrhage.

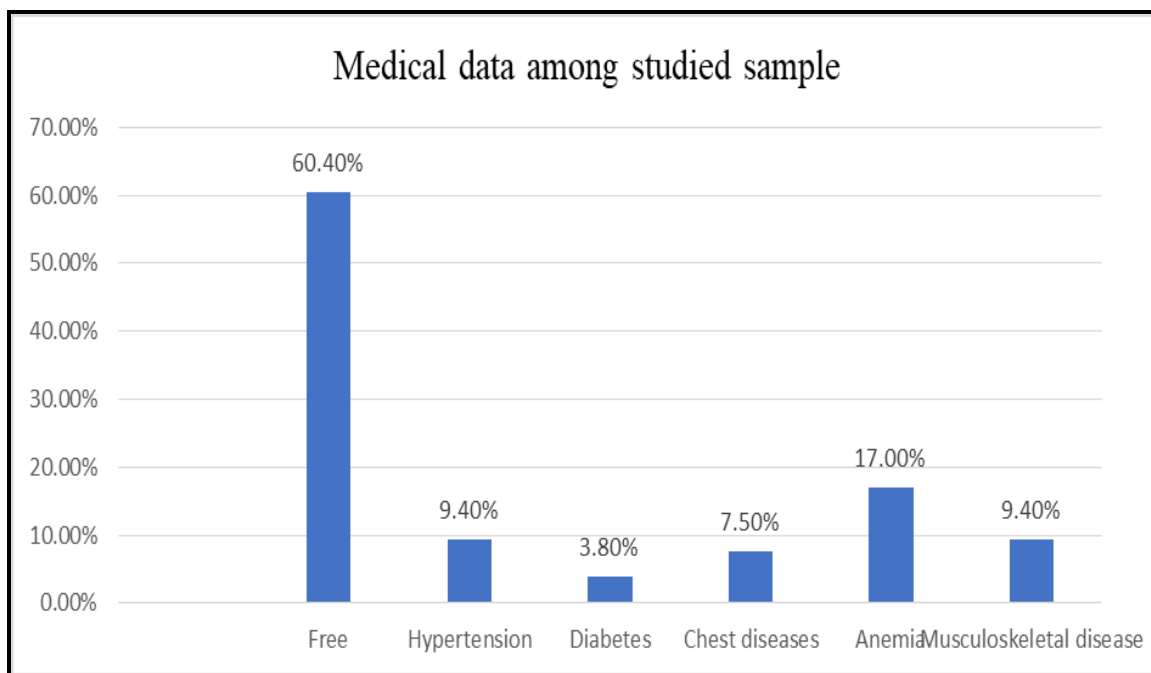
#### **Statistical analysis:**

The data obtained from the questionnaire were analyzed using SPSS Statistical Package for Social Sciences software, version 22.0. Data presented as number, percentage, mean and standard deviation, Chi-square and Fisher exact tests were used to compare qualitative variables. P-value considered statistically significant difference when  $p < 0.05$ .

**Results:**

**Table (1): Distribution of studied sample according to their personal data.**

Personal data	No. (53)	%
<b>Age: (years)</b>		
< 30	26	49.1
≥ 30	27	50.9
Mean ± SD (Range)	29.45 ± 6.20 (20.0-42.0)	
<b>Occupation:</b>		
Working	15	28.3
Housewife	38	71.7
<b>Level of education:</b>		
Read and write	3	5.7
Basic education	12	22.6
Secondary education	25	47.2
University education	13	24.5
<b>Residence:</b>		
Urban	32	60.4
Rural	21	39.6
<b>Type of physical exercise before the program:</b>		
Practicing walking exercise	16	30.2
No practicing exercise	37	69.8



**Figure (1): Distribution of studied sample according to their medical history (N=53).**

Table (2): Distribution of studied sample according to their obstetrical history.

Items	No. (53)	%
<b>Type of last delivery:</b>		
Normal	34	66.7
CS	17	33.3
<b>Number of gravidities:</b>		
Primigravida	2	3.8
Multigravida	39	73.6
Grand multi gravida	12	22.6
<b>Number of parities:</b>		
Primipara	23	45.1
Multipara	16	31.4
Grand multipara	12	23.5
<b>Number of children:</b>		
One	22	43.1
Two	17	33.3
Three or more	12	23.5
<b>Weeks of gestation at onset the program</b>		
Mean ± SD	27.23 ± 2.18	
Range	20.0 – 28.0	

Table (3): Previous and current complications during pregnancy and labor among studied sample.

Items	previous(n= 53)		Current (n= 53)		P-value
	No.	%	No.	%	
<b>#Complications during pregnancy:</b>					
Yes	27	50.9	26	49.1	0.846
No	26	49.1	27	50.9	
<b>#Complications during labor:</b>					
Yes	23	43.4	0	0.0	0.000*
No	30	56.6	53	100.0	
<b>Type of labor:</b>					
Normal	37	69.8	35	66.0	0.885
CS	16	30.2	18	34.0	

#Complications during pregnancy & labour as mentioned tool I part 3

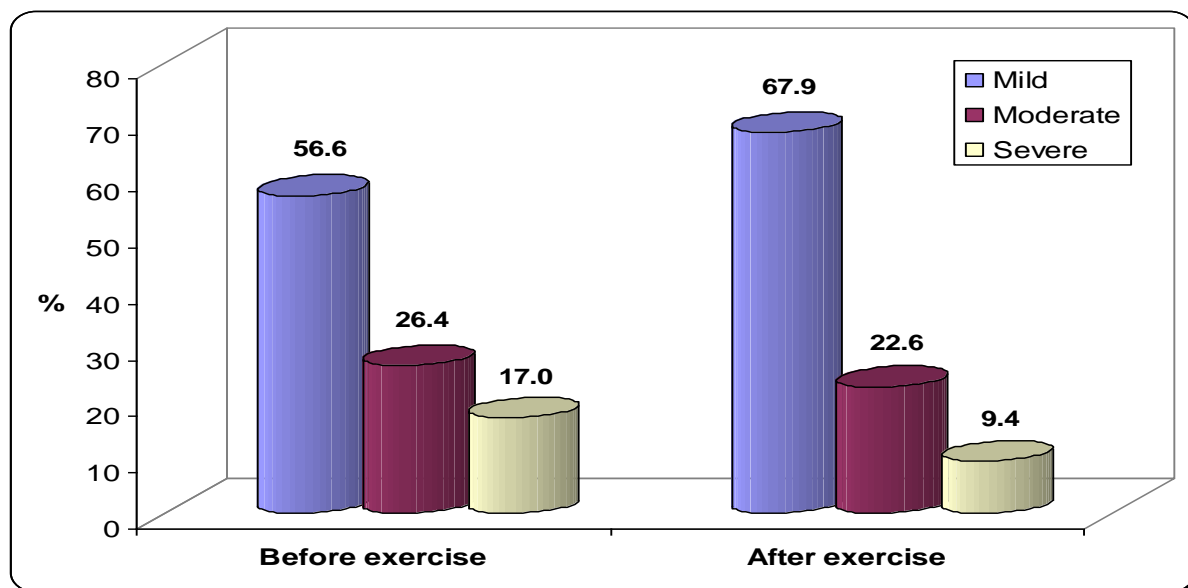


Figure (2): Total score of visual Analogue scale (back pain) among studied sample before and after exercise (N=53).

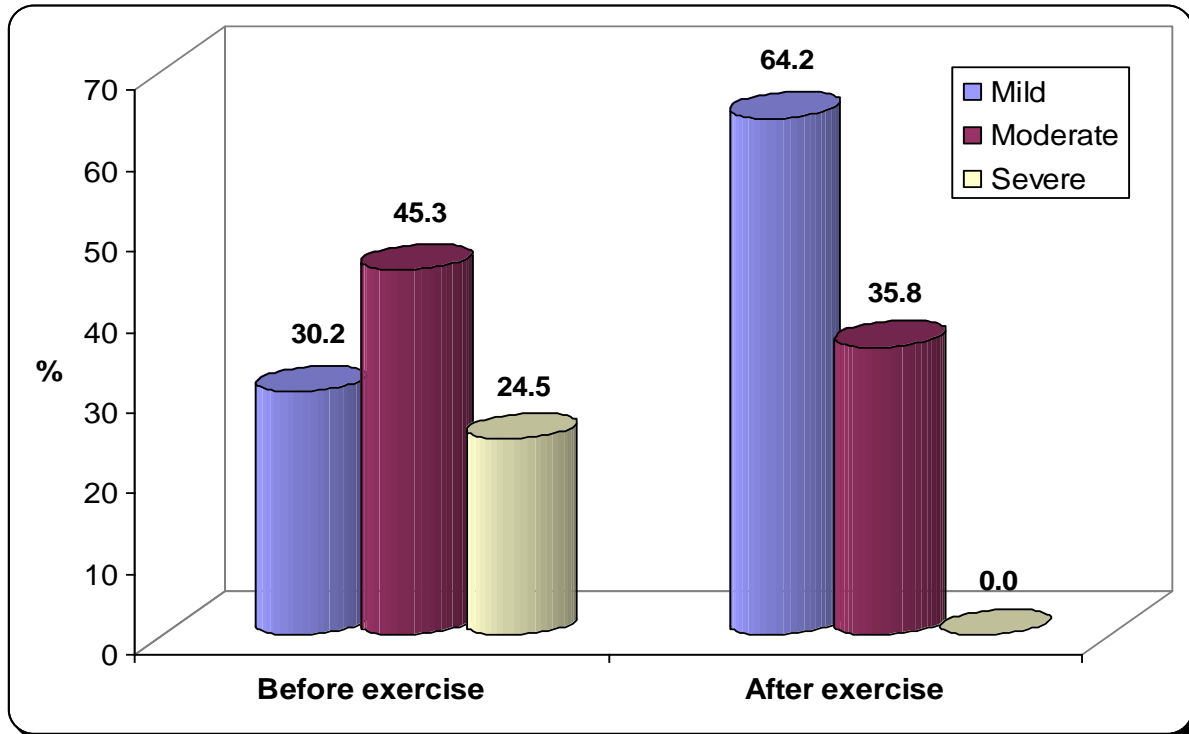


Figure (3): Total score of visual Analogue scale (leg pain) among studied sample before and after exercise (N=53).

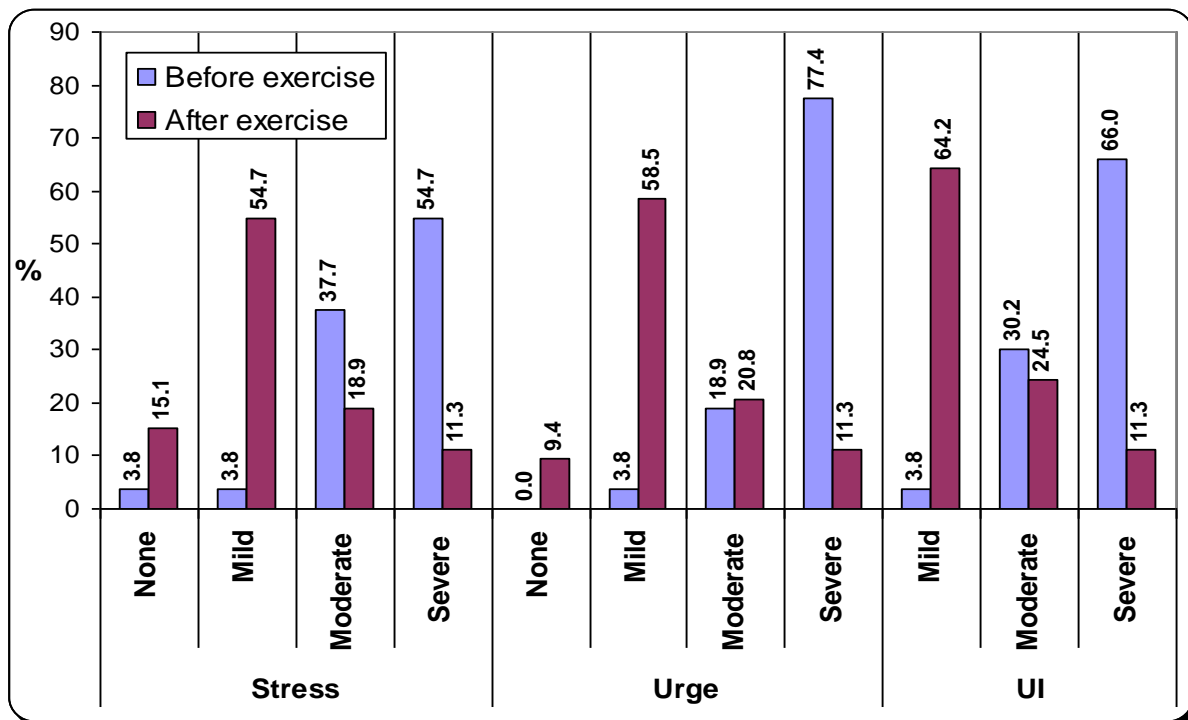


Figure (4): Total score of revised urine incontinence scale among studied sample before and after exercise (N=53).

**Table (4): Relation between personal, obstetrical data and back pain among studied sample before and after exercise (N=53).**

Items	Before exercise							P-value	After exercise						
	Back pain						P-value		Back pain						
	Mild		Moderate		Severe				Mild		Moderate		Severe		
	No.	%	No.	%	No.	%			No.	%	No.	%	No.	%	
<b>Age: (years)</b>															
< 30	20	76.9	6	23.1	0	0.0	0.002*	23	88.5	3	11.5	0	0.0	0.005*	
≥ 30	10	37.0	8	29.6	9	33.3		13	48.1	9	33.3	5	18.5		
<b>Occupation:</b>															
Working	10	66.7	3	20.0	2	13.3	0.649	13	86.7	2	13.3	0	0.0	0.145	
Housewife	20	52.6	11	28.9	7	18.4		23	60.5	10	26.3	5	13.2		
<b>Level of education:</b>															
Basic education	2	13.3	6	40.0	7	46.7	0.000*	2	13.3	8	53.3	5	33.3	0.000*	
Secondary education	17	68.0	6	24.0	2	8.0		21	84.0	4	16.0	0	0.0		
University education	11	84.6	2	15.4	0	0.0		13	100.0	0	0.0	0	0.0		
<b>Residence:</b>															
Rural	16	50.0	9	28.1	7	21.9	0.396	17	53.1	10	31.3	5	15.6	0.014*	
Urban	14	66.7	5	23.8	2	9.5		19	90.5	2	9.5	0	0.0		
<b>Medical history:</b>															
Yes	8	38.1	6	28.6	7	33.3	0.022*	8	38.1	8	38.1	5	23.8	0.000*	
No	22	68.8	8	25.0	2	6.3		28	87.5	4	12.5	0	0.0		
<b>Complications of pregnancy:</b>															
Yes	14	51.9	6	22.2	7	25.9	0.204	15	55.6	7	25.9	5	18.5	0.042*	
No	16	61.5	8	30.8	2	7.7		21	80.8	5	19.2	0	0.0		
<b>Complications of delivery:</b>															
Yes	10	43.5	4	17.4	9	39.1	0.001*	10	43.5	8	34.8	5	21.7	0.002*	
No	20	66.7	10	33.3	0	0.0		26	86.7	4	13.3	0	0.0		

**Table (5): Relation between personal, obstetrical data and leg pain (Visual analogue) among studied sample before and after exercise (N=53).**

Items	Before exercise							P-value	After exercise						
	Leg Pain						P-value		Leg Pain						
	Mild		Moderate		Severe				Mild		Moderate		P-value		
	No.	%	No.	%	No.	%			No.	%	No.	%			
<b>Age: (years)</b>															
< 30	12	46.2	11	42.3	3	11.5	0.019*	20	76.9	6	23.1	0.057			
≥ 30	4	14.8	13	48.1	10	37.0		14	51.9	13	48.1				
<b>Occupation:</b>															
Working	6	40.0	9	60.0	0	0.0	0.033*	14	93.3	1	6.7	0.005*			
Housewife	10	26.3	15	39.5	13	34.2		20	52.6	18	47.4				
<b>Level of education:</b>															
Basic education	0	0.0	4	26.7	11	73.3	0.000*	4	26.7	11	73.3	0.000*			
Secondary education	9	36.0	14	56.0	2	8.0		17	68.0	8	32.0				
University education	7	53.8	6	46.2	0	0.0		13	100.0	0	0.0				
<b>Residence:</b>															
Rural	6	18.8	14	43.8	12	37.5	0.011*	14	43.8	18	56.3	0.000*			
Urban	10	47.6	10	47.6	1	4.8		20	95.2	1	4.8				
<b>Medical history:</b>															
Yes	2	9.5	9	42.9	10	47.6	0.002*	8	38.1	13	61.9	0.001*			
No	14	43.8	15	46.9	3	9.4		26	81.3	6	18.8				
<b>Complications of pregnancy:</b>															
Yes	2	7.4	14	51.9	11	40.7	0.000*	12	44.4	15	55.6	0.002*			
No	14	53.8	10	38.5	2	7.7		22	84.6	4	15.4				
<b>Complications of delivery:</b>															
Yes	4	17.4	10	43.5	9	39.1	0.056	12	52.2	11	47.8	0.111			
No	12	40.0	14	46.7	4	13.3		22	73.3	8	26.7				



**Table (6): Relation between personal, obstetrical data and revised urinary incontinence among studied sample before and after exercise(N=53).**

Items	Before exercise					P-value	After exercise					P-value		
	RUI				P-value		RUI				P-value			
	Mild/moderate		Severe				Mild		Moderate				Severe	
	No.	%	No.	%			No.	%	No.	%			No.	%
<b>Age: (years)</b>														
< 30	12	46.2	14	53.8	0.066	23	88.5	3	11.5	0	0.0	0.001*		
≥ 30	6	22.2	21	77.8		11	40.7	10	37.0	6	22.2			
<b>Occupation:</b>														
Working	5	33.3	10	66.7	0.952	11	73.3	4	26.7	0	0.0	0.262		
Housewife	13	34.2	25	65.8		23	60.5	9	23.7	6	15.8			
<b>Level of education:</b>														
Basic education	2	13.3	13	86.7	0.078	2	13.3	7	46.7	6	40.0	0.000*		
Secondary education	12	48.0	13	52.0		21	84.0	4	16.0	0	0.0			
University education	4	30.8	9	69.2		11	84.6	2	15.4	0	0.0			
<b>Residence:</b>														
Rural	11	34.4	21	65.6	0.938	18	56.3	8	25.0	6	18.8	0.094		
Urban	7	33.3	14	66.7		16	76.2	5	23.8	0	0.0			
<b>Medical history:</b>														
Yes	3	14.3	18	85.7	0.014*	5	23.8	12	57.1	4	19.0	0.000*		
No	15	46.9	17	53.1		29	90.6	1	3.1	2	6.3			
<b>Complications of pregnancy:</b>														
Yes	4	14.8	23	85.2	0.003*	10	37.0	13	48.1	4	14.8	0.000*		
No	14	53.8	12	46.2		24	92.3	0	0.0	2	7.7			
<b>Complications of delivery:</b>														
Yes	6	26.1	17	73.9	0.289	10	43.5	9	39.1	4	17.4	0.023*		
No	12	40.0	18	60.0		24	80.0	4	13.3	2	6.7			

**Table (1):** Showed that 50.9% of studied sample aged ≥30 years old with Mean ±SD (29.45 ± 6.20); 71.7% of them were housewives, as regard to level of education; 24.5% of studied sample had university education, 60.4% of them from urban area and 69.8% didn't practicing exercise.

**Figure (1):** Revealed that 60.4% of studied sample don't suffering from any medical disorders, 17.0% of them suffering from anemia and only 3.8% from diabetes.

**Table (2):** Found that 66.7% of studied sample had normal childbirth process, 73.6%, 45.1% and 43.1% of them were multigravida, primipara and had only one child respectively, also the table cleared the Mean ±SD of gestational weeks among studied sample was (27.23 ± 2.18).

**Table (3):** Referred that there were statistically significant differences between previous and current complication of delivery (P value=0.000) while there weren't statistically significant differences in order to complication of pregnancy and type of labor (P value=0.846 and 0.885) respectively.

**Figure (2):** Revealed that that there weren't statistically significant differences between back pain before and after exercise (P value=0.398).

**Figure (3):** Revealed that that there were statistically significant differences between leg pain before and

after exercise (P value=0.000), whereas 30.2% and 24.5% of studied sample before the exercise had mild and sever back pain while after the exercise became 64.2% and 35.8% respectively.

**Figure (4):** Presented that there were statistically significant differences between urinary incontinence in subscale stress and urge and also within total score before and after exercise among studied sample (P value=0.000).

**Figure (5):** Indicated that there were statistically significant differences between general health among studied sample before and after exercise (P value=0.000).

**Table (4):** Indicated that there were statistically significant differences between back pain among studied sample before the exercise, their personal and obstetrical data related to age, educational level, medical history and complications of delivery (P=0.002, 0.000, 0.022and 0.001) respectively moreover not statistically significant differences between their occupation, residence, and complications of pregnancy. In addition, there was statistically significant differences between back pain among studied sample after the exercise, their personal and obstetrical data.

**Table (5):** Indicated that there were statistically significant differences between leg pain among

studied sample before and after exercises, their personal and obstetrical data except complications of delivery ( $P=0.056$ ) before while there is no statically significant differences after exercises related to age and complication of delivery. ( $P=0.057$  and  $0.111$ ) respectively.

**Table (6):** Indicated that there weren't statistically significant differences between revised urine incontinence among studied sample before exercises, their personal and obstetrical data except medical history and complications of pregnancy ( $P=0.014$  and  $0.003$ ) respectively. Moreover, there was statistically significant differences between age, education, medical history, complications of pregnancy and delivery with urinary incontinence after exercises ( $P= 0.001, 0.000$  and  $0.023$ ).

### Discussion

Physical activity during pregnancy assumes have a valuable and beneficial role for maternal outcomes. Pilates is effective for training the core muscles and stabilizing the hip joints, which provides relief from pelvic pain and low back pain during pregnancy **Hyun et al., (2021)**.

The study aimed to evaluate the effectiveness of Pilates exercise program during pregnancy on maternal outcomes in maternal and child health care centers at Assiut City The present study showed that slightly more than half of studied sample aged  $\geq 30$  years old with Mean  $\pm$ SD ( $29.45 \pm 6.20$ ); more than two thirds of them were housewives, about one quarter had university education and three fifths from urban areas.

These results similar with findings of **Ghandali, et al., (2021)** who reported that Mean  $\pm$ SD of sample age were ( $25.16 \pm 4.41$ ) and more than one third had university education.

While disagrees with **Feria-Ramírez et al., (2021)** who reported that Mean  $\pm$ SD of participants age was  $32.4 \pm 5.2$ . Also, these results disagree with **Kırıcı et al., (2021)** who found that almost half of sample was housewives and about half of them had university education. In addition, inconsistent with the findings of the present study in area of occupation whereas who reported that vast majority of the sample not working.

Concerning the type of last delivery, the present study revealed that two thirds of the studied sample had normal childbirth process; these results contraindicated with **Ghandali, et al., (2021)** who stated that the majority of sample had normal childbirth process

As regard to parities the findings of the present study illustrated that more than two fifths of studied sample were primipara; This may be explicating that primipara women is more interested and goes for

follow up constantly for lack of experiences more than multiparous women.

With regards to practicing physical activity before the program the present study found that more than two thirds of studied sample don't practice exercises while do routine household work. On the other hand, less than one third of them practice walking as a simple type of physical activity; This may be due to unawareness with specific exercises during pregnancy and role of these exercises on maternal and child health or may be as a result of some community culture about the negative impact of exercise on the fetus and increase of the responsibilities. This disagrees with **Rodríguez-Díaz et al., (2017)** who stated that more than three quarters of studied sample were practicing walking and 12% from them practicing swimming as exercise before the program.

According to weeks of gestation at onset the program; the study revealed that Mean $\pm$ SD of it were ( $27.23 \pm 2.18$ ); this finding similar to **Feria-Ramírez et al., (2021)** who indicated that the mean of studied sample at beginning the exercise were ( $27.3$ )

The current study indicated that there was a statistically significant difference between previous and current complications during delivery as perineal tears and post-partum hemorrhage. This may be attributed to the effect of Pilate's exercise which promotes continuous strengthening of the abdominal and pelvic floor muscles and increases the probability of the perineum remaining intact during childbirth then reduce postpartum complications.

These findings in the same line with **Ghandali, et al., (2021)** who found that the participants doing exercise during pregnancy reduces the complications associated with labor.

Whereas the study showed that there wasn't statistically significant difference between Pilates and pervious & current type of labor; this may be due to that the type of delivery interferes with many maternal and fetal factors. This result agrees with study conducted by **Dilek., (2018)** who reported that no effect of Pilates exercise during pregnancy on the type of delivery. Also; agree with **Davenport et al., (2019)** who found that there was no relationship between prenatal exercise and preterm/prelabour rupture of membranes, caesarean section, length of labour, vaginal tears, fatigue, injury, musculoskeletal trauma, and maternal harms.

While this finding disagrees with study of **Rodríguez et al., (2017)** who showed a statistically significant relation in the type of delivery between Pilates and control groups, with the number of normal deliveries being higher in the Pilates group.

The current study indicated that there wasn't statistically significant difference between levels of

back pain before and after exercise, this could be explained by that woman in developing and rural community have heavy work and more responsibilities inside and outside the home than women in western societies, and they also lead an unhealthy lifestyle, which increases back pain and interferes with the effect of exercise on relieve back pain.

This result inconsistent with **Hyun et al., (2021)** who stated that back pain among participants were significantly decreased. Also disagrees with study by **Pascoal, et al., (2019) & Perfeito et al., (2019)** who reported Pilates strengthens the core muscles and alleviating low back pain during pregnancy. In addition, others studies carried by **Wells et al., (2014) & Lin et al., (2016)** found that sample with chronic low back pain showed statistically significant improvement in pain relief and functional ability compared to who only performed usual or routine health care.

Concerning leg pain, the study indicated that that was statistically significant difference between level of leg pain before exercise and after exercise; this may be due to the proper continuation of healthy instructions by the researchers and guided pictures with exercises through always support and raising the leg during rest periods.

The study observed that was statistically significant difference between levels of revised urine incontinence before and after exercise, this finding supported by **Handa et al., (2011) & Perfeito et al., (2019)** who indicated that urinary incontinence is considered a risk factor especially during pregnancy and it's affecting the general health of women. Studies show a strong association between pelvic organs and bladder syndrome. Thus, Pilate's exercises that specifically train the pelvic floor muscles are used as prevention and treatment for urinary incontinence.

It is interesting to note that pilates exercise was better during pregnancy, this may be explained by the fact that its exercise improves functional parameters in pregnant women and benefits on maternal outcomes.

**Limitation of the study:** It was difficult to take many pregnant cases because they refused to participate in the Pilates exercise program from the beginning, which may be due to some thoughts and attitudes of some women in Egyptian community about lack of importance and practice of exercises, especially women who are uneducated or have low education, also some pregnant women fear from abortion so their number in the research is few.

## Conclusion

The study can be concluded that, the Pilates exercise program had significant effect on improving leg pain, urinary incontinence, tears and postpartum hemorrhage While didn't affect significantly on back pain.

## Recommendation

**In the light of the findings of the present study, the researchers suggested the following recommendations:**

- Pilates exercise can be suggested as a favorable modality of exercise to be practiced during pregnancy, because of its benefits for health promotion, prevention and treatment of some disorders that may affect women.
- Health care providers should increase awareness regarding the importance of exercise during pregnancy and its safety including Pilate's exercises which have been shown more benefits for most women.
- Further research with large number is needed to study the effects of exercise on outcomes of all reproductive stages of women.

## References

- **American College of Obstetricians and Gynecologists (ACOG), (2020):** Updated guidance on exercise in pregnancy today that includes a new section on pregnant athletes, Washington, D.C.
- **Bikmoradi A., Zafari A., Oshvandi K., Mazdeh M., & Roshanaei G., (2014):** Effect of progressive muscle relaxation on severity of pain in patients with multiple sclerosis: a randomized controlled trial. *Hayat*, 20(1):26–37.
- **Davenport M., Ruchat S., Sobierajski F., Poitras V., Gray C., & Yoo C., (2019):** Impact of prenatal exercise on maternal harms, labour and delivery outcomes: a systematic review and meta-analysis. *Br J Sports Med*. 53(2):99–107.
- **Dilek S., (2018):** pregnancy Pilates and Benefits of pregnancy Pilates during Childbirth, *Journal of Yoga and Physiotherapy*, Volume 5 Issue 1.
- **Feria-Ramírez C., Gonzalez-Sanz J., Molina-Luque R., & Molina-Recio G., (2021):** The effects of the palate's method on pelvic floor injuries during pregnancy and childbirth: A quasi-experimental study, *International Journal of Environmental Research and Public Health*, 18(13). 2:12, <https://doi.org/10.3390/ijerph18136995>
- **Ghandali N., Iravani M., Abdolhamid H., & Cheraghian B., (2021):** The effectiveness of a Pilates exercise program during pregnancy on childbirth outcomes: a randomized controlled

- clinical trial, BMC pregnancy and Childbirth, 21:480, Jundishapur University of Medical Sciences, Ahvaz, Iran.
- **Handa V., Blomquist J., Knoepp L., Hoskey K., McDermott K., & Muñoz A., (2011):** Pelvic floor disorders 5–10 years after vaginal or cesarean childbirth. *Obstet. Gynecol. de*; 118:777-784.
  - **Hyun, A, Cho, J., & Koo, J., (2021):** Effect of Home-Based Tele-Pilates Intervention on pregnant Women: A Pilot Study, *Healthcare*, 10, 125, Korea National Sport University, Seoul 05541.
  - **Kırıcı P., Nacar M., Karaçor T., Bülbül M., Baktroğlu M., Mavral N., & Kaya N., (2021):** Pilates workouts can improve the labor and newborn outcomes: A case control study, Adıyaman, Turkey, *Journal of Surgery and Medicine*;5(6):642-647.
  - **Leon-Larios, F., Corrales-Gutierrez, I., Casado-Mejía R., & Suarez-Serrano C., (2017):** Influence of a pelvic floor training program to prevent perineal trauma: A quasi-randomized controlled trial. *Midwifery*, 50, 72–77.
  - **Lin H., Hung J., Hung W., Hung J., Liaw L., & Chang J., (2016):** Effects of Pilates on patients with chronic non-specific low back pain: a systematic review, *The Journal of Physical Therapy Science*, J. 28: 2961–2969, 2016
  - **Motaghi B., fereshte A., & Reisi Z., (2021):** The Effect of Pilates on Pain in pregnant Women, *Medical Science*, Shahrekord University, 1–11.
  - **Oktaviani I., (2018):** Pilate's workouts can reduce pain in pregnant women. *Complementary Therapies in Clinical Practice*, 31:349-51.
  - **Pascoal G., Stuge Mota P., Hilde G., & Bø K., (2019):** Therapeutic Exercise Regarding Musculoskeletal Health of the pregnant Exerciser and Athlete. In *Exercise and Sporting Activity During pregnancy*; Springer Science and Business Media LLC: Berlin, Germany; pp. 309–326.
  - **Perfeito R., Allevato L., & Silveira D., (2019):** Effects of the practice of Pilates in pregnancy: a literature review, *SFM v.7*, n.2.
  - **Rahul, T., & Pravin K., (2020):** The effects of selected Pilates exercise on the body composition of obese people. *J. Crit. Rev*, 7, 3374–3381.
  - **Rodríguez-Díaz L., Ruiz-Frutos C., Vázquez-Lara J., Ramírez-Rodrigo J., Villaverde-Gutiérrez C., & Torres-Luque G., (2017):** Effectiveness of a physical activity programme based on the Pilates method in pregnancy and labour. *Enfermería Clínica*, 27, 271–277.
  - **Sansoni J, Hawthorne G, Marosszeky N, Moore K, Fleming G & Owen E. (2011):**-The Technical Manual for the Revised Incontinence and Patient Satisfaction Tools. Centre for Health Service Development, University of Wollongong
  - **Sarpkaya G., (2018):** Pregnancy Pilates and Benefits of pregnancy Pilates during Childbirth, *Journal of yoga and physiology*, 5(1).
  - **Sonmezer E., Manolya A., & Hayri B., (2021):** The effects of clinical Pilates exercises on functional disability, pain, quality of life and lumbopelvic stabilization in pregnant women with low back pain: A randomized controlled study" *Journal of back and musculoskeletal rehabilitation*, 34(1): 69~76.
  - **Wells C., Kolt G., & Marshall P., (2014):** Indications, benefits, and risks of Pilates exercise for people with chronic low back pain: a Delphi survey of Pilates-trained physical therapists. *Phys Ther*, 94: 806–817.
  - **Yaman S., Tulmaç Ö., Kılınç B., & Hançerlioğulları N., (2020):** The effect of Pilates performed during pregnancy on delivery outcomes, Ankara, Turkey. *Journal of Health Science Med*; 3(4): 442-447.