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The Effects of Pilate's Exercises on Pelvic Floor Muscles Strength in Immediate Post-Partum Women with Hyperlordosis

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Abstract:

Study design: *Semi-experimental randomized controlled trial with design of pre-test and post-test among women with hyperlordosis in post- partum and based on quantitative data.*

Objectives*: To determine the effect of Pilate's exercises on Pelvic floor muscles strength in women with hyperlordosis in immediate post- partum.*

Background: *Pelvic floor muscles weakness is associated with child birth. Pilate's exercises strengthen the pelvic floor muscles in post- partum. However, research to support these claims is limited.*

Methods and Materials: *Thirty new parous women with lumbar hyperlordosis, were enrolled. Subjects were selected objectively and randomly divided into experimental and control groups. The flexible ruler was used to measure the lumbar lordosis, Perineometer used to measure pelvic floor muscles strength. The exercise protocol was performed for eight weeks, three sessions per week and one hour per session. To compare the mean paired and sample t -test was used, (P ≤.05). The data was analyzed with the use of the Excel and SPSS*

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statistical software package.

Results: *Results demonstrated that there were statistically significant differences in pelvic floor muscle strength of both experimental and control groups. The improvement of experimental group, compared with control group was significantly great (p= 0.001, t=11.14)*

Conclusions: *It is concluded that Pilate's exercises could have a potential role to improve the women's Pelvic floor muscles restoration in post-partum and it is useful that health provider at health centers advice this exercise to help women in post-partum recover.*

Key words: Pelvic floor muscle, post- partum, strength, perineometer, Pilate's exercise

Introduction:

Pregnancy retains a higher risk for potential injury as compared to the patient who has not endured pregnancy or has not been pregnant for an extended period of time. Pelvic floor muscles (PFM) weakness is recognized as one of the problems encountered in women, because of vaginal childbirth (1-2), PFM weakness result in urinary and faecal incontinence (3-10) and re-education should address the perceived deficit. Although the PFM are thought to work tonically and reflexly during routine daily activities, voluntary contractions are required for training. Many of these cases need exercise therapy. Various PFMT protocols in women have been reported in literature (11-13). All of those studies have confirmed the efficiency of PFMT in the strengthening of PFM, reports regarding PFMT for the pelvic floor muscles in post-partum are scarce (11). In comprehending current motor learning theories, biomechanical principles, neuro – musculo - skeletal physiology, and anthropometry, the Pilates-evolved work can be perceived as a viable and effective method of movement reeducation. Surprisingly, there is no mentioning in the literature about the use of Pilates movements for the conditioning of the pelvic floor.

It is now necessary to subject this method to the rigors of research to investigate its validity as a cost-effective and efficient intervention for rehabilitation, post-rehabilitation, and fitness. The use of Pilates-evolved methods in the various fields of rehabilitation, including neurologically involved, chronic pain, orthopaedic, performance based, and pediatric rehabilitation, merits investigation, so in this article we study Pilate's exercises effects on Pelvic floor strength in a population of new parous women with hyper lordosis in their immediate post- partum, using a perineometer and digital examination.

Methods and Materials:

Approval for this study was obtained from the SANANDAG Medical Science University. This study design is a semi-experimental randomized controlled trial among new parous women with hyperlordosis in their immediate post- partum. This study community include all women who had been in a local hospital post-partum section as a result of their new child birth in first decade of September 23th to October 2th 2013, (n=109). As part of the initial screening procedures, the subjects' lumbar lordosis was qualitatively evaluated with independent postural body assessment by visually inspecting all the subjects. For this part of the study, the patients were asked to stand as comfortable as possible wearing bathing suits with bilateral symmetric weight bearing, while looking towards the horizon. The evaluation protocol was based on Kendall (14); in this screening 64 women with hyper lordosis were detected. All these women with hyper lordosis according to the exclusion criteria included sacroiliac disorders, spondilosis, scoliosis, presence of a pelvic organs prolaps, previous pelvic irradiation or abdominal or pelvic surgery including cesarean, tobacco use, chronic cough, history of pulmonary disease, connective tissue disease or conditions affecting the spinal cord or pelvic nerve roots, or unwillingness to participate in the study. Inclusion

criteria covered women in their immediate post- partum, of 20 to 40 years of age with hyperlordosis, who signed a written informed consent. Thirty volunteer women of the community study with hyper lordosis who were in their immediate post-partum, between 20 to 40 years of age, with a mean age (28.53±4.64) years, mean weight (69.44±7.42kg), mean height (161.2±5.43cm), mean body mass Index (26.62±1.89kg/m2) mean number of deliveries (2.23±.97) were used as subjects. The subjects be selected objectively and randomly divided in to experimental (n=15) and control (n=15) groups. (The characteristics of participants are indicated in Table 1).

Lumbar lordosis was measured using the system described by Youdas et al (15) in which the spinous process of T12 to S2 was used to measure the degree of lumbar curvature. A flexible ruler (with IDIO mark made in Thailand) was used to measure the degree of lordosis in the lumbar area. The flexible ruler is described as a 40, 50 or 60 cm strip of lead covered with plastic, can be bent in one plane only and retains the shape into which it is bent and molded to the contour of the spine to measure curves in the sagital plane. Its validity is 97% (16) PFM strength assessment done by a digital technique which has demonstrated reliability and validity as an assessment tool. A pressure perineometer (made in Iran, company of Erteashat Teby Iranian) was used to measure the pelvic floor muscle strength. Pressure perineometer is an advanced pressure biofeedback device that measures the strength of pelvic floor muscle voluntary contractions by sensing the pressure of air in a vaginal sensor. The pressure is displayed numerically in centimeter water pressure. In addition, it should be pointed-out that the use of perineometer is therefore difficult when a patient has a really low PFM strength, because no inward movement of the probe is possible in this case (17). To measure the pelvic floor muscle strength the location and action of the pelvic floor muscles (PFM) were described to the subjects in

enough detail for adequate understanding of this muscle group. Then subjects were respectively enrolled and underwent pelvic floor muscle strength assessment by examiner, subjects were positioned in supine, the hips were flexed and abducted, and the knees bent. Breath-holding discouraged, examiner placed sensor approximately 4 cm to 6 cm inside the vagina and inflated to reading of 100 (A standard inflation pressure of, say, 100 cm provides a constant base-line for readings) (17). The technique used is straightforward: it had the subject contract with both squeeze pressure and lift the sensor inward; in 2 or 3 seconds perineometer measurements of pressure showed on the monitor and recorded. This act repeated 3 times with 10 second intervals then maximal voluntary contraction (MVC) of this 3 consecutive pelvic floor muscle contractions were recorded as pelvic floor muscles strength. This evaluation was performed by a gynecologist in the gynecology clinic at Saeeid Medical Center, a local Medical Center. It must be noted that because of pelvic floor muscle stretch during the childbirth process no inward movement of the probe was possible in subjects of this case and pre-test score of them recorded zero. Then the experimental group attended training sessions for eight weeks, three sessions per week and one hour per session. Exercise Protocol was a progressive Pilate's specially designed one with no device, the protocol was 10 Pilate's exercise engaging PFM detected using video synchronized multichannel EMG by Crawford, MD in 2008 (18), including: Squats, Side Lying Bent Knee Lift, Side Lying Straight Leg Circle, Butterfly, Bridging, Corkscrew Hovering, All 4's Bent Knee lift, Cat into Cow plus some other Pilate's exercises engaging powerhouse (core) including: Cat Stretch, Swimming, The Hundred, Leg circle, Shoulder bridge, Scissors, Corkscrew, The teasers, hip twist, Roll over, roll up, Spine Stretch, Roll Back, Single Straight Leg Stretch, Double Leg Stretch, Single leg kick, The saw exercise, Sid kick series, Leg pull front, Leg pull back. The study group was followed between the 10th and 70th day after delivery,

training was from simple to advanced exercises, 60 minutes, 3 sections a week, eight weeks in a local gym called PASARGAD. Frequency of exercise was recorded in a training diary. Frequency started from 10 in first section and increased gradually to 35 in last section. The control group received no exercise. Post- test was down after exercise protocol.

Statistical analysis:

All results are given as mean values with 95% confidence intervals. Statistical significance was set at P≤.05. The clinical data was analyzed by paired, sample t -test (Tables 1, 2 and 3).The data was analyzed with the use of the Excel and SPSS statistical software package.

	groups	Mean	SD	MAX	MIN
Age (years)	**experimental**	28.86	4.75	38	22
	Control	28.2	4.68	35	21
Weight(CM)	**experimental**	69.12	7.91	87.5	60.2
	Control	69.76	7.16	85.7	59
Height (Kg)	**experimental**	161.7	5.78	170	150
	Control	161.87	5.24	173	155
BMI(kg/m2)	**experimental**	26.78	2.15	31.3	21.58
	Control	26.59	1.59	29.65	24.56
Delivery(n)	**experimental**	2.20	1.08	5	1
	Control	2.27	0.88	4	1

SD = standard deviation; BMI = Body Mass Index

Table1. Demographic characteristics of control and experimental groups

N	MIN	MAX	SD	Mean(CW)			
15	O	O	O	0	Pre-test	Experimental g	PFM Strength
15	50	42	2.66	47.33	Post-test		
15	50	42	2.66	47.33	Mean Difference		
15	0	0	0	0	Pre-test	Control g	
15	40	30	2.74	36.33	Post-test		
15	50	30	2.74	36.33	Mean Difference		

SD = standard deviation PFM= Pelvic Floor Muscles CW=centimeters of water

Table 2: Clinical Data for control and experimental groups

P	DF	T	Means Difference	
0.001	28	11.44	11	Experimental g
				Control g

DF= degree of freedom

Table 3: results of analysis of Pre-test and Post-test differences of PFM Strength control and experimental groups by sample t -test

Results:

A total of 30 new parous women with lumbar hyper lordosis in their immediate post- partum, of 20 to 40 years of age, as experimental (n=15) and control (n=15) groups were enrolled in the study. Results demonstrated that there were statistically significant differences in pelvic floor muscle strength of both experimental and control groups. Table 2 shows the improvement of experimental group compared with control group (p= 0.001, t=11.14) (Table 3).

Discussion:

The results demonstrate that a significant increase in pelvic

floor muscle strength was found in both experimental and control groups. The improvement of women following an eight-week Pilate's exercise course between the 10th and 70th day after giving birth, compared with control group was significantly great. The control group's PFM improvement is the result of physiologic restoration of body in homeostasy process. In the literature there is not a relevant deal of recent, high-quality evidence regarding the role of Pilate's exercise in the strengthening and conditioning of PFM. The Morkveds study in 1996 (11) and Mohseni - Bandpei study in 2010 (12) results are parallel with the results of this study, but they varied in terms of Exercise Protocol, how PFM strength was measured, the outcome measures and the number and characteristics of participants. The researcher discusses about this result by theoretic foundations of palates –based exercise experienced by Pilates-based practitioners in the field of rehabilitation: the PFM undergoes trauma with childbirth regardless of delivery method. During vaginal deliveries, nerves within the vaginal muscles are bruised, compressed and overstretched. Think, for example, of how nerves that are overstretched in a whiplash accident, affect the neck muscles: they respond by tightening up leading to pain and weakness. The pelvic floor muscles behave in the same way. Deep muscle tightness does not necessarily relax automatically. Long-term tension leads to weakness, painful intercourse, constipation and bladder issues; these would do well with movement, or better stated, mobilization of the nervous system and its connective tissues (19).

Pilates-based exercise can serve as technique to mobilize the nervous system and its surrounding connective tissues, as described by the practitioner. Neurophysiological properties of contractile tissues respond to stretching exercise. When Pilates stretching position is applied, slow stretch to soft tissues (i.e., skin, tendon, joint capsule) and muscles activates Golgi tendon organ. This sensory receptor detects differences in the tension

generated by either passive stretch or active muscle contraction. Golgi tendon organ inhibits alpha motor neuron activity as a result of decreased tension in muscles, permitting sarcomeres to lengthen. (20)

Another problem is PFM weak and de-conditioned Hypotonic PF muscle. In contrast to traditional modes of muscle conditioning that seek maximal voluntary contractions, Palates evolved muscle conditioning focuses on recruitment of the most effective motor units. Physiologically, most muscle recruitment during day-to-day activities occurs in postural muscles, which contain predominately type I fibers (21). Type I fibers contain plentiful mitochondria, high amount of oxidative enzymes and high density of capillaries. These characteristics make them well adapted for endurance activities over 30 minutes such as Pilates exercise prescription in this trial. Size or cross-sectional area of type I muscles increase as a result of increasing mitochondria, membranous and muscle filaments within the fibers (20) The pelvic floor muscles (PFM) consist of approximately 70% slow-twitch (type 1) and 30% fast-twitch (type2) muscle fibers (21). Thereby, the strength and endurance of type I fibers occur showing improvement of PFM strength. Improved recruitment and synchronous stimulation of these motor units also account for increased muscle strength. Therefore PFM can be influenced greatly by Pilates-evolved exercises, as results demonstrate that.

Conclusions:

The results of this research demonstrate the efficiency of Pilates exercise as an appropriate way to contribute to physiological benefits which occur after 8 weeks of training as improvement in the pelvic muscles strength. It is concluded that Pilate's exercises could have a potential role to improve the women postural abnormalities in post-partum, can be used as encouraging control-mobility of pelvic segments. They may also

help in preventing and attenuating the injury and dysfunction of musculoskeletal system and it is useful that the health provider at health centers offer advice about this exercise to help women in post-partum recover.

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