

Kinesiotaping Versus Pilate Exercises on Primary Dysmenorrhea in Girls

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Abstract—

Back ground: Primary dysmenorrhea (PD) is recurrent, cyclic, crampy pain in girls and its major symptoms were including lower abdominal pain, nausea, vomiting and headache. Therefore, there was a negatively effect on the activities of daily living and the school performance.

Purpose: This study was designed to assess the effect of kinesiotaping versus pilate exercises on primary dysmenorrhea in girls.

Subjects and Methods: Sixty girls participated in this study and their main complaints were pain and cramping during menstruation. The girls were divided randomly into two equivalent groups. **Group (A)** :Thirty girls were treated by kinesiotaping during menstruation for 3 consecutive menstruation. **Group (B)**: Thirty girls were treated by pilate exercises, 3 sessions for each week for 3 months with the exception of the days of menstruation. Visual analogue scale to assess pain intensity, Quality of life enjoyment and satisfaction questionnaire, Menstrual Distress Questionnaire, WALIDD score, Spielberger questionnaire and blood test analysis to evaluate plasma prostaglandin level were applied for each girl in two groups before and after the treatment.

Results: The obtained results showed a statistically highly significant improvement concerning visual analogue scale, Quality of life enjoyment and satisfaction, Menstrual Distress Questionnaire, Spielberger questionnaire in both groups but the improvement was highly significant improved in group (B) when compared with group (A). There was significant reduction of WALIDD score at post treatment in compare to pre-treatment in both groups but there was no statistical significant difference between both groups. Also, there was significant reduction of prostaglandin at post treatment in compare to pre-treatment in both groups and this significant reduction in favor to group (B) when compared with group (A).

Conclusion: The use of pilate exercises appeared to be more effective than kinesiotaping on primary dysmenorrhea in girls.

Key words--kinesiotaping, pilate exercises, primary dysmenorrhea, in girls.

I. INTRODUCTION

Primary dysmenorrhea (PD) is repetitive pain in the pelvic region associated with menstruation

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without recognizable pathology. It is typically known as menstrual cramps or period pain. PD is the most well-known gynecological issue in menstruating ladies and girls and the leading cause of repeated short-term school and work absenteeism among adolescents and girls. In spite of the treatments being accessible for PD, relatively few women consult a clinician about their indications and symptoms, favoring not to utilize treatment or non-pharmacological interventions [1].

Dysmenorrhea is a Greek expression to describe the painful uterine contractions throughout menstruation and is the most common prevalent problem in women with various intensities which involves 45 to 95% of females. Dysmenorrhea in adolescents and girls is usually primary and associated with ordinary ovulatory cycles with no pelvic pathology [2].

In girls who are suffering from primary dysmenorrhea, physical and mental health is affected; depression and the anxiety are significantly influenced, leading to disturbance in the activities of daily living performance. Thus, it is recommended that researchers and health care providers consider dysmenorrhea as a health problem and take steps to develop appropriate interventional studies in order to reduce the factors affecting the dysmenorrhea [3].

Kinesiotaping (KT) is a new type of elastic remedial tape that was created by Dr. Kenzo Kase in the 1970's and is utilized in the treatment of a numerous injuries [4].

It was reported that KT is a novel manner which has recently emerged as a suitable alternative to treat different musculoskeletal and neuromuscular deficits. KT is speculated to have several functions: (1) reestablishing correct muscle function by increasing support of weakened muscles, (2) decreasing congestion by improving the flow of blood and lymphatic fluid, (3) reducing pain by stimulating the neurological system, (4) modifying the misalignment of the joints through retrieving muscle spasm and (5) increasing proprioception through increased stimulation to the cutaneous mechanoreceptors. Thus, KT can be applied trying to reestablish muscle function and work, reduce pain, improve lymphatic and vascular flow [5].

The effect of KT related to physiological mechanisms by which is presumed to have therapeutic advantages that gather fascia to align the tissue in its ideal position, lift the skin over the inflammatory areas, pain and edema, provide a positional stimulus to the skin and lessening the pressure over the lymphatic channels and provide a path for exudates removal. KT has been reported to provide an increasing in the interstitial space, allowing the improvement of lymphatic and blood flow due to the elastic and adhesive characteristics of the tape [6]. Physiological effect of KT technique that the expanding and the contracting properties of the kinesiotape provide gentle stimulation to various types of sensory receptors in the skin during movement, this activates the spinal inhibitory system by stimulation of the touch receptors and activates the descending inhibitory system to diminish pain through the gate control theory [7]. Thus, kinesiotape applied to the lower abdominal area stimulate the tactile fibers in the skin suppressing the pain sensitizing action and reducing menstrual pain [8].

Pilates exercises are new emerging exercise form. It is a comprehensive method of stretching and strengthening exercises which is used to reduced stress, fatigue, improve mental and physical wellbeing, increase flexibility and increase in the blood flow and metabolism of the uterus. So, it relieves some of the symptoms that

can occur with primary dysmenorrhea [9].

Pilates exercises have recently been developing in the rehabilitation programs in the popularity, due to its perceived advantages in the musculoskeletal disorders. Pilates exercises had become a mainstream, low impact exercises with many perceived outcomes and benefits; both physical, (for example: balance, flexibility, pain diminution and disability reduction) and psychological (improved mindfulness and fitness) [10]. Exercise has been found to help in relieving menstrual discomfort through increased vasodilation and subsequently decreased ischemia. The release of endogenous opiates specifically β -endorphins suppress the prostaglandins and shunting of blood flow away from the viscera, resulting in less pelvic congestions [11].

Subjects & Materials and Methods

I-Subjects

Sixty girls were selected from gynecological and obstetric outpatient clinic of Eltebeen central hospital to participate in the study. The main complaints of girls were pain and cramping during menstruation. Their ages ranged from fourteen to twenty years old with body mass index (BMI) would be less than 25 Kg/ m². The girls were excluded from this study if they had skin diseases or cardiac diseases, irregular or infrequent menstrual cycles, previous abdominal or back operations as pelvic fractures and umbilical or inguinal hernia.

The study was approved by Research Ethical Committee, Faculty of Physical Therapy, Cairo University (No: P.T.REC/012/002116) and the clinical trial registration in Clinicaltrial.gov with an identifier number NCT04359381.

The study protocol was explained to all girls, who had signed an informed consent form.

Design of the study

The study was designed as a randomized controlled trial.

Group (A):

Consisted of 30 girls were treated by kinesio taping only (a special elastic and hypoallergenic tape which are all 5 cm wide are applied to dermatomes). kinesiotaping would be placed when the menstrual pain begins (one day before menstruation) and would be remain adhered for around four to five days until the pain disappears for three consecutive menstruation.

Group (B):

Thirty girls, all of them were treated by pilates exercises only which were practiced for 3 days a week for 12 weeks except the days of menstruation.

Randomization

An independent person randomly assigned to all participated subjects to either group (A) (n=30) or group (B) (n=30) by chosen numbers from closed envelopes having numbers that the number generator were chosen randomly.

II. MATERIALS

A. Evaluation materials:

1-Weight and height scale:

Was used to measure the weight and height of each girl before starting the study and to calculate BMI according to the following formula: $BMI = \text{weight (kg)} / \text{height square (m)}^2$

2-Visual analog scale (VAS) for both groups:

For determining the intensity of pain before and after the treatment for every girl in both groups (A&B). VAS is of ten centimeters line, at one end was written (no pain = zero) and at the opposite end (worst pain = ten) [12].

3-Quality of life enjoyment and satisfaction questionnaire (Q-LES-Q-SF) during menstruation:

The Q-LES-Q-SF consists of items that evaluate overall enjoyment and satisfaction regarding: physical health, mood, work, household and leisure activities, family and social relationships, ability to function in daily life, The economic status, living or housing situation, ability to get around physically, ability to do work or hobbies and overall sense of being. Responses were recorded at a five point scale from "very poor" to "very good", that higher scores showed better enjoyment and satisfaction with life (possible range of raw total score from fourteen to seventy). Scores were added and presented as a percentage of the total maximum possible score. The percent of total score of ≥ 70 indicated normal QoL [13].

4-The Menstrual Distress Questionnaire (MDQ):

It consists of symptoms or feelings associated with menstruation. The total numbers of items were 47. It is a 5- point rating scale from 0 to 4. For each items, there were 5 options i.e. No, mild, moderate, severe and very severe. An option of (very severe) had a score of 4, (severe) had a score of 3, (moderate) had a score of 2, (mild) had a score of 1 and (No) had a score of 0. The test includes seven sub scales as (pain, water retention, autonomic reactions, negative affect, impaired concentration, mood and behavioral changes, arousal, control). Total score was interpreted as follows: less than fifty was mild, from fifty to seventy was moderate and more than seventy was severe.

5-WaLIDD score:

To measure (working ability, location, intensity, days of pain of dysmenorrhea) [14].

6-Spielberger questionnaire was used to assess the anxiety level (State-Trait Anxiety Inventory (STAI) Form Y-1 and Y-2):

This scale was developed by Spielberger. It contains two scales, which are a trait anxiety (twenty items rated using a four point Likert scale) and a state-anxiety scale (twenty items rated using a four point Likert scale). The scores range from twenty to eighty in each scale. The levels of high scores demonstrate increased anxiety level [15].

7-Blood Sample Analysis to estimate plasma prostaglandin level:

Human Prostaglandin F2 α (PGF2 α) ELISA Kit (STAT FAX-2100 APPARATUS, AWARENESS TECHNOLOGY INC): For the quantitative determination of endogenic human prostaglandin F2 α (PGF2 α) concentrations in plasma. A sample of blood for each girl would be drawn and analyzed to estimate plasma prostaglandin level for both groups (A&B) at second day of menstruation before and after treatment.

B. Treatment material

- **kinesiotaping:** Kinesiotape is an elastic adhesive tape (Kinesio Tex® Ares Tape) , made in Korea, made of a porous cotton fabric with a medical grade acrylic adhesive that allows the skin under the tape to breathe, designed to allow a longitudinal stretch of 55-60 % of its resting length. This level of stretch approximates the elastic features of the human skin.
- **Table:** was utilized while kinesiotaping application.
- **Cotton and alcohol:** To clean the skin of the girl's lower back, lower abdomen and symphyseal area before kinesiotape application.
- **Scissor:** Used to cut a kinesio I strip shape.

III. METHODS

Kinesiotaping (for only group A):30 girls, all of them were treated by kinesiotaping application.

Basic rules of the kinesiotaping:

- Check the skin, the skin had to be clean and dry, no irritation or wounds and Hair removal was also important for fitting as well as for the best impact of the tapes.
- ☐kinesiotaping was applied when the menstrual pain begins (one day before menstruation) for periods of four to five days until the pain diminished then removed it. Kinesiotaping was utilized for three consecutive menstruations
- The patient was standing up, 3 bandages of a special elastic and hypoallergenic tape which all 5 cm wide were applied to dermatomes.
- First tape: was about twelve centimeter long, applied vertically between the belly-button and pubis. The central part of the adhesive was removed and is fastened by the lateral anchors. The tension was about 25%, which implied that the tape's length was increased by 3 cm. When applying the tape, the participant inhaled and had to be slightly lean backwards extending the torso. The central part of the kinesiotaping was adhered and then the rest of the protectors were detached from the lateral anchors (the rest of paper) afterward the rest of the kinesiotaping was adhered [16].
- Second tape: was about twelve centimeters in length that applied horizontally. A similar tension was used and following a similar methodology [16].
- Third tape: was about twenty centimeters long, the girls would be slightly lean forward. Physiotherapist had to detach the central part of the adhesive and hold it by the lateral anchors. The tension is about 25%, therefore increasing the length of kinesiotaping by five centimeters. A similar strategy as before was

followed, except that the tape was to be set in lumbar regions, covering both the posterior-superior iliac spines [13].

Pilate exercises program (for only group B)

Each girl in group (B) was engaged in a supervised pilate exercises program for 30 minutes per session for 3 days/week for twelve weeks except the days of menstruation. The girls would be asked to wear comfortable clothes. Pilate exercises consisted of Single leg stretch, double leg stretch, Hip mobility exercise, Leg floats, Chest lift, Plank pilate exercise and Pelvic curl. Each exercise would be performed for ten repetitions each session and the contraction would be maintained for five seconds followed by ten seconds of relaxation.

Statistical analysis

Descriptive statistics used for the collected data to calculate the mean, standard deviation and paired T-test to compare the result of each group before and after treatment. Independent T- test to compare the result of post treatment for both groups (A&B). The level of significance would be determined at $P < 0.05$

IV. RESULTS

General characteristics of girls

As indicated by the independent t test, there were no significant differences ($p > 0.05$) in the mean values of age, weight, height and BMI between both tested groups (A&B) **Table (1)**.

Table 1: Physical characteristics of participants in both groups (A&B)

Items	Group A	Group B	Comparison		S
	Mean \pm SD	Mean \pm SD	t-value	P-value	
Age (years)	17.66 \pm 0.92	17.63 \pm 0.96	0.137	0.892	NS
Weight (Kg)	57.66 \pm 4.37	59.56 \pm 3.38	-1.883	0.065	NS
Height (cm)	162.3 \pm 4.16	163.6 \pm 3.28	-1.343	0.185	NS
BMI (kg/m ²)	21.89 \pm 1.51	22.27 \pm 1.37	-1.017	0.314	NS

*SD: standard deviation, P: probability, S: significance, NS: non-significant.

Effect of treatment on all dependent variables

1. 2 \times 2 mixed design MANOVA

A. Overall effect:

Statistical analysis using 2x2 mixed design MANOVA indicated that there were significant effects of the tested group (the first independent variable) on the all tested dependent variables; ($F=15.1$, $P=0.0001^*$). However, there were significant effects of the measuring periods (the second independent variable) on the tested dependent variables ($F=1089.205$, $P=0.0001^*$). However, the interaction between the two independent variables was significant, which indicates that the effect of the tested group (first independent variable) on the dependent

variables was influenced by the measuring periods (second independent variable) ($F=22.236$, $P=0.0001^*$) (**Table 2**).

Table 2: The 2x2 mixed design Multivariate Analysis of Variance (MANOVA) for all dependent variables at different measuring periods between both groups.

	F-value	P-value	Partial Eta Squared	Observed power
Group	15.1	0.0001	0.67	1
Time	1089.205	0.0001	0.993	1
Interaction (group*time)	22.236	0.0001	0.75	1

B. Multiple pairwise comparison tests

I- Effect of treatment on VAS

The mean \pm SD values of VAS in the "pre" and "post" within group's comparison tests were 7.9 ± 0.88 and 4.36 ± 0.99 respectively in group A and were 7.7 ± 1.5 and 2.5 ± 0.77 respectively in group B.

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of VAS in post treatment in compare to pre-treatment ($P\text{-value} = 0.0001^*$) in both groups. The percent of change was 42.4% in group A and 67.5% in group B.

Considering the effect of the tested group (first independent variable) on VAS, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the "pre" test between two groups showed no significant differences with ($P=0.43$). While, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the "post" test between both groups with ($p=0.0001^*$) and this significant reduction in favor to group B. **Table (3)**.

Table 3: Mean VAS pre and post treatment of both groups (A&B).

VAS	Pre $\bar{X} \pm SD$	Post $\bar{X} \pm SD$	MD	% of change	P-value	Sig
Group A	7.9 ± 0.88	4.36 ± 0.99	3.35	42.4	0.0001	S
Group B	7.7 ± 1.5	2.5 ± 0.77	5.2	67.5	0.0001	S
MD	0.2	1.86				
P-value	0.43	0.0001*				
Sig	NS	S				

\bar{X} : Mean SD: Standard deviation MD: Mean difference
p value: S: Significant NS: Non significant
Probability value

2- Effect of treatment on Quality of life enjoyment and satisfaction (Q-LES-Q-SF)

The mean \pm SD values of Quality of life enjoyment and satisfaction in the "pre" and "post" within group's comparison tests were 25.46 ± 5.02 and 56.4 ± 5.19 respectively in group A and were 25.33 ± 5.01 and 61.33 ± 4.9 respectively in group B.

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant increase of Quality of life enjoyment and satisfaction at post treatment in compare to pre-treatment (P-value =0.0001*) in both groups. The percentage of change was 121.48% in group A and 142.12% in group B.

Considering the effect of the tested group (first independent variable) on Quality of life enjoyment and satisfaction, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the "pre" test between both groups showed no significant differences (P=0.918). While, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the "post" test between both groups with (p=0.0001) and this significant increase in favor to group B. **Table (4).**

Table 4: Mean Quality of life enjoyment and satisfaction pre and post treatment in both groups (A&B).

Quality of life enjoyment and satisfaction	Pre	Post	MD	% of change	P-value	Sig
	$\bar{X} \pm SD$	$\bar{X} \pm SD$				
Group A	25.46 ± 5.02	56.4 ± 5.19	-30.93	121.48	0.0001	S
Group B	25.33 ± 5.01	61.33 ± 4.9	-36	142.12	0.0001	S
MD	0.13	-4.93				
P-value	0.918	0.0001*				
Sig	NS	S				

\bar{X} : Mean, SD: Standard deviation, MD: Mean difference, p value: Probability value,
S: Significant, NS: Non significant

3-Effect of treatment on Menstrual Distress Questionnaire (MDQ)

The mean \pm SD values of Menstrual Distress Questionnaire in the "pre" and "post" within group's comparison tests were 106.53 ± 58.06 and 47.06 ± 10.48 respectively in group A and were 107.03 ± 13.91 and 37.63 ± 6.05 respectively in group B.

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of Menstrual Distress Questionnaire at post treatment in compare to pre-treatment (P-value =0.0001*) in both groups. The percent of change was 55.81% in group A and 64.84% in group B.

Considering the effect of the tested group (first independent variable) on Menstrual Distress Questionnaire, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the "pre" test between both groups showed no significant differences with ($P=0.865$). While, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the "post" test between both groups with ($p=0.0001$) and this significant reduction in favor to group B. **Table (5)**.

Table 5: Mean Menstrual Distress Questionnaire pre and post treatment in both groups (A&B).

Menstrual Distress Questionnaire	Pre	Post	MD	% of change	P-value	Sig
	$\bar{X} \pm SD$	$\bar{X} \pm SD$				
Group A	106.53 \pm 58.06	47.06 \pm 10.48	59.46	55.81	0.0001	S
Group B	107.03 \pm 13.91	37.63 \pm 6.05	69.4	64.84	0.0001	S
MD	-0.5	9.43				
P-value	0.865	0.0001*				
Sig	NS	S				

\bar{X} : Mean

SD: Standard deviation

MD: Mean difference

p value: Probability value

S: Significant

NS: Non significant

4- Effect of treatment on WALIDD score

The mean \pm SD values of WALIDD score in the "pre" and "post" within group's comparison tests were 8.1 ± 1.76 and 3.46 ± 1.13 respectively in group A and were 8.76 ± 1.4 and 3.1 ± 1.06 respectively in group B .

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of WALIDD score at post treatment in compare to pre-treatment ($P\text{-value} = 0.0001^*$) in both groups. The percent of change was 57.16% in group A and 64.61% in group B.

Considering the effect of the tested group (first independent variable) on WALIDD score, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the "pre" test between both groups showed no significant differences with ($P=0.112$). As well as, multiple pairwise comparison tests (Post hoc tests) revealed that there was no significant difference of the mean values of the "post" test between both groups with ($p=0.202$). In spite of there was no statistical significant difference between both groups, there was clinical difference and high percent of improvement in favor to group B. **Table (6)**.

Table 6: Mean WALIDD Score pre and post treatment of both groups (A&B).

WALIDD Score	Pre	Post	MD	% of change	P-value	Sig
	$\bar{X} \pm SD$	$\bar{X} \pm SD$				
Group A	8.1 \pm 1.76	3.46 \pm 1.13	4.63	57.16	0.0001	S
Group B	8.76 \pm 1.4	3.1 \pm 1.06	5.66	64.61	0.0001	S
MD	-0.66	0.36				

P-value	0.112	0.202	
Sig	NS	NS	

 \bar{X} : Mean

SD: Standard deviation MD: Mean difference

p value: Probability value

S: Significant

NS: Non significant

5- Effect of treatment on spielberger STAI Form Y-1and Form Y-2

The mean \pm SD values of STAI Form Y-1 in the "pre" and "post" within group's comparison tests were 57.2 ± 3.07 and 34 ± 3.4 respectively in group A and were 57.4 ± 3.25 and 26.23 ± 2.69 respectively in group B.

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of STAI Form Y-1 at post treatment in compare to pre-treatment (P-value =0.0001*) in both groups. The percent of change was 40.55% in group A and 54.28% in group B.

Considering the effect of the tested group (first independent variable) on STAI Form Y-1, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the "pre" test between both groups showed no significant differences with (P=0.808). While, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the "post" test between both groups with (p=0.0001) and this significant reduction in favor to group B. **Table (7)**.

The mean \pm SD values of STAI Form Y-2 in the "pre" and "post" within group's comparison tests were 52.43 ± 4.86 and 39.3 ± 3.01 respectively in group A and were 52.36 ± 4.94 and 31.4 ± 3 respectively in group B.

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of STAI Form Y-2 at post treatment in compare to pre-treatment (P-value =0.0001*) in both groups. The percent of change was 25.04% in group A and 40.04% in group B.

Considering the effect of the tested group (first independent variable) on STAI Form Y-2, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the "pre" test between both groups showed no significant differences with (P=0.958). While, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the "post" test between both groups with (p=0.0001) and this significant reduction in favor to group B. **Table (7)**.

Table 7: Mean STAI Form Y-1 and Form Y-2 in pre and post treatment of both groups (A&B).

		Group A $\bar{X} \pm SD$	Group B $\bar{X} \pm SD$	MD	P-value	Sig
STAI Form Y-1	Pre	57.2 ± 3.07	57.4 ± 3.25	-0.2	0.808	NS
	Post	34 ± 3.4	26.23 ± 2.69	7.76	0.0001*	S
	MD	23.2	31.16			
	Of change%	40.55	54.28			
	P-value	0.0001	0.0001			

	Sig	S	S			
STAI Form Y-2	Pre	52.43 ± 4.86	52.36± 4.94	0.06	0.958	NS
	Post	39.3± 3.01	31.4 ± 3	7.9	0.0001*	S
	MD	13.13	20.967			
	Of change%	25.04	40.04			
	P-value	0.0001	0.0001			
	Sig	S	S			

 \bar{X} : Mean

SD: Standard deviation MD: Mean difference

p value: Probability value

S: Significant

NS: Non significant

6- Effect of treatment on Prostaglandin

The mean ± SD values of Prostaglandin in the "pre" and "post" within group's comparison tests were 89.45 ± 17.22 and 41.62± 15.80 respectively in group A and were 89.05± 19.39 and 31.55 ± 10.11 respectively in group B.

Multiple pairwise comparison tests (Post hoc tests) revealed that there was significant reduction of Prostaglandin at post treatment in compare to pre-treatment (P-value =0.0001*) in both groups. The percent of change was 53.47% in group A and 64.57% in group B.

Considering the effect of the tested group (first independent variable) on Prostaglandin, Multiple pairwise comparison tests (Post hoc tests) revealed that the mean values of the "pre" test between both groups showed no significant differences with (P=0.933). While, multiple pairwise comparison tests (Post hoc tests) revealed that there was significant difference of the mean values of the "post" test between both groups with (p=0.005) and this significant reduction in favor to group B. **Table (8).**

Table 8: Mean Prostaglandin pre and post treatment of both groups (A&B).

Prostaglandin	Pre	Post	MD	% of change	P-value	Sig
	$\bar{X} \pm SD$	$\bar{X} \pm SD$				
Group A	89.45 ± 17.22	41.62± 15.80	47.83	53.47	0.0001	S
Group B	89.05± 19.39	31.55 ± 10.11	57.5	64.57	0.0001	S
MD	0.4	10.07				
P-value	0.933	0.005*				
Sig	NS	S				

 \bar{X} : Mean

SD: Standard deviation

MD: Mean difference

p value: Probability value

S: Significant

NS: Non significant

V. DISCUSSION

Primary dysmenorrhea is common and its major symptom was including pain in the lower abdomen, may radiate to the lower back and/or upper legs, develops within hours of the start of menstruation, peaks as the flow becomes heaviest during days 1 and 2 of the cycle that adversely affect daily life activities and school performance and may be considered a source of significant physical distress [17]. Dysmenorrhea in adolescents and girls is usually primary and associated with ordinary ovulatory cycles without any pelvic pathology [18].

The aim of this study was to investigate the effect of kinesiotaping versus pilate exercises on primary dysmenorrhea in girls.

The benefits of pilate exercises of the current study were prospective and generalized reflecting on girls on many aspects that they physically touched the benefits of pilate exercises in the form of overall improvement in the performance of ordinary activities of daily living resulting in more independence and more social interaction. In the present study, it was found that there was highly significant improvement of visual analogue scale (VAS) in the response to pilate exercises with percentage of improvement of pain intensity by 67.5%. Also, there was significant increase of quality of life enjoyment and satisfaction at post treatment in compare to pre-treatment ($P\text{-value} = 0.0001$) in response to pilate exercises.

The results of the current study were supported by Paithankar et al.[19] who detected that pilate exercises diminish the menstrual pain and also, lead to the improvement of quality of life during primary dysmenorrhea.. There was highly significant changes in pain measured by VAS and quality of life after 12 weeks of pilate exercises than conventional physiotherapy treatment. Also, the study of Fonseca et al. [20] confirmed that menstruation pain was significantly reduced by applying pilate stabilization training exercises for 3 times a week for 7 weeks. In addition to pain relief, pilate exercises improve muscular flexibility, reduced discomfort associated with dysmenorrhea and had a positive influence on quality of life, proving to be helpful alternative treatment for the symptoms related to primary dysmenorrhea.

In addition, the results of the study come in agreement again with the study of Abaraogu et al.[21] at Nigeria Teaching Hospital to explore the influence of exercise practices on pain and the quality of life of participants with primary dysmenorrhea and illustrated that exercise intervention caused a statistically significant reduction in pain severity and some other menstrual symptoms.

These findings and explanation was confirmed also by Araujo et al. [22]. A clinical evaluation was performed in 10 physical therapy students with primary dysmenorrhea, who were submitted to a protocol of 16 Pilate floor and ball exercises aimed at the pelvic area. The two pain evaluation tools (VAS and the McGill questionnaire) of the research have shown improvement of symptoms associated with primary dysmenorrhea and significant pain intensity decreased reported by participants of pilate exercises.

One of the recent studies that support our results was applied by Berde et al.[23] who compare effectiveness of core strengthening exercises and chair aerobic exercises in primary dysmenorrhea for 4 days per week for about 8 weeks (excluding the time of menstrual cycle). The statistical analysis revealed that there was a

very significant difference found in pain intensity using VAS scores and VMSS (Verbal Multidimensional Scoring System scores) at two groups after the treatment. So, exercises reduce pain by release of endorphins, rise in the pain threshold and improve the quality of life in females suffering from primary dysmenorrhea.

This also comes in agreement again with the study done by Dehnavi et al.[24]. The exercise protocol included aerobic exercise. The outcomes of analyzed data illustrated that aerobic exercises highly improve the severity of pain of the primary dysmenorrhea in the intervention group in contrast with the control group. Sports exercises increase the premenstrual blood flow in pelvic region. Therefore, the onset of the accumulation of prostaglandin in the pelvic region delayed the onset of pain, leads to faster transfer of wastes and prostaglandins (which is the main cause of menstrual pain) from the uterus and also reduce stress with providing mental and physical relaxation. Also, the study conducted by Khare et al.[25] reported that isometric exercises and various stretching techniques have positive effects in the treatment of primary dysmenorrhea in adolescent school girls. Shah et al.[26] added that stretching exercises are non pharmacological measure for reliving dysmenorrhea, which is simple, easy to practice and without any side effect.

The results of the study come in agreement again with Yeknami et al.[27]. Submaximal aerobic exercise along with ginger's usage, were effective in reducing the pain of primary dysmenorrhea more than control group and only ginger's usage. The group of exercises practiced submaximal aerobic exercises two times per week for 40 minutes. For those of ginger group, capsules containing 250 mg of powdered ginger root (Zyntuma) was prescribed in the first 3 days of menstruation: 4 capsules a day (every 6 hours). Exercise causes to delay the start of prostaglandins gathering, reduce the menstrual pain by increasing endorphins, reduce stress and sympathetic nervous activity and also by increase the blood flow to the pelvis.

The results of the study come in agreement again with the study of Cicek,[28] and Akbas et al.[29] who showed that regular aerobic exercise reduces and improves PMS symptoms in sedentary women. Regular aerobic exercise (4 week group aerobic training program, 50 minutes which is comprised 5 minutes of warming up, 40 minutes of aerobic fitness exercising and 5 minutes of cooling down) was recommended as a method for reducing the risk of PMS and its severity, an alternative to pharmaceutical treatments, reduce menstrual symptoms and improve quality of life.

The results of the current study were supported by Heidarimoghadam et al.[30] who demonstrate the impact of exercise plan dependent on FITT protocol(Intensity of exercise, the time of exercise and the type of exercise that was implemented) on primary dysmenorrhea in medical students. The training and aerobic exercise significantly reduced the severity and duration of pain. Therefore, this strategy is a good alternative to common drugs such as steroidal anti-inflammatory drugs and oral contraceptives especially in cases in which these drugs are contraindicated. Also, Sutar et al.[31] reported that Aerobic exercises might be the favored therapy for dysmenorrhea as it was less cost and had beneficial outcome on dysmenorrhea. Additionally, the quality of life and all eight domains of the SF-36 scale demonstrated improvement in the exercising girls.

The results of the study come in agreement again with the study of Safarzadeh et al.[32]. The regular sport exercises can be of an excellent effect on PMS prevention. Physical exercises trigger an increase in brain

efficiency, producing equilibration in female brain chemical secretions ,feeling of the happiness that creating a positive attitude towards life and have positive effect with PMS clinical symptoms such as muscle pain and water retention .

In the present study, it was discovered that there was highly significant improvement of visual analogue scale (VAS) with the percentage of improvement in pain intensity by 42.4% and significant reduction of Menstrual Distress Questionnaire (MDQ) at post treatment in compare to pre-treatment (P-value =0.0001) with the percent of change was 55.81% in response to kinesiotaping.

The results of the current study were supported by Lim et al.[8]who evaluate the effect of the kinesiotaping versus spiral taping on the pain of menstruation and the premenstrual syndrome.Degrees of menstrual pain were assessed using VAS. Menstrual pain significantly decreased in both the Kinesiotaping group ($p<0.01$) and the spiral taping group ($p<0.05$).Also, Lee et al.[33] reported that women in their 20s experienced a reduction in menstrual pain for up to 4 hours in both the taping and drug groups, but the pain continued to decrease 24 hours later in the taping group than in the drug group.

The results of the study come in agreement again with the study of Forozeshfard et al. [34]. Comparing menstrual pain in the lower back and disability between two conditions, of menstrual cycle with and without kinesiotaping (KT) in young females, showed that there was significant reduction in VAS ($P= 0.005$), McGill pain score ($P= 0.001$) and the functional disability ($P< 0.0001$) by utilizing KT during menstrual cycle.Additionally to this, Yum et al.[35] had shown the effect of balance taping for prevention of menstrual pain in female middle school students. The balance taping had appeared to be effective in alleviating menstrual pain and an alternative option to drugs in reducing the menstrual pain and distress.

The results of the present study were supported additionally by Choi, [36] who assess the effectiveness of taping and hot packs on premenstrual syndrome. Premenstrual syndrome was evaluated utilizing MDQ.The taping group and the hot pack with taping group showed that there was significantly reduction of premenstrual syndrome following the intervention more than the group treated by hot packs only. Also, Guruprasad et al.[37] demonstrated the immediate effect of yoga postures against physiotherapy exercises practices along with k-taping on pain in dysmenorrhea. Both groups received k taping. These results of both studies indicated that kinesiotaping is an easy, non-drug intervention in premenstrual syndrome, an auxiliary treatment that maximizes natural recovery ability, normalizes muscular function, increases lymphatic and vascular flow and stimulates the tactile fibers in the skin that suppress the pain sensitizing action.

These results of the current study were disagree with Lashgari et al.[38] who investigate the effects of pilate exercises on the mood of non-athlete women.The outcomes of analyzed data between both groups demonstrated that there is no significant difference between the variations average of stress ($p = 0.053$), the depression ($p = 0.961$), the anger ($p = 0.252$), the vitality ($p = 0.340$), the fatigue ($p = 0.611$), the confusion ($p = 0.988$), the relaxation ($p = 0.203$) and the happiness ($p = 0.67$) between study and control groups. It was observed that none of the mood variables changed due to the lack of participants' athletic experience, the limitations that exist in the society among women and the existence of various stresses and physiological factors in today's life

may have affected the activity of the nervous system and hormonal changes. Therefore, it was suggested that more research is done on larger samples.

These results of the current study were disagree also with Daluz et al. [39].The study conducted on 86 participants who suffered from chronic nonspecific pain in the lower back. Participants were randomly divided into a mat pilate exercises group and the equipment-based pilate exercises group. The participants attended sessions over a period of 6 weeks to 6 months. No significant difference was detected in the intensity of the pain at the short to the medium term (six weeks course of treatment and six months of the treatment course after randomization, respectively). A possible interpretation for the outcome was that the exercises selected for two groups lead to activation of the profound muscles of the lower back.

The outcomes of this study was contradicted with Blakey et al.[40] who didn't discover any connection between the intensity of pain in primary dysmenorrhea and physical activity. A total of 654 questionnaires (Women's Health and Lifestyle Questionnaire) were answered by participants. The results illustrated no connection between the exercise and primary dysmenorrhoea. Possible interpretations for this result was due to exercises were assessed by self-report and the possibility that participants overestimated answering the questionnaire cannot be excluded. The sample comprised university students who may be more educated and affluent than women not attending university, this may reduce the generalizability of the findings.

The study was directed to investigate and compare the effect of the kinesiotaping in patients suffering from chronic non-specific pain in the lower back against a placebo tape (a control group). The outcomes of the study confirm that the kinesiotaping is not superior than placebo taping in the treatment of patients with chronic pain in the lower back.

VI. CONCLUSION

These findings suggested that pilate exercises were found to be more effective and superior to kinesiotaping, providing a simple, no need any cost and safe method to relieve primary dysmenorrhea in girls.

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