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EFFECT OF AEROBIC COMBINED WITH PELVIC ROCKING EXERCISES ON QUALITY OF LIFE IN PRIMARY DYSMENORRHEA

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Authors' contributions
This work was carried out in collaboration between all authors. Author GEE designed the study, wrote the protocol, and wrote the first draft of the manuscript. Author AME managed the literature searches and performed the statistical analysis. Authors GEE and HOG managed the analyses of the study. All authors read and approved the final manuscript.

ABSTRACT

Aims: To determine the effect of aerobic combined with pelvic rocking exercises on quality of life in women with primary dysmenorrhea. *Place and Duration of Study:* Outpatient Clinic of Faculty of Physical Therapy, Cairo University, between January and July 2013.**Methodology:** A sample of sixty volunteers, virgin females diagnosed as primary dysmenorrhea was selected from the students of Faculty of Physical Therapy, Cairo University. Their age ranged between (17- 25) years and body mass index (BMI) <30kg/m². They were randomly assigned into two equal groups in number (A& B). Group (A) participated in an aerobic exercise-training program in addition to pelvic rocking exercise. Group (B) performed pelvic rocking exercise only. Both groups continued their ordinary daily living activities. Exercise training program and pelvic rocking exercise were performed three times per week for 3 successive months. Assessment of all subjects in both groups (A& B) was carried out before and after the treatment program (3 months) throughout present pain intensity (PPi) to measure dysmenorrhic pain intensity and Short Form (SF)-36v2 questionnaire to measure the quality of life. **Results:** Both groups (A&B) showed a significant decrease (P<0.001) in the PPi scores and a significant increase (P<0.001) in the quality of life scores after the end of three consecutive months of training program. However, aerobic plus pelvic rocking exercises group (A) showed a greater decrease in the PPi scores and greater increase in the quality of life with percentage of improvement was 83.33% & 13.4% respectively while in pelvic rocking exercise group (B) the percentage of improvement was 46.32% & 3.4% respectively. **Conclusion:** So, it could be concluded that aerobic combined with pelvic rocking exercises are effective in decreasing dysmenorrhic pain and improving quality of life in girls having primary dysmenorrhea.

Keywords: Primary dysmenorrhea, Aerobic exercise, Pelvic-rocking exercise, Quality of life.

INTRODUCTION

Dysmenorrhea is chronic, cyclical pelvic pain associated with menstruation. Typically, it is characterized by cramping lower abdominal pain occurring just before and/or during menstruation, usually starting soon after menarche once regular ovulation is established [15]. The prevalence of dysmenorrhea is difficult to determine because of different definitions of the condition, estimates varying from 45% to 95%. However, it seems to be the most common gynecological condition, regardless of age and ethnicity [22].

Painful menstruation is a cyclic painful condition that adversely affects the woman's wellbeing for a large part of her life. Its pathogenesis is not always understood. Prostaglandins seem to be intimately involved in primary dysmenorrhea, although it is difficult to understand the underlying cause for their excessive secretion [26]. Abnormalities in plasma steroid levels could account for the disturbance, especially significantly elevated plasma levels of estradiol in the luteal phase. Plasma levels of vasopressin appear to be higher in

women with dysmenorrhea suggesting a possible etiological role in the uterine prostaglandin synthesis [28].

The main aim of diagnosis for dysmenorrhea is to distinguish those cases with secondary dysmenorrhea due to endometriosis and chronic pelvic inflammatory disease and treat them accordingly. The developments of sonographic and magnetic resonance imaging techniques (MRI) allow pre-operative diagnosis of adenomyosis, a difficult to diagnose cause of dysmenorrhea and pelvic pain [27].

Women with secondary dysmenorrhea often have chronic pelvic pain associated with a structural abnormality, whereas in primary dysmenorrhea there is no structural abnormality. Until now, many medical and gynecological texts attributed dysmenorrhea to emotional or psychological problems. However, experimental and clinical research has shown that, it is caused by uterine prostaglandins and overproduction of vasopressin [3].

Prostaglandins are also implicated in secondary dysmenorrhea; however, anatomical mechanisms can also be identified, depending on the type of accompanying pelvic disease [17]. Especially when it is severe, dysmenorrhea is associated with restriction of activity and absence from school or work. Participation in usual activities is adversely affected in 5 - 20% of these women [10].

Medication is usually required for all cases of moderate to severe painful menstruation. Apart from pharmacological agents, several techniques have been used including relaxation therapy, hypnosis, manipulation, psychotherapy, acupuncture, biofeedback techniques and surgery [28].

Yet despite this substantial effect on their quality of life and general wellbeing, few women with dysmenorrhea seek treatment, as they believe it will not help [16]. Treatments for dysmenorrhea such as non-steroidal anti-inflammatory drugs relieve pain or symptoms by affecting prostaglandin production. Gonadotropin-releasing hormone antagonists or oral contraceptives can also be used in treatment. Alternative treatments include herbal products, dietary supplements, dietary changes and exercises [19].

Physical exercise has been suggested as a non-medical approach for the management of symptoms. Despite the widespread belief that exercise can reduce dysmenorrhea, evidence-based studies are limited [6]. Several observational studies reported that physical exercise was associated with a reduced prevalence of dysmenorrhea, although numerous other studies found no significant association between outcomes. Evidence from controlled trials suggests that exercise can reduce dysmenorrhea and associated symptoms, but these studies have had small sample sizes and poor methodological quality [1]. Therefore, the aim of this study is to investigate the impact of aerobic combined with pelvic rocking exercises on the quality of life in women with primary dysmenorrhea.

MATERIAL AND METHODS

DESIGN

A randomized controlled trial design was used for the purposes of the current study. Subjects were randomized to either group (A) or (B) by simple randomization using the envelope method. Accordingly, a pack of sealed envelopes including a card with either the word "Aerobic exercise and pelvic rocking exercise" or "Pelvic rocking exercises only" written on it, was given to a staff physical therapist unrelated to the study; she/he picked one envelope after subjects agreed to take part in the study. Depending on which card was selected, subjects were allocated to their respective group.

This study was carried out upon a sample of sixty volunteers, virgin females diagnosed as having primary dysmenorrhea. They were selected from the students of Faculty of Physical Therapy, Cairo University, having the same ordinary daily living activities. Their age ranged between (17- 25) years and BMI<30kg/m [2]. A detailed medical history was obtained to screen for other pathological conditions, and all subjects underwent pelvic ultrasonography to exclude any pelvic pathological problems as endometriosis, adenomyosis or pelvic adhesions. Subjects, who had irregular or infrequent menstrual cycles and using any anti-inflammatory or antispasmodic drugs within 2 months before the study were excluded. All subjects were instructed not receive any drugs during the duration of the study. All subjects were not participated in any pervious exercise training program for at least 3 months prior the study.

They were randomly assigned into two equal groups in number (A& B). All subjects were instructed briefly and clearly about the nature of exercise and its value in order to gain their confidence and co-operation all through the study. Informed consent form was signed by each subject in both groups (A&B) before starting the treatment.

Group (A): participated in aerobic exercise training program in addition to pelvic rocking exercise and Group (B) performed only pelvic rocking exercise. Both groups continued their ordinary daily living activities.

Methods of Subject Evaluation: both groups (A&B) were evaluated before and after 3 months of the exercise program by the following:

Present pain intensity (PPi) scale: used for assessment of dysmenorrhic pain intensity which was scored as being: no pain=0, mild pain=1, moderate pain=2, severe pain=3, unbearable pain=4 [5].

Short Form (SF)-36v2 Questionnaire to measure quality of life:

It is a multi-purpose, short-form health survey with only 36 questions. It yields an 8-scale profile of functional health and well-being scores as well as psychometrically based physical

and mental health. 36 questions under 8-scale profile were answered by each participant to determine physical and psychological quality of life [20]. Calculation of scores for the eight scales is performed using the transformed scores ranging from 0 (the worst) to 100 (the best) and summary measures are standardized to produce mean of 50 with a standard deviation of 10. Short form health survey (SF) includes 8 scales: physical functioning (PF-2 items on limitation doing moderate activities and climbing several flights of stairs), role limitation due to physical problems (RP-2 items on less accomplishment than one would like to achieve and limitation in kind of work or other activities), bodily pain (BP-1 item on pain interference with one's normal work), general health(GH-1 item on general health perception), vitality (VT-1 item on having energy), social functioning (SF-1 item on interference of physical health or emotional problems with one's social activities), role limitation due to emotional problems (RE-2 items on less accomplishment than one would like to achieve and not being careful in doing activities as usual), and perceived mental health (MH-2 items on feeling calm or peaceful and feeling sad) [20].

Exercise procedures: both groups (A&B) performed exercises three times per week for 3 successive months.

1. Aerobic exercise training program on bicycle ergometer:

It was performed for all subjects in-group (A). Each subject was asked to sit on the adjustable seat of bicycle ergometer and asked to catch the modified handle bar; the ear sensor was connected to the ear lobe of the subject to measure pulse rate. Every subject was asked to start cycling "pedaling" by their lower extremities. The exercise performed as following:

First stage (Warming up): Consisted of 5 minutes in the form of pedaling at speed of 60 revolutions per minute.

Second stage (Active stage): Consisted of 20 minutes pedaling at speed of 60 revolutions per minute with incredible load until achieves 60% 0f maximal heart rate which was calculated by the following equation: Maximal heart rate= 220-age in years. The heart rate was measured through pulsometer attached to the subject's ear.

Third stage (Cooling down): Consisted of 5 minutes in the form of pedaling at speed of 60 revolutions per minute.

2. Pelvic rocking exercise:

Each subject in both groups (A&B) performed pelvic rocking exercise from crock lying position, by instructing the subject to contract glutei, abdominal muscles, press lumbar region down against bed, hold, then relax. Sustained muscle contraction was maintained for 5 seconds followed by 10 seconds of relaxation and was repeated 10 times/ session, 3 times weekly, for 3 successive months.

STATISTICAL ANALYSIS:

The collected data of this study was expressed as mean ± standard deviation (SD). Comparison between normally distributed variables in the two studied groups (A&B) was performed using unpaired t test. Comparison between not normally distributed variables in the two studied groups (A&B) was performed using Mann-Whitney U test while comparison between before and after assessment within the same group was performed using Wilcoxon Signed Ranks test. SPSS computer program (version 16 windows) was used for data analysis. P value less than or equal to 0.05 was considered significant and < 0.01 was considered highly significant [11].

RESULTS

General characteristics

As shown in Table (1): The general characteristics for all subjects in both (A & B) at entry of the study. Group (A): The means of their age and BMI were (20.23 ± 1.52) years, (24.78 ± 1.76) Kg/m^2 respectively. Group (B): The means of their age and BMI were (19.67 ± 1.61) years and (24.88 ± 1.79) Kg/m^2 respectively. Comparison between both groups (A&B) showed a statistically non-significant difference (P< 0.166 & P< 0.829) at age and BMI respectively.

Table 1. General characteristics of the subjects in both groups (A&B).

Variables	Group A (n= 30)	Group B (n= 30)	Level of significance
Age (yrs.)	20.23 ± 1.52	19.67 ± 1.61	P< 0.166
Weight (kg.)	65.83 ± 5.55	65.93 ± 5.85	P< 0.946
Height (cm.)	162.97 ± 4.47	162.73 ± 4.35	P< 0.838
BMI (Kg/m^2)	24.78 ± 1.76	24.88 ± 1.79	P< 0.829

Data are expressed as mean ± SD. P> 0.05= not significant.

Dysmenorrhic pain intensity assessed by PPi *scale before and after exercise for both groups (A&B)*:

Regarding Group (A): the mean values at entry of the study was (3.60 ± 0.50) score, after 3 months the mean value was (0.60 ± 0.49) score, the percentage of improvement was 83.33%. Which revealed a statistically highly significant decrease (P<0.001).

While in-group (B): the mean values at entry of the study was (3.67 ± 0.48) score, after 3 months the mean value was (1.97 ± 0.81) score, the percentage of improvement was

46.32%. Showed statistically highly significant decrease (P<0.001).Comparison between both groups (A) and (B), revealed a statistically non-significant difference (P>0.05) in dysmenorrhic pain intensity before the treatment and a statistically high significant difference (P<0.001) after the treatment favoring group (A) as shown in table (2).

Table2. Dysmenorrhic pain intensity scores within the same group and between the two studied groups.

Variables	Dysmenorrhic pain intensity (score)		Level of significance[#]
	Group A (n= 30)	Group B (n= 30)	
Before exercise	3.60 ± 0.50	3.67 ± 0.48	P< 0.595
After exercise	0.60 ± 0.49	1.97 ± 0.81	P< 0.001**
% improvement	83.33 %	46.32 %	
Level of significance[##]	P< 0.001**	P< 0.001**	

Data are expressed as mean ± SD.
Mann-Whitney U test; ## Wilcoxon Signed Ranks test.
P> 0.05= not significant; **P< 0.01= highly significant.

Quality of life assessed by SF-36 v2 before and after exercise for both groups (A&B):

Group (A): The mean value of SF-36 before the study was (70.38 ± 8.13) score, after 3 months the mean value was (81.26 ± 11.34) score, the percentage of improvement was 13.4%, which revealed a statistically highly significant increase (P< 0.001) in quality of life.

Group (B): The mean value of SF-36 before the study was (72.26 ± 8.69) score, after 3 months the mean value was (74.78 ± 9.36) score, the percentage of improvement was 3.4%, which revealed a statistically highly significant increase (P< 0.001) in quality of life.

Comparison between both groups (A) and (B), revealed a statistically non-significant difference (P>0.05) in SF- 36 before the treatment and a statistically significant difference (P<0.05) after the treatment favoring group (A) as shown in table (3).

Table 3. Quality of life measured within the same group and between the two studied groups.

Variables	Quality of life (score)		Level of significance[#]
	Group A (n= 30)	Group B (n= 30)	
Before exercise	70.38 ± 8.13	72.26 ± 8.69	P< 0.379
After exercise	81.26 ± 11.34	74.78 ± 9.36	P< 0.012*
% improvement	13.4%	3.4%	
Level of significance[##]	P< 0.001**	P< 0.001**	

Data are expressed as mean ± SD.
Mann-Whitney U test; ## Wilcoxon Signed Ranks test.
P> 0.05= not significant; *P< 0.05= significant. **P< 0.01= highly significant.

DISCUSSION

Dysmenorrhea refers to the occurrence of painful menstrual cramps of uterine origin and is a common gynecological condition with considerable morbidity. The behavioral approach assumes that psychological and environmental factors interact with, and influence, physiological processes. Behavioral interventions for dysmenorrhea may include both physical and cognitive procedures and focus on both physical and psychological coping strategies for dysmenorrhic symptoms rather than modification of any underlying organic pathology [17].

For almost half a century, exercise has been thought that relief or even cures primary dysmenorrhea and in the last 15 to 20 years, researches for the link between physical activity and menstrual disorders have increased significantly [18].

The results of the present study revealed that aerobic combined with pelvic rocking exercises (group A) produced a significant reduction of dysmenorrhic pain intensity score and significant increase in the quality of life compared to performing pelvic rocking exercise alone (group B) after 3 months of treatment, which indicated that performing aerobic with pelvic rocking exercises are more effective in alleviating primary dysmenorrhea than when performing pelvic rocking exercise alone.

The results agree with those of in the study of **Salehi et al.,** [23] they investigated the effect of a set of aerobic exercises three times /week for 12 weeks results in a significant reduction on primary dysmenorrhea and observed a significant reduction in intensity and length of pain in the exercise group after intervention through improving blood flow at the pelvic level, which occurs during exercise.

These results are in agreement with ***Mahvash et al.,*** [13] *they revealed that* 8 weeks of exercise, 3 sessions a week and 90 minutes per session was an effective, significant method in reducing dysmenorrhic pain and its symptom in young females by enhancing blood flow at the pelvic level.

Shahrjerdi *et al.,* [25] *studied* the effect of stretching exercise on primary dysmenorrhea in 179 single girls aged 15-17 years, they concluded that stretching exercises are effective in reducing pain intensity and pain duration in girls with primary dysmenorrhea.

Also, **Saadatabadi et al.,** [21] *studied* the effect of six weeks flexibility training on dysmenorrhea. They concluded that aerobic exercises are effective in the reduction of dysmenorrhic symptoms.

A meta-analysis studying the risk factors for different classes of chronic pelvic pain revealed that exercise was associated with a small reduction in risk of dysmenorrhea, highlighting that exercise might potentially is an effective intervention [9, 12].

Daley[7] had shown that exercise could result in reduced stress, fatigue and depressed mood; it therefore has the potential to relieve some of the secondary symptoms that can occur with primary dysmenorrhea. It is therefore possible that the relationship between exercise and primary dysmenorrhea is mediated by stress reduction rather than via direct biological pathways.

Samadi *et al.*, [24] examined the effects of 8 weeks of regular, moderate aerobic exercise on physical, and psychological menstrual cycle symptoms. They revealed significant effects for exercise on negative mood states and physical symptoms. In addition, they revealed that women who frequently exercise might be some extent protected from deterioration of mood before and during menstruation.

Mahvash et al., [13] proposed that the increase in the blood flow and metabolism of the uterus during exercise may be effective in the reduction of dysmenorrhea symptoms. In another words, improved metabolism is a factor in the reduction of symptoms .

It is also suggested that increased menstrual pain by uterine muscle contraction is derived from a nervous system that is innervated by the sympathetic nerve hence; stress through hyperactivity of sympathetic nerve system via the increase contractibility of uterine muscles may lead to menstruation symptoms. Consequently, it might be possible to reduce dysmenorrhea symptoms by decreased sympathetic over-activity through exercise. Another hypothesis suggests that therapeutic exercise can increase the secretion of endorphins from the brain, and these materials in turn raise the pain threshold of the body [2, 8]

Verma [29] studied the effect of pelvic rocking exercises in reducing dysmenorrhea in 60 girls selected of colleges of nursing in New Delhi, their age between 17-27 years. 30 were assigned in experimental group and 30 in control group. Menstrual pattern and menstrual symptoms assessed by using questionnaire. Intensity of pain assessed during menstruation by using verbal descriptor scale. Pelvic rocking exercises practiced from the last day of menstruation till the next menstruation starts, practiced for 20 minute daily, 5 times in a week. The results showed that the intensity of the pain in the exercise group declined with marked reduction in pain of girls during menstruation and significant improvement of psychological symptoms in girls during menstruation and other physical symptoms especially the backache as pelvic rocking exercise mobilize the lumber region.

Regarding group (A) using the aerobic exercise in addition to pelvic rocking exercise is more effective than using the pelvic rocking exercise only in group (B) as the aerobic exercise is helpful for the treatment of primary dysmenorrhea through various modes such as decrease stress, attenuate menstrual symptoms through increase of local metabolism, and increase local blood flow at the pelvic level and increase of endorphin production [1]. It is a multidimensional problem and has various aspects that are a combination of organic, psychological, and sociocultural factors that result in its symptoms. However, findings of current research illustrate that exercise may have a key role in alleviating these problems. An interesting element of the relationship between exercise and dysmenorrhea is the involvement of stress. A number of studies have showed a correlation between life stress and gynecological problems as premenstrual syndrome [4, 22]. Exercise is widely accepted as a mean of moderating stress and biochemical changes in the immune system. A mechanism by which exercise may improve the symptoms of dysmenorrhea (reducing stress) has been articulated [14].

Daley [7] proved that aerobic exercise could result in reduced stress, fatigue and depressed mood; it therefore has the potential to relieve some of the secondary symptoms that can occur with primary dysmenorrhea. It is therefore possible that the relationship between exercise and primary dysmenorrhea is mediated by stress reduction rather than via direct biological pathways.

In conclusion, aerobic combined with pelvic rocking exercises is a cheap and effective method for reducing of dysmenorrhic pain and greater improvement of quality of life for dysmenorrhic women. Aerobic exercise can be performed in every place that do not need to any cost as medications.

CONSENT

All authors declare that 'written informed consent was obtained from the subject before starting the study for publication of this case report.

ETHICAL APPROVAL

This study was approved by ethical committee of faculty of Physical Therapy, Cairo University on 26-10-2014. No: P.T.REC/012/00659.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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الملخص العربى

تأثير التمرينات الهوائية مع تمارين إمالة الحوض على جودة الحياة فى حالات عسر الطمث الأولي

يهدف هذا البحث لدراسة تأثير التمرينات الهوائية وتمارين إمالة الحوض على جودة الحياة فى حالات عسر الطمث الأولي، وقد شاركت فى هذه الدراسة ستين فتاة غير متزوجات متطوعة ممن تتراوح اعمارهن بين 17و25 عاما. وتعانين من عسر الطمث الأولى (مع انتظام الحيض) وتم اختيارهن من طالبات كلية العلاج الطبيعي، جامعة القاهرة. وقد تم تقسيمهن عشوائيا إلى مجموعتين متساويتين في العدد مجموعة (أ) قمن بإجراء التمرينات الهوائية متوسطة الشدة على الدراجة الثابتة لمدة ثلاثين دقيقة ثم قمن بعمل تمرين ميل الحوض للخلف عشر مرات وذلك لمدة 36 جلسة يوم بعد يوم لمدة 3 أشهر وإستمرار النشاط المعيشى اليومي المنظم لهن. والمجموعة (ب) قمن بعمل تمرين ميل الحوض للخلف مثل مجموعة (أ) وإستمرار النشاط المعيشى اليومي المنظم لهن وقد تم تقييم جميع الفتيات فى المجموعتين (أ، ب) قبل وبعد اجراء الدراسة باستخدام المقياس المدرج لقياس شدة الألم الحالية، وكذلك باستخدام استبيان لقياس جودة الحياة. وقد أثبتت المعالجات الإحصائية للنتائج وجود نقص ذو دلالة إحصائية عالية في الإحساس بشدة ألام عسر الطمث الأولى بعد الانتهاء من تطبيق التمرينات الهوائية مع تمارين إمالة الحوض، كما أن هناك ارتفاع ذو دلائل إحصائية عالية في جودة الحياة وهكذا، يمكن أن نستخلص أنه ممارسة التمارين الرياضية وإعتبارها نمط حياة وعلاج تحفظي ممتاز يساعد على تخفيف الألام وتحسين جودة الحياة لدى الفتيات مع عسر الطمث الأولي.

الكلمات الدالة: آلام عسر الطمث الأولي – التمرينات الهوائية، تمارين إمالة الحوض، جودة الحياة.