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A Study on Effects of Aerobic Exercises on Quality of Life in Primary Dysmenorrhea in Bangalore

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ABSTRACT

Background

Dysmenorrhea is one of the most frequently encountered gynecological disorders in women of reproductive ages. The Primary type of dysmenorrhea (PD) occurs when there is no identifiable pelvic disease, leading to absenteeism and affecting the quality of life. It is associated with restriction of activity and absence from school or work.

Objective: To determine the effects of aerobic exercises on quality of life in primary dysmenorrhea.

Materials and methods: Comparative two group controlled study conducted on 60 female students aged 18 – 25 years with Primary dysmenorrhea. They were selected through convenience sampling techniques and were randomly assigned to intervention group A (n=30) and control group B (n=30). Participants in the intervention group participated in a 45-minute per session, 4 times per week for a 12 weeks aerobic exercise training program, while the control group did not participate in the exercise program. The pain intensity and menstrual severity were assessed with visual analogue scale (VAS) and Verbal multidimensional scoring system (VMSS); quality of life was assessed with Quality of Life Enjoyment and Satisfaction Questionnaire – Short form (Q-LES-Q-SF); and VO2 max for exercise intensity was assessed with 3-minute step test. These scales and questionnaires were used to assess both groups at the initial assessment (O- week), after the first menstrual cycle (4-week), after the second cycle (8-week), and after the third cycle (12-week). Data collected, analyzed, and level of significance was kept at 5%.

Result: Pre and post-test results of both groups were analyzed by parametric tests; independent t-test and Non-parametric tests; Mann-Whitney U test to determine the study significance between the two groups. With an analog independent t-test, a significant difference was observed between Group A compared to GROUP B with changes in VO2 max from pre-test to post-test 3 ($t=11.1387$, $p=0.0001$) as $p<0.05$. With the Mann-Whitney U test, there was a significant difference in VAS improvement in GROUP A concerning pre-test to post-test 3 ($Z= -6.6530$, $p=0.0001$) as $p<0.05$, and VMSS ($Z=-5.8990$, $p=0.0001$) as $p<0.05$. The pre-test to post-test 3 Q-LES-Q-SF scores were compared between both groups using an independent t-test. A Significant and higher improvement was observed in GROUP A compared to GROUP B ($t=13.0001$, $p=0.0001$) as $p<0.05$,

Conclusion: 45-minute, 4-session per week for 12 weeks aerobic exercise training programs are effective not only to reduce pain but to improve quality of life in females with primary dysmenorrhea.

Keywords: Aerobic exercises, Primary dysmenorrhea, Quality of life.

INTRODUCTION

The menstrual cycle is complex and is controlled by different glands and hormones produced by these glands. The hypothalamus which is a structure of the brain stimulates the pituitary gland to produce chemicals that prompt the ovaries to produce estrogen and progesterone.[6] Dysmenorrhea comes from the Greek word which means difficult monthly flow and describes painful menstruation. Also, dysmenorrhea is the most common gynecological disorder, in which approximately, 20-90% of women

suffer from this problem during their reproductive age.[1] Study conducted by Shabnam et al (2015) on primary dysmenorrhea and menstrual symptoms among Indian female students revealed that the prevalence of dysmenorrhea was 70.2%.[2] Dysmenorrhea can be classified into two subtypes: Primary and Secondary Dysmenorrhea. The Primary type of dysmenorrhea (PD) occurs when there is no identifiable pelvic disease, while secondary dysmenorrhea is vice versa.[1]

The nature of pains are spasmodic and strongest over the lower abdomen, which may radiate to the back and the inner aspects of the thigh, and resembles labor pain.[4,7] Other systemic symptoms include nausea and vomiting (89%), fatigue (85%), diarrhea (60%), lower backache (60%), and headache (45%). Other factors associated with primary dysmenorrheal are; nervousness, dizziness, mood swings, and in some cases, syncope and collapse. Constipation, urinary frequency is often present occasionally.[3] Primary Dysmenorrhea leads to absenteeism and affects the quality of life.[1] It is associated with restriction of activity and absence from school or work.[1]

Abnormal and increased prostanoids and possibly eicosanoid secretion lead to abnormal uterine contractions in primary dysmenorrhea, reduce blood flow to the uterus, thereby leading to hypoxia of the uterus.[4,7,8]

OLDCART mnemonic (onset, location, duration, characteristics, aggravating factors, relieving factors, treatment) might be used as a systematic approach to assess pain symptom[8,9].
In women of reproductive ages, exercise affects the levels of steroid hormones in their blood circulation, increasing pain threshold due to endorphin hormone elevation. Exercise reduces the activity of the sympathetic system, resulting in a decrease in dysmenorrhea symptoms.[16,17]
The main indicator used for assessing cardiopulmonary capacity and determining respiratory circulation functions such as exercise intensity is the VO2 max. [21,22,23]

According to Rachel P. et al (2018), the English version of the Q-LES-Q-SF is a valid, reliable self-report instrument for the assessment of the quality of life.[13,14] Therefore, the English version of Q-LES-Q-SF was used in this study as it yielded valid and reliable clinical assessment of self-reported health status.[15]
A study conducted by Stella Iacovides suggested that women with primary dysmenorrhea had a reduction in quality of life when experiencing menstrual pain.[11,12] the study aimed to determine the effects of aerobic exercises on quality of life in primary dysmenorrhea.

Materials and Methods
The populations of the research were female students of Garden City University Bengaluru, Karnataka India. 60 out of 72 subjects who were aged between 18 to 25 years participated in the study. The subjects who met the inclusion criteria were selected through the convenience sampling technique and were randomly assigned to the experimental and control groups. The inclusion criteria of the study were: Girls between the ages of 18 to 25 years, regular menstrual cycle (cycles of 21 to 35 days), subjects with VMSS 2, 1, and 0. The study protocol was approved by the Research Ethical Committee of Garden City University, Bengaluru. The research objectives were explained to the participants and written informed consent was obtained.

In both groups, demographic data includes name, age, weight, height, BMI were collected in the data collection sheet. General assessment form, VAS, VMSS, 3-minute step test, and Q-LES-Q-SF were also used for data collection at Pre-test, post-test, and follow-up

Treatment Procedure
Both groups were assessed before the intervention, after the first cycle of intervention, after the second cycle of intervention, and after the third cycle of intervention. The researcher demonstrated

the exercises to the subjects using verbal and visual instructions to the intervention group and advised the participants to perform the exercises at home, when not menstruating, and report when necessary.

The protocols for exercise training in the study include,
Frequency: 4 days per week for 12 weeks.
Intensity: 40% to 60% VO2 max (moderate intensity)
Time: 45 minutes per session (10 minutes warm-up, 30 minutes aerobics, 5 minutes cool-down)
Type:/mode: Alternate knee lift, hamstring curls, squat jump, and stair running.

The exercise program consists of 3 components; warm-up period, aerobic exercise period, and cool-down period.

WARM-UP PERIOD enhances the adjustments that must take place before physical activity. Each session begins with 10 minutes warm-up **(**alternately step their legs forward, backward, and sideways 5 times in each direction).

AEROBIC EXERCISE PERIOD: A conditioning part of the exercise program and its effectiveness depends on the FITT method. All the aerobic exercises included in the study were done by the participants for 30 minutes per session according to their tolerance at the initial stage and were fun as days goes by. Subsequently, progressed gradually as adaptation took place to improve cardiorespiratory fitness, aerobic capacity, and in turn improve quality of life and coping efficacy.
A
lternate knee lift helps to improve cardiovascular function, strengthen the core muscles and balance the body. Mostly, it was fun performing this exercise for 10 minutes as it eased tension in the subjects.

Hamstring curl strengthens the hamstrings and glutes, stabilizes the knees to be able to withstand the exercise impact, relieves the quadriceps tightness, stabilizes the spine, thereby reducing pain in the back. Performed by the subjects for 10 minutes.

Squat jump improves cardiovascular function, strengthens quadriceps, glutes, hamstring, and core muscles. It helps in postural balance and helps reduce calories in sedentary workers. Performed for 5 minutes.

Stair running improves aerobic capacity, strengthens lower limb muscles, and improves balance, agility, and motor control. Performed for 5 minutes.

COOL-DOWN PHASE: similar to the warm-up period but lasts 5 minutes. It prevents the pooling of blood in the extremity, prevents fainting, enhances the recovery period, and prevents cardiovascular complications. This includes taking a deep breath with both arms overhead and breathing out while bringing the arms down, shaking out the arms and legs.
Group B: Did not perform the exercise.

OUTCOME MEASURES
The **VO2 MAX** was estimated by a 3minute step test. The subject's heart rates are monitored before the step test and 5 seconds post-test. VO2max was estimated by calculating the post-recovery heart rate using an equation made specifically for females, not for men; 65.81- (0.1847 × pulse rate bpm).

Visual Analogue Scale is a valid and reliable tool used in the measurement of pain intensity.[1, 24] The score was determined by measuring the distance 0-10cm. Subjects were asked to rate pain intensity

as no pain (0), mild pain (1-3cm) moderate pain (4-7cm), and severe pain (8–10 cm). The scale was shown to the patient otherwise it is an auditory scale, not a visual one.

Verbal Multidimensional Scoring System (VMSS): Pain and dysmenorrhea severity was measured and assessed by the use of VMSS. VMSS grading system ranges from 0 to 3 grades to evaluate the working ability, the systemic symptoms, and the analgesics requirements. Grade 0 indicate no pain; grade one: mild pain; grade two: moderate pain; grade three: severe pain..[26]

Quality of life was determined by the Quality Of Life Enjoyment And Satisfaction Questionnaire Short-Form (Q-LES-Q-SF). Q-LESQ-SF was derived from the general activities scale of the original 93-item questionnaire. It is a reliable and validated, self-reported evaluation of the degree to which enjoyment and satisfaction are derived from a different area of life.[11] To evaluate the quality of life, the subjects were given Q-LES-Q-SF form which consists of 16 items but only 14 item scores are computed, the last two are stand-alone items. Q-LES-Q-SF is rated on a 5-point scale as 1-very poor, 2-poor, 3-fair, 4-good, and 5-very good. 70 is the maximum score. After that, the total score was computed into percentage maximum using the formula; (raw score- 14)/ 56.

Statistical Analysis and Results

Data were analyzed using SPSS software 20 version. Demographic data and outcome of the two groups were compared using independent t-test, and Mann-Whitney U test and kept at the level of 5% significance. The results of the study revealed that,

A significant difference was observed between the control group and experimental group regarding the mean age (p=0.0194), and BMI (p=0.0012) (Table 1).

Before the intervention, there was no significant difference between the control group and the experimental group with VO2 MAX scores (p=0.0187). Results showed a significant difference between intervention and control groups after the first, second, and third cycles of intervention (p=0.0001) (Table 2).

No significant difference was observed between the control group and experimental group in VAS scores

(p=0.8708). However, a significant difference was observed between the two groups after the 3 cycles of interventions as the VAS score decreased in the experimental group (p=0.0001) (Table 3).

A non-significant difference was observed between the control group and experimental group with VMSS scores at pretest (p=0.0187). VMSS scores significantly reduced in the experimental group (p=0.0001) after the 3 cycles of intervention (Table 4).

A non-significant difference was observed between the control group and experimental group with Q-LES-Q-SF scores at pretest (p=0.2850). Q-LES-Q-SF significantly increased after the 3 cycles of intervention in the experimental group (p-0.0001) (Table 5).

Table 1: Comparison of the control group and experimental group demographic characteristics.

Variables	Control group		Experimental group		t-value	P-value
	Mean	SD	Mean	SD		
Age in yrs	20.10	2.16	21.63	2.75	-2.4049	0.0194*
Weight	53.29	4.73	57.67	4.95	-3.0228	0.0042*
Height	1.55	0.04	1.57	0.07	-1.0144	0.3160
BMI	22.15	1.54	23.48	1.01	-3.4788	0.0012*

*p<0.05 indicates significant

Table 2: Comparison of the the the the control group and experimental group with VO2 MAX scores at different treatment time points

Treatment times	Control group		Experimental group		t-value	P-value
	Mean	SD	Mean	SD		
Pretest	47.18	1.75	46.21	1.34	2.4194	0.0187*
Posttest 1	47.22	1.74	47.99	0.88	-2.1648	0.0345*
Posttest 2	47.54	1.58	49.59	0.90	-6.1520	0.0001*
Posttest 3	47.64	1.48	50.67	0.80	-9.8950	0.0001*

*p<0.05 indicates significant

Table 3: Comparison of control group and experimental group with VAS scores at different treatment time points

Treatment times	Control group		Experimental group		Z-value	P-value
	Mean	SD	Mean	SD		
Pretest	8.23	1.30	8.17	1.46	-0.1626	0.8708
Posttest 1	7.80	1.27	4.73	1.11	-6.0838	0.0001*
Posttest 2	7.33	1.06	1.93	0.91	-6.6530	0.0001*
Posttest 3	6.83	1.09	1.10	0.40	-6.6530	0.0001*

*p<0.05 indicates significant

Table 4: Comparison of control group and experimental group with VMSS scores at different treatment time points.

Treatment times	Control group		Experimental group		Z-value	P-value
	Mean	SD	Mean	SD		
Pretest	1.60	0.50	1.77	0.43	-1.1088	0.2675
Posttest 1	1.60	0.50	1.03	0.18	-3.7700	0.0002*
Posttest 2	1.27	0.45	0.43	0.50	-4.5388	0.0001*
Posttest 3	1.30	0.53	0.03	0.18	-6.2834	0.0001*

*p<0.05 indicates significant

Table 5: Comparison of control group and experimental group with Q-LES-Q-SF scores at different treatment time points

Treatment times	Control group		Experimental group		t-value	P-value
	Mean	SD	Mean	SD		
Pretest	31.63	10.17	34.57	10.87	-1.0791	0.2850
Posttest 1	35.53	11.58	61.13	8.37	-9.8097	0.0001*
Posttest 2	38.47	12.15	72.20	4.80	-14.1447	0.0001*
Posttest 3	43.53	14.49	82.73	5.87	-13.7342	0.0001*

*p<0.05 indicates significant

Figure 1: Comparison of control group and experimental group with Q-LES-Q-SF scores at different treatment time points .

Discussion

Exercise is frequently utilized to alleviate daily stress and regulate immune system chemical changes. Stress management methods include doing favorite things, listening to music, meditating, self-hypnosis, and exercising. During rest, exercise can relieve stress by reducing sympathetic neurological activity and boosting parasympathetic nerve activity. (Guyton AC, Hall JE. Medical physiology. Gökhan N, Çavuşoğlu H (Çeviren). 2006;3.)

Stress stimulates sympathetic nerve activity, which can lead to increased uterine muscle contractions and menstruation pain. Exercise can reduce sympathetic nervous system activity, which can minimize menstrual symptoms of menstruation. (Davaneghi S, TARIGHAT EA, Dahri M. Association of nutritional factors and physical activity with the severity of primary dysmenorrheal pain.)

Exercise, according to Chantler et al., can lower the intensity and duration of dysmenorrhea by releasing endorphins, relaxing, reducing stress, and improving blood flow. (Chantler I, Mitchell D, Fuller A. Diclofenac potassium attenuates dysmenorrhea and restores exercise performance in women with primary dysmenorrhea. The Journal of Pain. 2009 Feb 1;10(2):191-200.)

Different treatment approaches for primary dysmenorrhea have been popular in recent years, and simple remedies have taken a prominent place in researchers' dysmenorrhea studies. This study found that 8 weeks of aerobic exercise reduced the pain intensity in primary dysmenorrhea in the intervention group compared to the control group. (Dehnavi ZM, Jafarnejad F, Kamali Z. The Effect of aerobic exercise on primary dysmenorrhea: A clinical trial study. Journal of education and health promotion. 2018;7.).

(Heidarian Pour A, Zamiri Dalir F, Shorideh Yazdi M. The effects of eight-week aerobic exercise on menstrual cycle disorders and hormones levels of FSH and LH. Journal of Sabzevar University of Medical Sciences. 2016 May 21;23(2):336-43.)

A Publication by Shavandi et al. also looked at the effects of 8 weeks of isometric exercises on primary dysmenorrhea in female students control and found that doing isometric exercises (such as abdominal, pelvic, and groyne enhancement exercises) can help reduce the severity and duration of pain, as well as the rate of medication use. (Shavandi N, Taghian F, Soltani V. The effect of isometric exercise on primary dismenorrhea.)

Mohammadi et al. also looked at the impact of aerobic exercise on nonathletic students' menstrual symptoms, and found that regular and continuous aerobic exercise can help reduce initial dysmenorrhea and severe monthly haemorrhage.(Mohammadi B, Azamian Jazi A, Fathollahi Shourabeh F. The effect of aerobic exercise training and detraining on some of the menstrual disorders in non-athlete students in Lorestan Universities. The Horizon of Medical Sciences. 2012 Jul 10;18(2):5-12.)

Many studies were done on the available options in management of primary dysmenorrhea symptoms which reduction in quality of life is among the symptoms.. The present study was conducted to determine the effects of aerobic exercises on quality of life in primary dysmenorrhea. The study used Q-LES-Q-SF as an outcome measure to ascertain the efficacy of aerobic exercises in primary dysmenorrhea with respect to poor QoL as a result of primary dysmenorrhea. Subjects in the experimental group revealed a significant reduction in menstrual pain intensity, severity, and other symptoms after 12 weeks of exercise training program.

In the present study, the overall effect in VO2 MAX after post-test 3 in experimental group is higher as compared to control group, with mean VO2 max in intervention group increases from 46.21 to

47.99 (after first cycle of intervention) to 49.59 (after second cycle of intervention) and to 50.63 (after third cycle of intervention). The findings support the studies done previously by Hunter Bennett et al, Antonio Saraiva et al, and Nguyen Thi et al [21,22,23]

In the present study, primary dysmenorrhea pain in the intervention group compared to the control group with the mean VAS in the intervention group reduces from 8.17 to 4.73 (post-test 1) to 1.93 (post-test 2) and to 1.10 (post-test 3). And mean VMSS of the intervention group reduces from 1.77 to 1.03 (post-test 1) to 0.43 (post-test 2) and to 0.03 (post-test 3). Study done by Farideh Vaziri et al (2015) found that 8-week aerobic exercises reduces dysmenorrheic severity.[17] Priya Kannan et al (2018) proposed that aerobic exercise utilizes hormone (progesterone) and inflammatory cytokine-mediated mechanisms to reduce the pain associated with primary dysmenorrhea.[20] Reduction in pain intensity and severity may be due to increased blood flow and metabolism of the uterus following an aerobic exercise program.

The mean Q-LES-Q-SF in the intervention group increases from 34.57 to 61.13 (post-test 1) to 72.20 (post-test 2) and 82.73 (post-test 3). The result of the present study conforms with the study done by Rachel P. et al (2018) who stated that the English version of the Q-LES-Q-SF is a valid, reliable self-report instrument for the assessment of the quality of life.[13] Study done by Ozlem Onur et al (2012) revealed that home-based exercise intervention seemed to provide a significant improvement in health-related quality of life and pain in patients with primary dysmenorrhea. [21]

CONCLUSION

The findings of the study revealed that 45-minute, 4-session per week for 12 weeks aerobic exercise training programs are effective not only to reduce pain but to improve quality of life as well. Thereby reducing the dysmenorrheic symptoms and improve functions. The Alternate Hypothesis is accepted as there are significant effects of aerobic exercises on quality of life in primary dysmenorrhea.

Besides cultural and family controls, many girls have little or no accurate information regarding the normal reproductive cycle at the beginning of their menstruation. The menstrual sensation and menses may put them in a state of distress or frightened. Menstrual pain experienced by some girls made them assume of being sick, punished, contracted disease, or even dying. Therefore, it is important to health educate girls before menarche to prepare their minds positively on the gynecological expectation and care.

LIMITATIONS OF THE STUDY:

- Small sample size.
- Subjects Lack of knowledge on the normal menstrual cycle.
- Subjects Lack of knowledge on dysmenorrhea.

RECOMMENDATIONS:

- The study can be further done by taking a larger sample size.
- Further study should be done to compare if the impact of Primary dysmenorrhea on quality of life is a result of pain or beliefs (religious, socio-cultural, family) that were attached to menstruation both in rural and urban areas.
- Further study will be done on different populations with different age groups.

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