

The effect of aquatic exercises on primary dysmenorrhoea in nonathlete girls

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ABSTRACT

Background: Primary dysmenorrhoea without any specific pelvic disease is one of the common complaints in women's medicine. The general purpose of this research is to define the effects of 12-week aquatic exercises on nonathletic girls' primary dysmenorrhoea.

Materials and Methods: This quasi-experimental was conducted on 40 nonathletic girls aged 18-25 years. Data gathering tools were: Evaluation form of primary dysmenorrhoea and the pain evaluation tool based on the McGill standard pain questionnaire completed before and after the intervention in 3 months (first, second, and third run). Then, 20 subjects were assigned to aquatic exercise group and the other 20 to control group. The subjects in experimental group did aquatic exercise for three sessions a week for 60 minutes for 12 weeks between two menstruations. Kruskal — Wallis and one way analysis of variance (ANOVA) tests were used to analyze the data.

Results: The results of this research indicated that severity and duration of pain decreased after 12 weeks of aquatic exercises. Comparison of the two groups showed a significant difference in pain intensity based on visual analogue scale (VAS) scale after these exercises (first, second, and third runs). Present pain intensity (PPI) scale after these exercises (second and third runs) showed a significant difference. Comparison of the two groups showed a significant difference in length of pain after these exercises (third run).

Conclusions: Totally, the findings of the present study showed that 12-week regular aquatic exercises are effective on decrease of the severity of the symptoms of primary dysmenorrhoea.

Key words: Exercise therapy, Iran, primary dysmenorrhea

INTRODUCTION

Dysmenorrhoea is one of the most common problems among women.^[1,2] Primary dysmenorrhoea, in absence of a diagnosable pelvic disease and secondary dysmenorrhoea, results from pathologic pelvic problems like endometriosis and inflammatory diseases.

Pain starts either before or concurrently with onset of menstruation and lasts for 12-72 hours.^[2] Prevalence of primary dysmenorrhoea has been reported as 50-90% in

various societies.^[3,4] Its prevalence has been reported as 74-84% in Iran.^[5] Although primary dysmenorrhoea is not life threatening and does not lead to individuals' defect, it highly affects the daily life among the young women.^[6] It is reported that 1% of the women at reproductive age do not go to work for 1-3 days in a month as a result of acute dysmenorrhoea, school girl' absenteeism is estimated to be 14% due to painful contractions, and those who attend their work face a severe reduction in their efficiency.^[1] This fact is of great importance from socioeconomic view and is supposed to be the main reason for waste of time at work and school.

For instance, in USA, where women are accounted for 42% of total manpower, the burden is estimated to be 600 million work hours.

In contrast, dysmenorrhoea can cause psychological and mental problems in some women and leads to their social isolation and lack of their active participation in the society.^[7] Existence of pain, as a serious health problem, is considered important and should be relived due to ethical reasons and the reduction effect on psychological and physiological status promotion.^[8] Evidences show that prostaglandin

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F2 α , which is secreted from endometrium, is responsible for dysmenorrhoea and uterine contractions stimulation. Uterine is sensitive to prostaglandin F2 α in all women either with dysmenorrhoea or without, but the difference in its amount of production in dysmenorrhoea group is significant.^[2] Due to lack of a unique treatment method for dysmenorrhoea and individuals' various responses to the treatment different treatment methods including medication, acupuncture, skin electrical stimulation, surgery, and prescription of various vitamins and mineral have been suggested.^[1] There are numerous treatments for primary dysmenorrhoea with some advantages and disadvantages.^[9] They include prostaglandin inhibitors that are effective in treatment of dysmenorrhoea. These medications have some side effects such as nausea, digestive system dysfunction, diarrhea, and sometimes fatigue.^[10] In addition, consumption of these medications is forbidden among those with peptic ulcer, or aspirin-sensitive asthmatic patients. Another suggested method is physical activity, which has been noticed as a nonmedicational method.^[11] Physical activity can help venous return through muscular contraction that leads to an increase in production of prostaglandins and other substances and finally prevents their collection in the pelvis. An average level of sport can be effective on menstruation.^[12]

Reduction of dysmenorrhoea in women who play sport may be resulted from the effect of hormonal changes on endometrium or increase of endorphins. Physical exercises seem to act as a nonspecific pain killer.^[13] Bouyancy reduces the imposed pressure to cardiovascular system so that floating in water up to neck, imposes the pressure to the lower limbs, facilitates venous return, and diminishes the load to cardiovascular system through hydrostatic pressure.

Heart rate drops by 5-8 pulses in resting position so that the exercises, done in water accompanied at a specific maximum heart rate, have less pulse increase (10-12 pulses) compared with the same exercises done out of water.^[14] Hydrostatic resistance also improves muscular endurance and power if aquatic exercises are designed based on scientific principles and personal characteristics and differences.^[15] Aquatic exercises have been vastly recommended to various age groups due their lower weight bearing. Barabosa studied the effect of aquatic exercises in a pool with temperature of 28-30°C in healthy individuals and concluded that water temperature as well as doing exercises in deep part of the pool and using assistive tools (for more bouyancy and doing power exercises with weights in water) are of great importance.

The above study indicates aquatic exercises as an important therapeutic program for some diseases based on various

researches.^[16] Numerous studies have emphasized on the association between dysmenorrhoea and regular sport activities in recent years. Granath *et al.* showed that the needed rest time for pregnancy low back pain was reduced in water. A comparison on 390 healthy pregnant women who exercised once a week in two separate groups of aquatic and land exercise showed that aquatic exercise during pregnancy reduced pelvic pain and low back pain leading to fewer sick leaves in this group compared with the land exercise group.^[17] In another study titled the effect of a set of isometric exercise on dysmenorrhoea, it was concluded that isometric exercises reduced length and severity of dysmenorrhoea as well as consumption of medication among girls.^[18]

Salehi *et al.* investigated the effect of a set of Pilates exercises on primary dysmenorrhoea and observed a significant reduction in intensity and length of pain in Pilates group after intervention.^[19] Aquatic exercise can be effective on individuals' pain reduction and improvement of quality of life through empowerment of muscles and decreased pressure on the joints.^[20] With regard to the specifications of the water, and as the effect of aquatic exercises among various exercises on primary dysmenorrhoea has not been already investigated, this study aimed to define the effect of a 12 week aquatic exercise on primary dysmenorrhoea among nonathlete girls in direction of women's health and ability promotion.

MATERIALS AND METHODS

This is a pretest — posttest quasi experimental action clinical trial with control group conducted during 2010-2011. Study population comprised all female nonathlete students aged 18-25 years in Sama school of Najafabad Azad University and private Shahid Ashrafi Esfahani University. Inclusion criteria were existence of primary dysmenorrhoea in most of menstruation cycles, personal desire to use a method to relieve pain, regular menstruation cycles in each 24-35 days, onset of pain prior to or concurrent with bleeding lasting for 12-72 hours, 26 > body mass index (BMI) > 19, and being single and nonathletic. Exclusion criteria were pelvic pain during reproductive age (having no pelvic infection or being involved in pain not related to dysmenorrhoea), history of a diagnosed endometriosis in immediate relatives, history of chronic diseases such as diabetes, hypertension, cardiovascular and pulmonary diseases, history of professional sport (playing sports for 1 hour or more a day or 7 days or more a week) and being employed.

Diagnosis of primary dysmenorrhoea and the entrance of the subjects to the study was conducted based on primary

dysmenorrhoea evaluation form, checking the positive answers (Yes) to the first five questions and responding negative (No) to four questions out of five in the second five questions. Then, based on the above evaluation form, 40 subjects were randomly selected and assigned to a group of aquatic exercise ($n = 20$) and control ($n = 20$). The questionnaires had been already numbered and the subjects were classified based on even or odd numbers. Since in the present study, it was tried to measure dysmenorrhoea, which is a subjective issue, objectively as much as possible, severity of subjects' dysmenorrhoea was investigated by present pain intensity (PPI) and visual analogue scale (VAS) indexes of McGill standard pain questionnaire, which is a precise and valid tool to measure phenomenon of pain objectively. Reliability and validity of this questionnaire have been calculated by Valiani *et al.* in 2009 ($r = 0.8$).^[9] McGill standard questionnaire was given to the subjects in both groups (as a pretest) after menstruation to determine dysmenorrhoea signs. It included a VAS with a 5 cm ruler scored zero (no pain) at one end and 5 (intolerable pain) at the other end. Subjects' PPI was measured by selecting an option from 0 to 4 (no pain, mild pain, suffering pain, and killing pain). Then, the researcher obtained subjects' informed written consent and give them nutritional instructions including tips on salt intake, cereals, vegetables, etc. (some nutrient are effective on decrease or increase of pain) to make the conditions identical for both groups. The questionnaire was firstly given to the subjects just after the menstruation. In the next step, physical exercises for the subjects were precisely and regularly conducted between two menstruations with the attendance of the researcher in the study group for three straight cycles. At the beginning of the exercises, aquatic exercises technique was educated to the students out of water. Then, the aquatic exercises were conducted for one hour, three sessions a week in the pool. In the first week, aquatic exercises were conducted in shallow part of the pool and in other weeks in the 3-meter deep part with temperature of 28-30°C. Meanwhile, control group had no aquatic exercise at this time interval. At the end of menstruation cycle, the questionnaires were collected and next posttest questionnaires (for the following months) were given to both groups. These exercises were educated to strengthen pelvic area muscles in order to modify blood

stasis in pelvic veins and facilitate quicker blood circulation. The aquatic exercises included 10 minutes of warming up in form of walking and running in water, 40-45 minutes of aerobic, endurance, flexibility, power, coordination, speed and agility in addition to other specific exercises for abdominal and pelvic muscles and thighs. The exercises were conducted with 60-80% of maximum heart rate. Heart rate was measured by a polar pulse watch among the subjects.

At the end of exercises, the subjects underwent cooling down for 5 minutes.

Descriptive and analytic statistical tests were used to analyze the data through SPSS version 16.

Mean and standard deviation (SD) were adopted in descriptive statistics, one way analysis of variance (ANOVA) to compare the variable in two independent groups and ANOVA repeated observations was adopted to compare each group before and after intervention. Kruskal — Wallis test was used for qualitative comparison of pain intensity. $P < 0.05$ was considered significant.

RESULTS

Subjects' mean age and SD in aquatic exercises and control groups were 20.25 (2.02) and 20.50 (1.79) years, subjects mean age and SD of the first menstruation were 12.58 (1.72) and 12.30 (1.92), and mean BMI and SD were 20.72 (1.80) and 20.33 (2.44), respectively. One way ANOVA showed no significant difference in mean age ($P = 0.85$, $F = 0.16$), mean age of the first menstruation ($P = 0.61$, $F = 0.49$), and BMI ($P = 0.83$, $F = 0.18$) in both groups before intervention. Mean pain intensity, measured with scale of PPI, showed no significant difference before intervention in two groups of aquatic exercises and control ($P = 0.21$), and after intervention in the first menstruation than before intervention ($P = 0.48$), but showed a significant difference in the second and the third periods of menstruation, respectively ($P = 0.05$) and ($P < 0.001$) [Table 1]. Table 2 presents mean pain intensity

Table 1: Comparison of subjects' mean dysmenorrhoea pain intensity measured by PPI scale in two groups before and after intervention in each period of menstruation

Pain intensity group	Before intervention		After intervention					
	mean	SD	First period		Second period		Third period	
			mean	SD	mean	SD	mean	SD
Aquatic exercises	3.05	1.27	2.09	1.11	2.35	0.98	1.06	0.94
Control	2.85	1.13	2.95	0.82	2.95	0.88	2.95	0.05
Kruskal — Wallis test		$P=0.213$ $F=0.097$		$P=0.48$ $F=0.062$		$P=0.05$ $F=4.53$		$P=0.001$ $F=16.29$

Table 2: Comparison of subjects' mean dysmenorrhoea pain intensity measured by VAS scale in two groups before and after intervention in each period of menstruation

Pain intensity group	Before intervention		After intervention					
			First period		Second period		Third period	
	mean	SD	mean	SD	mean	SD	mean	SD
Aquatic exercises	3.45	0.53	2.26	0.48	1.96	0.76	1.42	0.64
Control	3.01	0.82	3.11	0.66	2.97	0.75	3.05	0.75
ANOVA		$P=0.057$ $F=2.25$		$P=0.034$ $F=2.82$		$P=0.001$ $F=10.26$		$P=0.001$ $F=25.85$

Table 3: Comparison of subjects' dysmenorrhoea pain length in two groups before and after intervention in each period of menstruation

Pain length group	Before intervention		After intervention					
			First period		Second period		Third period	
	mean	SD	mean	SD	mean	SD	mean	SD
Aquatic exercises	2.20	1.10	1.94	1.13	1.63	0.97	1.00	0.70
Control	2.07	1.01	2.07	1.02	1.92	0.99	1.92	0.99
ANOVA		$P=0.907$ $F=0.097$		$P=0.525$ $F=0.652$		$P=0.584$ $F=0.543$		$P=0.002$ $F=6.716$

of dysmenorrhoea measured by VAS showed no significant difference before intervention in two groups ($P = 0.057$), but after intervention, it showed a significant difference in all three periods of menstruation than before intervention ($P = 0.03$) ($P \leq 0.001$). As seen in Table 3, mean length of pain showed no significant difference before intervention ($P = 0.907$) and after intervention in the first and second periods of menstruation than before intervention ($P = 0.52$) ($P = 0.58$), but it showed a significant difference in the third period of menstruation ($P = 0.002$). The results of the present study showed that pain intensity and length were reduced after 2 months of aquatic exercises in the experimental group (through 8 weeks of aquatic exercises) so that if physical exercise continued, dysmenorrhoea would decrease constantly.

Long-term effect of these exercises should be investigated by further studies.

DISCUSSION

In the present study, positive effect of 12 week aquatic exercises on nonathletic girls' dysmenorrhoea was observed, which is consistent with the findings of some previous studies investigating the positive effect of exercises on primary dysmenorrhoea. Soltani in her study titled "effect of a period of isometric exercises on primary dysmenorrhoea" showed that these exercises could reduce low back pain and abdominal discomfort.^[21] Shahrjerdi investigated the effect of 2-month stretching exercises on primary dysmenorrhoea and concluded that these exercises reduced pain intensity and length and consumption of sedatives among school

girls.^[22] Rakhshae in her investigation on the effect of three Yoga postures (cobra – cat and fish) on primary dysmenorrhoea concluded that these exercises reduced pain intensity and length in study group.^[23]

Dysmenorrhoea is treated by anxiety reduction techniques. Dysmenorrhoea is possibly made due to an increase in uterine muscles contractions under influence of sympathetic system.

Stress has potentiality to increase sympathetic system activity and can enhance dysmenorrhoea through increase of sympathetic system stimulation. In a study titled stress and dysmenorrhoea, Wang *et al.* concluded that there was a significant association between stress and dysmenorrhoea. They also reported that dysmenorrhoea increases among the women at higher ages and argued that sport can diminish sympathetic system stimulation and help improvement of dysmenorrhoea signs.^[24]

With regard to the obtained results by VAS, aquatic exercises reduce dysmenorrhoea in the first 4 weeks of the exercise.

With regard to PPI scale, aquatic exercises reduce dysmenorrhoea after 8 weeks. The reason for this difference is that VAS is a quantitative scale while PPI is qualitative.

The obtained results are in line with those of researches investigating the positive effect of stretching exercises on dysmenorrhoea. Shavandi *et al.* showed that isometric exercises reduced pain intensity and length, and drug consumption.^[18] A part of aquatic exercises is devoted

to muscular relaxation and stretching exercises. Muscular relaxation can diminish dysmenorrhoea. Rasoolzade *et al.* investigated the effect of relaxation on primary dysmenorrhoea and concluded that muscular relaxation can reduce dysmenorrhoea.^[25]

In another study on the effect of 6-week flexibility exercises on dysmenorrhoea, the researchers concluded that dysmenorrhoea signs reduced after 6 weeks of flexibility exercises.^[26]

Some of the Pilates exercises including active stretching and isometric exercises, pelvic muscles empowerment, and mental and physical relaxation can be helpful in reduction of stress.^[27]

In the present study, it was shown that pain intensity and length in aquatic exercises group was decreased after 2 months of exercises and if the exercises continued, dysmenorrhoea would be reduced constantly. Kardavani investigated the effect of aquatic exercises on lumbar herniated disc pain and concluded that aquatic exercises improved pain in these patients.^[28]

In another study, the effect of 8-month aquatic exercises in warm water in the patients with fibromyalgia was investigated and their physical function (aerobic capacity, balance, muscular tone) was improved.^[29] Khademi *et al.* reported the effect of 8-week swimming, as an aerobic sport, on reduction of physical and psychological premenstruation signs.^[30]

Kanda in her study on comparison of lower limb muscles activity during walking in water and walking on land showed that aquatic exercises can stimulate flexor and extensor muscles of hip further.^[31] She indicated the difference between walking in water and on land is due to the fact that walking in water is one of the major aquatic exercises. It is clear that in water with lower gravity power and hydrostatic resistance as well as lower load on joints and muscle, muscles, tendons, and ligaments can be easily strengthened. Physiologic responses of the body to floating in warm water are quite similar to those to local heat, but with less concentration. Physical properties of combination of water and heat, is the reason for most of general physiologic responses affecting various systems in the body.^[14]

Therefore, aquatic exercise with regard to their potential environment for activities, compared with land exercises, can be helpful for stress and pain reduction. In the present study, pain intensity and length in the study group was reduced through 8-week aquatic exercises and if the exercises continued, dysmenorrhoea would be diminished constantly. Its long-term effect needs further studies.

CONCLUSIONS

Overall, the findings suggest that aquatic exercise in patients with primary dysmenorrhea can reduce the symptoms. Since the primary dysmenorrhea can have a negative impact on women's employment centers, can be an affordable way to make a positive impact on other aspects of women's health is also proposed.

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