Impact of home-based exercise on quality of life of women with primary dysmenorrhoea

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Primary dysmenorrhoea is chronic cyclical pelvic pain associated with menstruation in the absence of an identifiable pathological condition. While medical treatments are available for primary dysmenorrhoea, exercise is accepted as an effective intervention. This study aimed to investigate the impact of home-based exercise on pain intensity and quality of life in women with primary dysmenorrhoea. Of 45 women with primary dysmenorrhoea included in the study, 40 completed it. At the beginning of the study baseline physical activity was determined using the International Physical Activity Questionnaire (IPAQ). Pain intensity was measured on the visual analogue scale (VAS), and health-related quality of life (HRQoL) was assessed with the SF-36 health survey. A standard home-based exercise intervention was recommended for all the patients, and the outcome measures were re-assessed at the first, second and third menstrual cycles. At each menstrual cycle VAS showed a significant decrease ($p<0.001$). When the eight domains of the SF-36 health survey and the physical and mental component summary scores were compared between the first and fourth visits, all domains showed significant improvement ($p<0.012$). In our study, home-based exercise intervention seemed to provide a significant improvement in HRQoL and pain in patients with primary dysmenorrhoea.

Dysmenorrhoea is chronic, cyclical pelvic pain associated with menstruation. Typically it is characterised by cramping lower abdominal pain occurring just before and/or during menstruation, usually starting soon after menarche once regular ovulation is established.[1] The prevalence of dysmenorrhoea is difficult to determine because of different definitions of the condition, estimates varying from 45% to 95%. However, dysmenorrhoea seems to be the most common gynaecological condition, regardless of age and ethnicity.[2] In a recent cross-sectional study on 729 women of reproductive age in a town in western Turkey the prevalence of dysmenorrhoea was found to be 63.6%.[3] Women with secondary dysmenorrhoea often have chronic pelvic pain associated with a structural abnormality, whereas in primary dysmenorrhoea there is no structural abnormality. Until recently, many medical and gynaecological texts attributed dysmenorrhoea to emotional or psychological problems. However, experimental and clinical research has shown that it is caused by uterine prostaglandins and overproduction of vasopressin.[4] Prostaglandins are also implicated in secondary dysmenorrhoea; however, anatomical mechanisms can also be identified, depending on the type of accompanying pelvic disease.[5] Especially when it is severe, dysmenorrhoea 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.[6] Yet despite this substantial effect on their quality of life and general wellbeing, few women with dysmenorrhoea seek treatment, as they believe it will not help.[1] Treatments for dysmenorrhoea such as paracetamol, aspirin and non-steroidal anti-inflammatory drugs relieve pain or symptoms by affecting prostaglandin production. Gonadotrophin-releasing hormone antagonists, oral contraceptives or intra-uterine devices can also be used in treatment. Alternative treatments include herbal products, dietary supplements, dietary changes and exercise.[5] Physical exercise has been suggested as a non-medical approach for the management of symptoms. Despite the widespread belief that exercise can reduce dysmenorrhoea, evidence-based studies are limited. Several observational studies reported that physical exercise was associated with a reduced prevalence of dysmenorrhoea, although numerous other studies found no significant association between outcomes. Evidence from controlled trials suggests that exercise can reduce dysmenorrhoea and associated symptoms, but these studies have had small sample sizes and poor methodological quality.[7] We aimed to investigate the impact of home-based exercise on the quality of life in women with primary dysmenorrhoea.

Material and methods

Subjects

We evaluated 45 women with primary dysmenorrhoea aged between 16 and 39 years. The women were included in the study if they fulfilled the following inclusion criteria:

- primary dysmenorrhoea

- dysmenorrhoea in the majority (>50%) of menstrual cycles for at least one day.

A detailed history was obtained to screen for other pathological conditions, and all patients underwent vaginal examination and pelvic ultrasonography. Women who had irregular or infrequent menstrual cycles, were using an intra-uterine contraceptive device or were taking oral contraceptive pills were excluded from the study.

Determination of pain intensity

A visual analogue scale (VAS) (in mm) was used to determine the intensity of the pain at the beginning of the study and the subsequent three visits.

Determination of the physical activity level

At the beginning of the study, to determine the baseline physical activity level, the International Physical Activity Questionnaire (IPAQ) short form was used. This instrument is designed primarily for population surveillance of physical activity among adults (age range 15 - 69 years). The validity and reliability of the IPAQ short form were tested for the Turkish population.[8] The short form consists of seven questions providing information about the time spent doing three specific types of activities: walking, moderate-intensity activities and vigorous-intensity activities. Each activity must be performed for at least 10 minutes. The scores of these specific activities are calculated separately in the IPAQ short form. Computation of the total score for the short form requires summation of the duration (in minutes) and frequency (days) of walking and moderate-intensity and vigorous-intensity activities. An average MET (metabolic equivalent tasks) score was derived for each type of activity.[9] The following values continue to be used for the analysis of IPAQ data: walking 3.3 METs, moderate physical activity (PA) 4.0 METs and vigorous PA 8.0 METs. Using these values, four continuous scores are defined: (*i*) walking MET-minutes/week = 3.3 × walking minutes × walking days; (*ii*) moderate MET-minutes/week = 4.0 × moderate-intensity activity minutes × moderate days; (*iii*) vigorous MET-minutes/week = 8.0 × vigorous-intensity activity minutes × vigorous-intensity days; and (*iv*) total physical activity MET-minutes/week = sum of walking + moderate + vigorous MET-minutes/week.

Total physical activity of at least 600 MET-minutes per week is considered a moderate level of physical activity, and a score of at least 3 000 MET-minutes per week is considered high. Total physical activity scores of less than 600 MET-minutes per week are considered low.[10] The 40 patients with dysmenorrhoea who completed the study were grouped as low (8), moderate (17) and high (15) according to their physical activity levels at the beginning of the study, and the effect of exercise on pain and quality of life was investigated individually in these subgroups of patients.

Measurement of quality of life

The impact of dysmenorrhoea on health-related quality of life (HRQoL) was assessed by the SF-36 health survey (SF-36). Reliability and validity studies for the Turkish version of the SF-36 were carried out by Kocyigit *et al.*[11] The SF-36 is a questionnaire containing 36 items covering eight domains. For each variable item scores are coded, summed, and transformed on to a scale from 0 (worst possible health state measured by the questionnaire) to 100 (best possible health state).[12] It yields scale scores for each of these eight health domains, and two summary measures of physical and mental health: the Physical Component Summary (PCS) and the Mental Component Summary (MCS). Patients were asked to visit every month after their menstruation to complete SF-36 questionnaires for a total of 3 months.

Exercise programme

A home-based exercise programme (lasting for 12 weeks, 3 times a week) was recommended for the patients. The programme was taught to the patients by a physical therapist, and instruction booklets with illustrations were provided. An exercise session lasted 40 minutes and comprised 10 minutes of stretching exercises, 20 minutes of aerobic exercise (walking or cycling), and 10 minutes of relaxation exercises. Participants recorded on a calendar whether they had completed the prescribed exercises each day. They were followed up for 3 menstrual cycles and each month the VAS and SF-36 scores were recorded. At each visit, compliance with the exercise intervention was checked by reviewing the information on the calendar.

Study ethics

This study was approved by the university ethical committee and complied with the Helsinki Declaration including current revisions and the Good Clinical Practice guidelines. All women gave written informed consent before starting the study.

Statistical analysis

Statistical analyses were performed using SPSS software, version 17.0 (SPSS, Chicago, IL). Power analysis was performed using a general power analysis program (G*Power 3.0.10, Kiel, Germany). The power calculation was used to determine the minimum sample size, assuming an alpha of 0.05 at 95% power, based on an effect size of 0.25 and 3 repeated measures for every patient. A sample size of 43 was calculated and 45 women were included in the study, but only 40 of them completed it. The *post hoc* power of the study was therefore 90%.

The Shapiro-Wilk test demonstrated that none of the variables was parametric. Proportions between findings of four visits for each woman were compared using the Friedman test. Spearman correlation analysis was done to evaluate relationships between the IPAQ and domains of the SF-36 questionnaire. A p-value of ≤ 0.05 was considered to be significant. When the Friedman test showed significance, comparisons were made between related pairs to detect the difference and a Wilcoxon test with Bonferroni correction was performed; $p<0.012$ was considered to be significant.

Results

The demographic and lifestyle data for the subjects are summarised in Table I. The median age of the subjects was 25 years (range 16 - 39 years). Thirteen women (32.5%) were married and almost 80% were university graduates or had undergraduate education.

At the beginning of the study the basal physical activity levels measured by the IPAQ revealed that 15 subjects (37.5%) had high, 17 (42.5%) moderate and 8 (20%) low activity levels. The relationship between the IPAQ scores and the domains of the SF-36 questionnaire at the onset of the study (Table II) showed

Table I. Socio-demographic characteristics of the subjects with dysmenorrhoea

Characteristics	
Age (yrs) (*N* (%), range)	25 (8), 16 - 39
Gravidity (median (IQR), range)	1 (1), 0 - 3
Educational level (*N* (%))	
Secondary	8 (20.0)
Undergraduate education	9 (22.5)
Graduate	23 (57.5)
Marital status (*N* (%))	
Married	13 (32.5)
Unmarried	27 (67.5)
Employment status (*N* (%))	
Housewife	3 (7.5)
Student	10 (25.0)
Professional	27 (67.5)
Smoker (*N* (%))	5 (12.5)
Body mass index (median (IQR), range)	21.2 (2.2), 17.9 - 29.2
Overweight (*N* (%))	5 (12.5)

IQR = interquartile range.

Table II. Simple correlations between the IPAQ and the domains of the SF-36 in the first visit (before the exercise intervention)

	IPAQ	
Domains of SF-36 in the first visit	**Rho***	***p***
General health perception	-0.044	0.788
Physical function	0.262	0.103
Role – physical	-0.109	0.504
Bodily pain	-0.051	0.757
Vitality	-0.364	0.021
Social functioning	-0.403	0.010
Role – emotional	0.152	0.348
Mental health	-0.352	0.026

*Spearman's rank correlation coefficient.

a statistically significant linear negative relation between vitality, social functioning and mental health domains ($p<0.001$).

Of the 45 patients entered into the study, 40 (89%) complied with the exercise intervention.

No injuries related to the programme were reported. After the exercise intervention, at each menstrual cycle VAS scores decreased significantly (Table III). The VAS scores started to decrease just after the beginning of the exercise intervention and continued to decrease in the subsequent three visits (Fig. 1). The difference in VAS scores of two subsequent visits was statistically significant ($p<0.001$).

Table III. Mean VAS scores measured before the exercise intervention (VAS-1) and at subsequent three menstrual cycles (VAS-2, VAS-3 and VAS-4)

VAS (mm)	Friedman χ^2	*p*
VAS (1 - 4)	106.987	<0.001

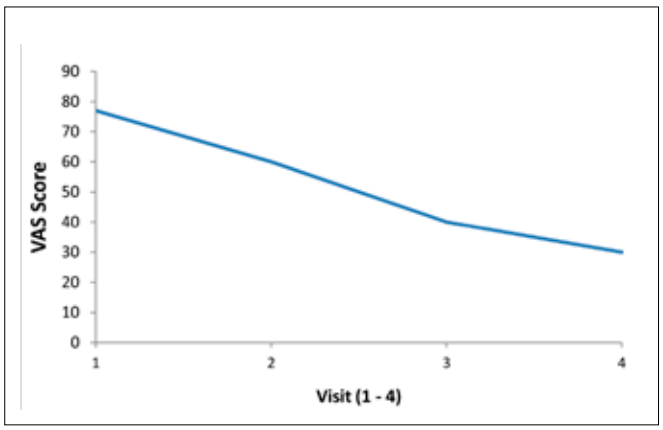

Fig. 1. Graphical representation of the progressive decrease in the VAS scores from the first to the fourth visit.

When the eight domains of the SF-36 and the PCS and MCS scores were compared between the first and fourth visits, all domains showed significant improvement ($p<0.012$) (Table IV). The positive effect of exercise on the PCS and MSC started at the first menstrual cycle (Fig. 2). When the Wilcoxon test was used for paired comparison, for each visit the differences in PCS and MCS scores were statistically significant when compared with the subsequent visit ($p<0.001$ for each one). Our study did not show a correlation between baseline IPAQ scores and PCS and MCS scores at baseline and after the exercise programme.

Table IV. Improvement in the domains of the SF-36 from the first to the fourth visit (1 - 4)

Domains of SF-36	Friedman χ^2	*p*
General health perception (1 - 4)	51.333	<0.001
Physical function (1 - 4)	70.066	<0.001
Role – physical (1 - 4)	62.784	<0.001
Bodily pain (1 - 4)	81.401	<0.001
Vitality (1 - 4)	9.339	<0.025
Social functioning (1 - 4)	52.365	<0.001
Role – emotional (1 - 4)	48.260	<0.001
Mental health (1 - 4)	46.644	<0.001

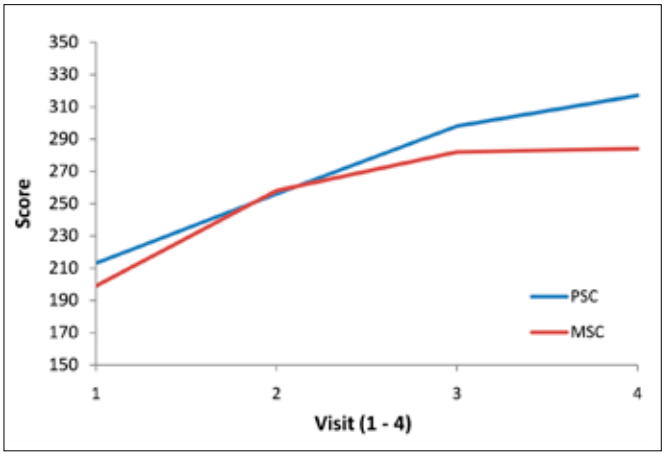

Fig. 2. Graphical representation of the progressive improvement in the PSC and MSC scores from the first to the fourth visit.

Discussion

Many women with primary dysmenorrhoea report that exercise provides symptomatic relief. The first medical report claiming that exercise might help relieve dysmenorrhoea was by Billing in 1943. He proposed that women with dysmenorrhoea had contracted ligamentous bands in the abdomen and he therefore developed a series of stretching exercises for which he claimed a high rate of symptomatic relief.[13]

Later, several observational studies reported that exercise was associated with a reduced prevalence of dysmenorrhoea. In a randomised controlled trial comparing symptoms between women who did physical training and a sedentary control group, a significant decrease in symptoms in the training group was found; however, this study had methodological flaws.[14]

A recent 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 dysmenorrhoea, highlighting that exercise might potentially be an effective intervention.[15] However, numerous other studies have found no significant association. These tend to be studies with large sample sizes involving a wide range of ages and populations, and have been conducted in a variety of countries. Another problem for researchers has been the subjective nature of the dysmenorrhoea symptoms experienced by the women in the studies.[7]

In our study we found that the intensity of pain, which was measured by the VAS, decreased after the exercise intervention. The decrease started immediately after starting the exercise programme and continued to decline in the subsequent three menstrual cycles. In previous studies it has been hypothesised that exercise has a beneficial effect because it improves blood flow at the pelvic level, as well as stimulating the release of endorphins, which act as nonspecific analgesics.[16]

Studies have shown that exercise can 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 dysmenorrhoea. It is therefore possible that the relationship between exercise and primary dysmenorrhoea is mediated by stress reduction rather than via direct biological pathways.[7]

In the medical literature, exercise interventions vary in quality, intensity and duration. Researchers have tried to quantify exercise in terms of high and low intensity, but the problem remains that exercise regimens are heterogeneous.[14] In the current study, the exercise intervention comprised sessions of home-based stretching exercises, aerobic training and relaxation exercises. The exercise programme we used was home based and therefore easy for every subject, and as a result the compliance rate remained very high throughout the study.

As the most common gynaecological complaint in menstruating women, primary dysmenorrhoea affects HRQoL negatively.[17] Two recent surveys conducted in Turkey demonstrated that most of the domains of the SF-36 scale were lower in women with dysmenorrhoea when compared with women without.[3,18]

In our study, exercise intervention appeared to provide a significant improvement in health-related quality of life measured by the SF-36. All eight domains of the SF-36 (physical functioning, role – physical, bodily pain, general health perception, vitality, social functioning, role – emotional, mental health) and the summary measures of physical and mental health showed significant improvements in every subsequent visit.

VAS and HRQoL, the two outcome measures assessed in our study, showed immediate improvements after starting the exercise intervention and continued to improve over time in the three subsequent cycles. The limitations of our study were that the researchers were not blinded to the assigned intervention or outcomes, and the lack of a control group ('sham' exercise) may have exaggerated the effect of the intervention.

In conclusion, there is evidence that exercise has a positive effect in the treatment of dysmenorrhoea, although further randomised controlled trials may be need for a definitive conclusion. In addition to the many health benefits of exercise, because of its potential positive effect in reducing a number of other symptoms and complaints that are often associated with primary dysmenorrhoea, it can be recommended for all affected women.

Declarations. This study was approved by our university ethical committee and complied with the Helsinki Declaration including current revisions and the Good Clinical Practice guidelines. All women signed written informed consent before starting the study.

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