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Menstrual pain and quality of life in women with primary dysmenorrhea: Rationale, design, and interventions of a randomized controlled trial of effects of a treadmill-based exercise intervention ☆

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ABSTRACT

Dysmenorrhea in the absence of pelvic abnormality is termed primary dysmenorrhea (PD). The health burden and social and economic costs of PD are high as it is reported to be the leading cause of recurrent absenteeism from school or work in adolescent girls and young adults. The belief that exercise works for relieving symptoms in women with PD is based on anecdotal evidence and non-experimental studies. There is very limited evidence from randomized controlled trials (RCTs) to support the use of exercise to reduce the intensity of menstrual pain. The objective of this study is to evaluate the effectiveness of exercise to reduce intensity of pain and improve quality of life in women with PD. We describe the study design of a single-blind (assessor), prospective, two-arm RCT, and the participant characteristics of the 70 women recruited in the age-group 18 to 43 years. The primary outcome of the study is pain intensity. The secondary outcomes of the study are quality of life, functional limitation, sleep, global improvement with treatment, and protocol adherence. The outcomes assessments are done at first menstrual period (baseline, Week 0), 2nd menstrual period (Week 4) and at two additional time points (Week 16 and Week 28) during the trial.

The results of the study will provide physiotherapists, medical practitioners, and researchers as well as the women who have PD with new insights, knowledge, and evidence about the use of exercise to manage pain in women with PD.

1. Introduction

The word "dysmenorrhea" translates as difficult menstruation [1]. Dysmenorrhea in adolescent and young women, usually associated with a normal ovulatory cycle [2,3] and no identifiable pelvic disease, is termed *primary dysmenorrhea* [PD] [4]. PD is an extremely common problem, with a prevalence ranging from 60% to 93%, depending upon the population and study [3,5]. A New Zealand prevalence study of 2,261 women in 2001 reported that the 3-month prevalence of dysmenorrhea was 55.2% and the 12-month prevalence 66.5% [6]. The initial onset of PD is usually within 6 to 12 months after menarche [7,8] and is commonly described as cramping, aching, or dull pain in the midline supra-pubic region, with or without radiation into the lower back, abdomen, medial thigh, or upper legs [9,10]. PD may begin a few hours before or after the onset of menstrual bleeding, lasts for about 48 to 72 h, and is most severe during the first or second day of menstruation [9,10]. Other associated symptoms include nausea, vomiting, loss of appetite, headaches, dizziness, diarrhea, sleeplessness, depression, irritability, and in severe

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cases, syncope or fainting [4,11]. A key differentiating factor in secondary dysmenorrhea is the onset and the presence of symptoms of pain that persist beyond the normal menstrual period. Secondary dysmenorrhea occurs any time after menarche and can arise as a new symptom in women in their 30s or 40s [7]. Chronic pelvic or lower abdominal pain that could begin 1–2 weeks before the onset of menstruation that is relieved after the onset of menstruation is usually associated with an underlying organic pathology such as endometriosis [10,12]. The onset, location, duration, and characteristics of pain plus any aggravating or relieving factors are helpful in differentiating primary and secondary dysmenorrhea [2,13].

There are a number of hypotheses proposed for the effectiveness of exercise for relieving menstrual pain. Mosler in 1914 was the first to speculate that exercise relieves pelvic congestion by shunting uterine blood flow [14]. Other proposed mechanisms include exercise-induced release of endogenous opiates, specifically beta-endorphins, vasodilatation, suppression of prostaglandins, reduction in stress, and elevation of mood: mechanisms that decrease pain or uterine contractions thereby relieving menstrual discomfort [11,12]. Particularly vigorous-intensity exercises are believed to stimulate the release of beta-endorphins, which act as systemic analgesics in reducing the menstrual pain associated with PD [15]. Aerobic exercise during the luteal phase is thought to be beneficial for PD [16], but no recommendations have been made for stopping exercises during menstruation. However, previous studies on exercise for PD restricted women from exercising during menstruation [17,18].

According to the American College of Sports Medicine (ACSM, 1978) guidelines for exercise prescription, vigorous-intensity aerobic exercise is 60%–90% of maximum heart rate (MHR) completed 3–5 times per week in bouts of 15–60 min per session [19]. Methods of quantifying the relative intensity of exercise include metabolic equivalents (METs), heart rate, or heart rate reserve. METs are considered a useful, convenient, and standardized way to describe the absolute intensity of a variety of exercises [20]. Vigorous exercise is defined as requiring $\geq$6 METS, including activities such as walking at a very brisk pace, jogging, and running [20,21].

Though vigorous-intensity exercises are believed to be useful for PD, there is limited empirical evidence to support their efficacy, with most studies being observational. A recent systematic review [22] that evaluated the efficacy of physiotherapy interventions for PD identified a single RCT on exercise [18]; however, the RCT was not eligible for the review as pain was not an outcome measure in the study. A review in 2008 [11] and a Cochrane systematic review of RCTs in 2010 [23] on exercise for PD identified only a single RCT on exercise for PD [18], with major methodological flaws. The potential benefits of vigorous exercise to manage associated symptoms of PD, and the lack of high quality studies, were the drivers to design this experimental study, which aims to evaluate the effectiveness of an exercise intervention to reduce the pain and associated symptoms of menstruation in women with PD.

1.1. Operational definition of primary dysmenorrhea

Primary dysmenorrhea is painful menstruation that presents within six to 12 months after menarche [7,8], when ovulation becomes regular, and in the absence of pelvic pathology. It is characterized by cramping, aching, or dull pain in the supra-pubic region with or without radiation into lower back, abdomen, medial thigh and/or upper leg and occurs just before or during menstruation with pain lasting from 48 to 72 h [7,10,12,24,25].

2. Methods

2.1. Objective and Study design

The study is a single-blind (assessor), prospective, two-arm, RCT, being conducted at the Otago School of Physiotherapy, Dunedin, New Zealand. The objective of the study is to evaluate the effects of an exercise intervention to reduce pain intensity and improve quality of life in women with PD. The study duration is 29 weeks inclusive of baseline (Week 0) and final follow-up (Week 28) assessments. Participant recruitment took place between 19 March 2014 and 23 July 2014. The study was approved by the Health and Disability Ethics Committee of New Zealand (Ref: 13/STH/206).

2.2. Sample size

The required sample size is calculated based on results of our previous feasibility study to explore the use of a treadmill-based exercise intervention for alleviating menstrual pain associated with PD [26]. A sample size of 70 participants (35 in intervention group and 35 in usual care control group) was estimated for an overall two-tailed 0.05 level of significance with 90% power, and standard deviations consistent with those observed in the feasibility study [26], to detect effect sizes of 15 mm on the visual analogue scale (VAS). The estimated sample size accommodated a dropout rate of 15%.

2.3. Study population and recruitment strategy

The study recruited a multiethnic group of women by public and University campus advertising. Advertising was by posting study flyers around the University of Otago, Dunedin campus, waiting rooms of the Women's and Children's Health clinic, Dunedin Hospital, General Practitioners, Dunedin Family Planning Clinic and physiotherapy clinics, sports centers and clubs, child care centers, community churches, and super markets. The advertisement flyers contained simple inclusion and exclusion information as well as contact details of the Clinical Research Administrator (CRA).

The study recruited women who fulfilled the following inclusion criteria: Non-pregnant in the age-group 18 to 43 years with general good health and having PD, not on a formal exercise program, women with regular menstrual periods and having no pelvic abnormality, PD with pain scoring $\geq$4 on a 0–10 numeric rating scale (NRS) for at least two consecutive months. The exclusion criteria were as follows: women with secondary dysmenorrhea, women having intra uterine devices, women on oral contraceptive pills (OCPs), and hormonal therapy and women with menstrual cycle interval exceeding 34 days.