

Review Article

Aerobic exercise as a non-medicinal option in the management of primary dysmenorrhea: A critical review

Chisom Anastasia Nwaezuoke¹, Yusuff Tunde Gbonjubola²

¹Department of Physiotherapy, Federal Medical Center, Abuja, Federal Capital Territory, ²Department of Physiotherapy, Abubakar Tafawa Balewa University, Bauchi, Nigeria.



***Corresponding author:**

Yusuff Tunde Gbonjubola,
Department of Physiotherapy,
Abubakar Tafawa Balewa
University, Bauchi, Nigeria.

gbonjubola4mercy@gmail.com

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ABSTRACT

Dysmenorrhea is a common gynecological problem among females and it is classified into primary and secondary dysmenorrhea. Primary dysmenorrhea occurs in women with normal ovulatory patterns and no apparent pelvic pathologies. Although, most women manage the pain of primary dysmenorrhea using NSAIDs and other pain-relieving techniques, treatment options for dysmenorrhea ranges from medicinal therapeutic options, non-medicinal therapeutic options, surgical options, and complementary/alternative medicines. However, this review focused on the exercise as a form of non-medicinal therapeutic option for dysmenorrhea. In recent times, studies have identified exercise as a very important method of managing primary dysmenorrhea. Although, little information is available on the effectiveness of this intervention. The purpose of this study was to review the available literature on the effectiveness of aerobic exercise on primary dysmenorrhea.

Keywords: Dysmenorrhea, NSAID, Aerobic exercise, myometrial activity, Gynecological symptom

INTRODUCTION

Dysmenorrhea is defined as cyclical pain that is related to menstruation and is commonly referred to as menstrual cramps.^[1] It is the most common gynecological symptom reported by women as 90% of women who present for primary care experience some menstrual pain.^[2] Dysmenorrhea negatively impacts the quality of life of affected women^[3] yet, despite its severity, many women do not seek medical attention or utilize available therapies to manage their symptoms.^[4]

Dysmenorrhea is commonly divided into two types: Primary dysmenorrhea and secondary dysmenorrhea. While primary dysmenorrhea is a cyclical pain in the absence of any pelvic pathology, secondary dysmenorrhea occurs as a result of an underlying pathology.^[5] Some of these conditions include endometriosis, adenomyosis, uterine myomas, cervical stenosis and obstructive lesions of the genital tract, pelvic abscess, pelvic inflammatory disease, ovarian cysts, ectopic pregnancy, endometrial polyps, use of an intrauterine contraceptive device and rarely, and uterine or ovarian neoplasms.^[5]

PRIMARY DYSMENORRHEA

Primary dysmenorrhea is defined as painful spasmodic cramping in the lower abdomen, just before and/or during menstruation in the absence of any discernable macroscopic pelvic pathology.^[6] It is caused by myometrial activity resulting in uterine ischemia, causing

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pain.^[2] This myometrial activity is modulated by prostaglandin synthesis.^[7] Primary dysmenorrhea has its onset at or shortly after menarche which usually fall between 6 and 24 months^[6] and the pain associated with primary dysmenorrhea adopts a predictable pattern beginning just before or at the start of menstruation.^[8] In primary dysmenorrhea, the pain may last for 8–72 h and is usually severe on the 1st or 2nd day of menstruation.^[6] The pain experienced in primary dysmenorrhea is spasmodic or labor-like in character, felt especially in the lower abdomen which may also radiate to the back and along the inner thighs.^[9]

Primary dysmenorrhea can be considerably disabling and has been likened to renal colic pain.^[10] It has a negative impact on the different aspects of the lives of the women affected including school/work performance, friendships, family, and social activities.^[11] In fact, primary dysmenorrhea has been reported to be the major cause of school or work absenteeism among women of child bearing age.^[6] This condition has also been associated with, and aggravates psychological distress as studies conducted revealed that women who experience primary dysmenorrhea are more agitated and have a poorer mood during their menstruation phase of their menstrual cycle as compared with the follicular phase.^[6]

PREVALENCE OF DYSMENORRHEA

The prevalence of dysmenorrhea is considerably high and varies in the literature. Most studies did not provide the definition, they used for dysmenorrhea and that possibly explains the varying prevalence of dysmenorrhea between surveys.^[12] Most studies conducted on the prevalence of dysmenorrhea also do not distinguish between the primary and secondary dysmenorrhea. A study conducted on 424 female students of Obafemi Awolowo University, Ile-Ife Nigeria showed a prevalence of 53.3%.^[13] The lowest prevalence of dysmenorrhea reported (16%) was in a random sample of Japanese women between the ages of 17 and 51,^[14] while the largest prevalence (93%) was reported in a large Australian study on senior high school girls.^[15]

Despite the reportedly high prevalence of dysmenorrhea, many women either do not seek medical attention or are undertreated.^[4] In a study, 98% of adolescents use non-pharmacological methods such as heat and rest to treat dysmenorrhea with perceived effectiveness of 40% or less.^[8] Only 54% of adolescents knew that certain medications could relieve menstrual cramps and 27% of girls were unable to recognize any of three non-steroidal anti-inflammatory drugs listed as possible treatment for dysmenorrhea.^[8]

PATHOPHYSIOLOGY OF DYSMENORRHEA

The pathophysiology of the primary dysmenorrhea can be explained by uterine contraction and vasoconstriction.^[16] After

ovulation, there is a buildup of fatty acids, especially omega-6 fatty acids in the phospholipids of the cell membranes. After the onset of progesterone withdrawal before menstruation, these omega-6 fatty acids, particularly arachidonic acid, are released and a cascade of prostaglandins and leukotrienes is initiated in the uterus.^[8] The increase in prostaglandin in the endometrium following the fall in progesterone in the late luteal phase results in increased myometrial tone and excessive uterine contraction.^[17] Increased leukotrienes levels contribute to the pathophysiology of dysmenorrhea as leukotrienes increase vasoconstriction and myometrial stimulation.^[18] Furthermore, the stimulation of pain fibers in the uterus causes activation of the afferent pain pathways which is transmitted to the central nervous system and it has been suggested that leukotrienes can increase the sensitivity of these pain fibers.^[19]

SYMPTOMS OF DYSMENORRHEA

The most common symptom of dysmenorrhea is lower abdominal cramping although many women suffer other menstrual related symptoms such as headache and nausea.^[8] The symptoms of dysmenorrhea include abdominal cramps, nausea, vomiting, loss of appetite, headaches, backaches, leg aches, weakness, dizziness, diarrhea, facial blemishes, flushing, sleeplessness, general aching, irritability, depression, and nervousness.^[20] The symptoms of dysmenorrhea typically accompany the start of menstrual flow or occur within the first few hours before or after onset, and last for the first 24–28 h.^[8] The severity of these symptoms positively correlates with early menarche and with increased duration and the amount of menstrual flow.^[21]

RISK FACTORS OF DYSMENORRHEA

Some risk factors have been associated with dysmenorrhea. For example, there is an inverse relationship between the age of a woman and her menstrual symptoms with the symptoms being more severe in adolescents than older women.^[4] Non-parous women appear to be more at risk for dysmenorrhea as there is some evidence that women who have given birth have less dysmenorrhea.^[22] Stress and poor social support are associated with dysmenorrhea as an increased stress level and poor social support from family and friends worsens the severity of a woman's menstrual pain.^[2] There is also a relationship between psychological disorders and dysmenorrhea as evidence suggests that psychological disorders such as depression or anxiety coexists with dysmenorrhea.^[13] Socioeconomic factors including education and religion are correlated with dysmenorrhea.^[16] Religious women have a higher prevalence of dysmenorrhea than atheist women.^[23] Furthermore, women from lower socioeconomic groups show an increase prevalence of dysmenorrhea.^[4] Cigarette smoking may increase

the duration of dysmenorrhea and this is presumably as a result of nicotine-induced vasoconstriction.^[2] Other risk factors associated with dysmenorrhea includes heavy menstrual flow, positive family history, obesity, and alcohol consumption.^[16]

TREATMENT FOR PRIMARY DYSMENORRHEA

The treatment of dysmenorrhea involves medicinal therapeutic options, non-medicinal therapeutic options, surgical options, and complementary and alternative medicines.^[2] However, this review will focus on exercise as a form of non-medical approach to managing dysmenorrhea.

NON-MEDICINAL THERAPEUTIC OPTIONS

The non-medicinal therapeutic options for the management of primary dysmenorrhea include exercise, transcutaneous electrical nerve stimulation, topical heat, and behavioral intervention are commonly used by women in an attempt to relieve their symptoms.^[2,24] However, the evidence on the effectiveness of these interventions remains largely controversial.

OVERVIEW OF EXERCISE

Exercise is a subcategory of physical activity that is planned, structured, repetitive, and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective.^[25] Exercise must not be mistaken for physical activity, even though the terms are commonly used interchangeably. Physical activity is any body movement produced by the contraction of skeletal muscle during work, daily activities, or play that results in increased energy expenditure.^[26] Hence, while exercise is a physical activity, a physical activity is not always exercise.

EFFECTIVENESS OF AEROBIC EXERCISE ON PRIMARY DYSMENORRHEA SYMPTOMS

Exercise today is an integral part of normal life for many women. There are many health benefits for women who exercise regularly and in moderation.^[27] Exercise improves the cardiovascular status, increases bone mineral content, and relieves the symptoms of dysmenorrhea and premenstrual syndrome.^[28] Considering the side effects of drug treatments and surgery, non-drug interventions, mainly exercise, has attracted the attention of health-care professionals and women.^[29] The idea that exercise might help to relieve menstrual pain is not novel; as early as 1943, Billing proposed that women with dysmenorrhea had contracted ligamentous bands in the abdomen and consequently developed a series of stretching exercises, for which he claimed a high rate of symptom relief.^[27] Evidence suggests that aerobic exercise

reduces the symptoms of dysmenorrhea in women who exercise regularly as they exhibit lower levels of physical symptoms across their menstrual cycle.^[30] Exercise helps in reducing pain, relieving stress, elevating mood, and improving health.^[31] Women who exercise show less severe dysmenorrhea than women who are sedentary.^[27]

The pain in the primary dysmenorrhea is as a result of prostaglandins which are present in high quantities in the menstrual fluid.^[32] Prostaglandins are vasoconstrictors that cause ischemia to the uterus and reduced progesterone may increase the production of prostaglandins.^[27] Reduced levels of progesterone cause increased myometrial contraction which puts more stress on the ischemic myometrium and intensifies pain, resulting in the primary dysmenorrhea.^[33] Exercises act on the lining of the uterus and increase the levels of circulating endorphins which raise the pain threshold.^[34] Exercise increases the release of several neurotransmitters including natural endorphins, estrogen, dopamine, and endogenous opiate peptides as well as suppresses prostaglandin from being released.^[35] Exercise may also act as a distraction from intrusive thoughts and promotes positive thoughts, decreasing short-term depression.^[36] Exercise may increase concentration and improve mood and behavior.^[27]

There is an interesting involvement of stress in primary dysmenorrhea and exercise. Stress inhibits the release of the follicle-stimulating hormone and the luteinizing hormone which lead to impaired follicular development.^[30] As the synthesis of progesterone is increased in the luteinized follicle following ovulation, a stress-induced impairment of follicular development could reduce progesterone synthesis and release.^[27] This reduction in progesterone could result in increased myometrial contraction and subsequently worsen primary dysmenorrhea.^[33] Furthermore, the primary dysmenorrhea stems from increased contraction of the uterine muscle which is innervated by the sympathetic nervous system.^[36] Stress enhances sympathetic activity hence may worsen primary dysmenorrhea by exacerbating uterine contraction.^[9] Exercise relieves stress, therefore, may alleviate symptoms by reducing sympathetic activities.^[28] Health-care professionals have suggested that aerobic exercises such as walking, bicycling, swimming, and pelvic tilting may improve blood flow, relax abdominal muscles, reduce pelvic pain, and relieve pressures on nerve centers, pelvic organs, and the alimentary canal.^[27]

REVIEW OF PREVIOUS STUDIES ON EFFECT OF AEROBIC EXERCISE ON PRIMARY DYSMENORRHEA

A review of studies on the effect of aerobic exercise on primary dysmenorrhea was conducted on Google Scholar and PubMed databases. Fifteen items were reviewed [Table 1], and the duration of studies reviewed was from

Table 1: Review of the previous studies on effect of effect of aerobic exercise on primary dysmenorrhea.

S/No.	Author/Year	Country	Study Focus	Target Population	Sample Size	Findings
1.	Dehganzadeh <i>et al.</i> , 2014	Iran	The effect of 8 weeks of aerobic training on physical and psychological symptoms of primary dysmenorrhea	Non-athletic women	30	Aerobic exercise cannot reduce symptoms between the 1 st month ($P=0.023$) but between the pre-test and 2 nd month ($P=0.023$) and the 1 st month and 2 nd month ($P=0.002$)
2.	Sutar <i>et al.</i> , 2016	India	Effect of aerobic exercises on primary dysmenorrhea	Female college students	100	Pain (VAS scores) in the exercise group reduced significantly ($P<0.05$). All eight domains of the sf-36 health survey questionnaire showed significant improvement
3.	Samadi <i>et al.</i> , 2013	Iran	Effect of 8 weeks of regular aerobic exercise on symptoms of premenstrual syndrome	Non- athlete college women	40	The mean scores of symptoms during and after exercises were significantly different
4.	Vaziri <i>et al.</i> , 2015	Iran	Comparing the effects of aerobic and stretching exercises on the intensity of primary dysmenorrhea	Female college students	105	A significant difference was observed among the three groups (aerobic, stretching and control) in the first and second cycles of the intervention
5.	Dehnavi <i>et al.</i> , 2018	India	The effect of aerobic exercises on primary dysmenorrhea	Female college students	70	At the end of the 4 weeks, the intervention group did not show any significant changes compared to the control group ($P=0.423$) but at the end of 8 weeks, there was a significant change ($P=0.041$)
6.	Mohammadi <i>et al.</i> , 2012	Iran	The effect of aerobic exercise training and detraining on some menstrual disorders	Non-athletic college students	60	Aerobic exercise training significantly decreased early dysmenorrhea but the positive effects of aerobic exercise training on dysmenorrhea totally disappeared 48 days after training
7.	Nasri <i>et al.</i> , 2017	Iran	The effect of aerobic training and pelvic floor muscle exercise on primary dysmenorrhea	Adolescent egirls	45	In terms of intensity and duration of pain. A significant difference was observed between pre-test and post-test. The results showed that aerobic exercise and kegels could improve the symptoms of primary dysmenorrhea
8.	Siahpour <i>et al.</i> , 2013	Iran	The effect of 8 weeks aerobic exercise and yoga	Non-athlete girls	60	Both aerobic exercise and yoga significantly reduced pain intensity, duration of pain and reduction of drug compared to the control group
9.	Kannan <i>et al.</i> , 2019	China	Effectiveness of a treadmill-base aerobic exercise intervention on pain, daily functioning and quality of life	Women	70	Exercise has significant effects on primary dysmenorrhea-related pain, QoL and function
10.	Huang, 2007	China	Aerobic exercise impacts on primary dysmenorrhea and uterine blood flow in adolescents	Female college students	50	Moderate exercises are effective on different degrees of dysmenorrhea and uterine blood flow
11.	Vidya, 2014	India	Effectiveness of Billig's exercise in reducing dysmenorrhea	Adolescent girls	50	After the practice of Billig's exercise, participants felt relief of pain

(Contd...)

Table 1: (Continued).

S/No.	Author/Year	Country	Study Focus	Target Population	Sample Size	Findings
12.	Egenti <i>et al.</i> , 2016	Nigeria	Perception of dysmenorrhea and its relationship to school activities	Secondary school girls	215	70.4% of participants had dysmenorrhea and while 17.5% saw a doctor for their pain while the rest resorted to self-medication and other non-pharmacological means of pain relief
13.	Ogunfowokan and Babatunde, 2009	Nigeria	Management of primary dysmenorrhea	Adolescent girls	150	Adolescents had a knowledge deficit regarding menstruation and dysmenorrhea
14.	Iiknur <i>et al.</i> , 2012	South Africa	Impact of home-based exercise on quality of life with women with primary dysmenorrhea	Women	45	At each menstrual cycle, VAS showed a significant decrease. All eight domains of the SF-36 health questionnaire showed significant improvement
15.	Loto <i>et al.</i> , 2008	Nigeria	Prevalence and correlates of dysmenorrhea	College women	409	Dysmenorrhea is prevalent among Nigerian young adults and correlates with younger age at menarche and longer days of menstrual flow

2007 to 2019. Out of the 15 studies, six were conducted in Iran, three in India, three in Nigeria, two in China, and one in South Africa. The range of sample size was 30–409 participants and a total of 1,499 participants were captured in the 15 papers review. In seven out of the 15 studies, college students were recruited as the participants, while four studies recruited adolescents.

Out of the 15 studies that were reviewed, 11 studies support the conclusion that aerobic exercises can be used to effectively manage primary dysmenorrhea. A study by Dehnavi *et al.*^[37] showed that there was no significant outcome of aerobic exercises on primary dysmenorrhea after 4 weeks, but significant positive outcomes were recorded after 8 weeks of training. A study by Siahpour *et al.*^[38] found yoga to be beneficial in the management of primary dysmenorrhea.

A study was conducted by Vaziri *et al.*^[39] to compare the effect of aerobic exercise and stretching exercise on the intensity of the primary dysmenorrhea and it was concluded that both forms of exercise yield a positive outcome. A study by Dehnavi *et al.*^[37] revealed that aerobic exercise training and kegel exercises have a significant effect on the pain intensity of primary dysmenorrhea. The results were similar; majority of the studies revealed that aerobic exercise has a significant positive effect on primary dysmenorrhea. A recent systematic review and meta-analysis by Carroquino-Gracia *et al.*^[40] concluded that therapeutic exercises reduce pain intensity in patients with primary dysmenorrhea. However, there is a low and very low evidence of its effect on the duration of pain and quality of life of patients with primary dysmenorrhea.^[40]

CONCLUSION

The available evidence on the effectiveness of the non-medicinal therapeutic treatment for the primary dysmenorrhea remains largely controversial. However, this review summarizes the outcome of some earlier studies on the benefits of aerobic exercise and its benefits in relieving the symptoms in people with primary dysmenorrhea, of which 11 out of 15 articles support the conclusion that aerobic exercise can be used to effectively reduced the pain symptom in primary dysmenorrhea. In addition, stretching as a form of exercise was reported to have produced a positive similar result as aerobic exercise in reducing pain in patients with primary dysmenorrhea.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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