Bachelor of Health Care

Semasingha Nawarathna Mudiyanselage Dulanga Kalmini Nawarathna

Effects of exercise therapy on primary dysmenorrhea

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Author	Semasingha Nawarathna Mudiyanselage Dulanga Kalmini Nawarathna
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Primary dysmenorrhea defines as the pelvic pain during menstruation in the absence of any pelvic pathology. It is found to be one of the most common gynecological problems in women who menstruate around the world. Primary dysmenorrhea was found to be one of main reasons that cause school and work absenteeism among young adolescents and working women. The most common treatment option for primary dysmenorrhea worldwide is oral contraceptive pills.

The purpose of this bachelor's thesis is to investigate the effects of exercise therapy on primary dysmenorrhea.

This bachelor's thesis was based on literature review and follows the basic principles of systematic search. The search for literature was done in Pubmed, CINAHL and ScienceDirect databases. 8 articles: 5 randomized control trials (RCT), 2 systematic review and metanalyses and one quasi experimental study fulfilled the inclusion criteria of this thesis.

According to results exercise therapy indicated a significant impact on reducing the pain in terms of intensity and duration in women who suffered from primary dysmenorrhea. Exercise as a treatment option was found to be benefical in managing other symptoms of primary dysmenorrhea such as sleep disturbance, anxiety level during menstruation and overall quality of life. The effects were more significant in the second and third menstrual cycles followed up by exercise interventions.

In conclusion exercise as a treatment option for primary dysmenorrhea showed significant impact when used with or without other existing treatment options and was found to managed the symptoms without any pharmacological treatment.

Key Words	primary dysmenorrhea, dysmenorrhea, exercise therapy, therapeutic exercise

Contents

1 Introduction

Primary dymenorrhea (PD) is one of the most prevalent gynecological disorders among women in childbearing ages and is defined as painful menstrual cramps during or before menstruation. It is typically underdiagnosed, and most females do not seek medical attention. This is typically due to a lack of menstrual education, financial concerns, or dissatisfaction with medical advice. (Chen et al. 2018.) It can either be classed as primary or secondary dysmenorrhea depending on its etiology. PD affects both young and adult females. In the absence of any pelvic pathology, it is characterized by excruciating lower abdominal cramps. The cramp-like pain brought on by an underlying condition is defined as secondary dysmenorrhea. Women's quality of life (QOL) is observed to be significantly impacted by primary dysmenorrhea, which is also the main cause of their absence from job or school.(Sharghi et al. 2019.)

Prostaglandins F2 and E2 are discovered to release during dysmenorrhea. In dysmenorrhic women and young adults, both physical and psychological problems develop, which lowers overall quality of life. Headache, drowsiness, sleep difficulties, soreness in the breasts, bodily pains, nausea, vomiting, changes in appetite, constipation or diarrhea, and increase in urination are among the common physical complaints. Mood disorders such as anxiety, depression, and irritability are examples of psychological symptoms. (Proctor & Farquhar. 2006). The history, symptoms, and physical examination of the patient all contribute to the diagnosis. Through the management of symptoms and pain, the treatments seek to enhance overall quality of life. Pharmacological treatments are most frequently used. According to studies, hormonal contraceptives or nonsteroidal anti-inflammatory drugs (NSAIDs) are the initial medications prescribed for PD. (ACOG Committee Opinion No. 760, 2018).

Although there are studies that conclude the use of non-pharmacological interventions to treat primary dysmenorrhea, it has found to be applied in rare occasions, whereas pharmacological interventions are extremly common. Exercise therapy has found to be extremly effective in treating primary dysmenorrhea. Most of the studies on exercise therapy as a treatment were conducted in the recent years. Among the studies and experiments Aerobic exercises, isometrics, stretching exercises, FIIT protocol were found to relieve pain and the symptoms significantly. The purpose of this thesis is to examine how exercise therapy affects primary dysmenorrhea. (López-Liria et al., 2021.)

2 Background

2.1 Menstruation

2.1.1 Menstrual cycle

The menstrual cycle is made up of uterine and ovarian cycles.The three phases of the uterine cycle—menstrual, proliferative, and secretory phase—indicate the activity that takes place during the menstrual cycle. The ovarian cycle indicates the activity in ovary during the menstrual cycle and consists of follicular and luteal phase. The menstrual stage normally lasts for 3-4 days. The uterine wall sheds and bleeds through the vaginal canal. After the menstruation the uterine wall rebuilds itself, this phase is proliferative. Usually lasts for 10 days. On the 14th day of the cycle, the egg is released. This is ovulation. The uterus is prepared for implantation during the next 14 days; if it doesn't occur on the 28th day the next menstruation takes place. (Norwitz 2017.)

2.1.2 Hormonal and biological regulation

The hormones involved are estrogen, progesterone, LH and FSH. The menstrual cycle depends on these hormones. Hormonal levels are low during the menstruation and rise during the proliferative phase. The sudden peak of FSH and LH results in ovulation on the 14th day. The estrogen and progesterone levels stay up during the secretory phase. However, if implantation doesn't occur by the 27-28th day these hormonal levels drop resulting in the next menstrual cycle. The brain, pituitary ovaries, and endometrium interact intricately to regulate the menstrual cycle. The hypothalamus is the central processing unit of the reproductive system. Neuronal stimuli from the cerebral cortex are converted by the hypothalamus into neuropeptide pulses (GnRH). Pulsatile GnRH from the hypothalamus initiates the synthesis and secretion of LH and FSH from the anterior pituitary. On the 24th day of the menstrual cycle, ovulation occurs due to an increase in FSH and LH. The follicle collapses after ovulation to form the corpus luteum, which secretes progesterone to prime the endometrium for conception. The corpus luteum degenerates without implantation resulting in menstruation. Endometrium is rebuilt and vascularized after an ovulation as a preparation for pregnancy, and collapses in the without it (Norwitz & Schorge 2017.)

2.2 Primary dysmenorrhea

2.2.1 Pathophysiology

Primary dysmenorrhea's pathophysiology is still not fully understood. The evidence at hand points to increased prostaglandin F2 (PGF2) and prostaglandin E2 (PGE2) release in the uterus during endometrial sloughing as the etiology of dysmenorrhea. These prostaglandins contribute to myometrial vasoconstriction and increased myometrial contractions, which results in uterine ischemia and the formation of anaerobic metabolites. As a result, pain fibers become hypersensitive, which leads to pelvic pain. (Lentz et al., 2012.)

2.2.2 Symptoms of primary dysmenorrhea

Primary dysmenorrhea typically begins one to two days prior to the commencement of menstruation or immediately following the menstrual flow, with lasting pain up to 8-72 hours. Common physical symptoms include gastrointestinal(changes in appetite, bloating, nausea, and vomiting), systemic (headache, drowsiness, exhaustion, sleepiness, tender breasts, weight in the lower belly, backache, discomfort in the inner thighs and knees, myalgia, arthralgia, and swollen legs), and elimination-related (sweating, frequent urination, diarrhea, and constipation). Females with dysmenorrhea could have mental disorders as anxiety, melancholy, irritability, and anxiousness. (Proctor & Farquhar 2006.) It was noted that women with dysmenorrheic pain had three times the rate of depression, anxiety, and excessive somatic symptoms. (Latthe et al., 2006).

2.2.3 Effects of primary dysmenorrhea

According to Chéileachair, McGuire & Durand (2022), One of the most common reasons for absenteeism from school among menstruating students around the world is primary dysmenorrhea. As a result, the United States loses $2 billion a year and 600 million hours each year (Sharghi et al., 2019). Unsal et al., (2010) reported that menstruation caused a 29% to 50% drop in class attendance. A study conducted in Palestine found that more

than half of university students with dysmenorrhea miss classes due to their uncomfortable periods (Abu Helwa et al., 2018).

2.2.4 Diagnosis

The diagnosis is mostly made by reading a detailed medical history and performing a physical exam to rule out pelvic pathology. It is necessary to collect relevant medical, menstrual, gynecological, and sexual history as part of the first examination of primary dysmenorrhea. Information on the following is acquired during the assessment: Age at Menarche, Menstrual Cycle, Site of Pain, Regularity and Length of Menstrual Bleeding, Abnormal Vaginal Discharge, Onset and Length of Menarche-Related Symptoms, and Related Systemic Symptoms. (ACOG Committee Opinion No. 760, 2018).

2.2.5 Management and treatment

The major goal is to offer dysmenorrheic women with appropriate pain relief so they can carry out their regular activities, enhance their quality of life, and experience a reduction in absenteeism from school or the workplace. (ACOG Committee Opinion No. 760, 2018.) NSAIDs and hormonal contraceptives are advised as first-line treatments because they prevent the synthesis of prostaglandins, which are directly linked to menstruation pain and its accompanying systemic symptoms. It is advised and stressed that non-pharmacological therapies are necessary for treating primary dysmenorrhea. (Kho & Shields 2020.)

2.2.6 Why women don’t seek healthcare for dysmenorrhea

In spite of the fact that dysmenorrhea dramatically interrupts women's everyday lives and may increase their chance of later developing chronic pain problems, only a small number of women seek medical assistance for it. Assuming symptoms are normal, preferring to self-manage symptoms, lacking resources, believing providers would not provide assistance, thinking symptoms are tolerable, being unaware of treatment options, being wary of available treatments, feeling embarrassed or afraid to seeking care, and not seeking health care generally were the nine categories of reasons that were found. The results highlight the importance of routine dysmenorrhea screening, avoiding discrediting dysmenorrhea symptoms, starting conversations and educating people about dysmenorrhea. They also, offer treatment options based on research and women's

preferences, and increasing public awareness of dysmenorrhea and its effects. (Chen et al., 2018.)

Menstrual inequalities negatively impact menstrual health. Women and menstruating people who menstruate (trans and non-binary) between the ages of 18 and 55 participated in a study done in Barcelona, Spain, in 2020. The study gathered experiences of menstrual unfairness and menstrual health. The participants had trouble finding suitable facilities to change menstrual t products at work, school, and other public places. In addition, they had financial difficulties purchasing menstrual products. Participants were only given hormonal contraception for menstruation problems when they sought medical attention. Menstruation had a huge impact on their daily lives. The study focuses on menstrual poverty and a lack of t periods education. The only available medical support is oral contraceptives, which suggests further research to identify alternative treatment modes. (Holst et al., 2022.)

2.3 Effect of exercise therapy on primary dysmenorrhea

Several clinical experiments conducted at Mashhad University of Medical Sciences have demonstrated that aerobic exercise reduce the duration and severity of dysmenorrhea, as well as the need for sedative medications. The intervention group had changed significantly compared to control group by 8 weeks into the research. According to the findings of this study, aerobic activity can improve the symptoms of primary dysmenorrhea. Hence, primary dysmenorrhea can be treated with aerobic exercise. (Dehnavi, Jafarnejad & Kamali, 2018.) According to a quasi-experimental study, after a 12-week exercise program, corrective therapeutic exercises significantly reduced dysmenorrhric discomfort and monthly hemorrhage. Furthermore, this study shows a direct connection between primary dysmenorrhea and hyper lordosis, which means treating hyper lordosis will also reduce dysmenorrhic pain. (Lorzadeh, Kazemirad & Kazemirad 2021.) A treadmill-based aerobic exercise intervention significantly reduced pain quality and intensity. Despite the fact that the results were not significant after four weeks, the effects on pain have improved over the course of the seven-month follow-up period It took up to seven months for exercise's benefits to become apparent for current pain (Kannan et al., 2019.)

It has been discovered that combining exercise therapy with other treatments is an efficient strategy to treat symptoms of primary dysmenorrhea. The exercise group exercised

thrice a week for eight weeks. Pain severity was measured using the Visual Analog Scale (VAS). Menstrual symptoms and sleep quality were measured utilizing the Menstrual Symptom Questionnaire (MSQ) and Pittsburgh Sleep Quality Index (PSQI), respectively. All the aforementioned scales showed significant variations after eight weeks. (Kirmizigil & Demiralp 2020.)

3 Aim and methodology

3.1 Aim

The aim of this bachelors thesis is to investigate the effects of exercise therapy on primary dysmenorrhea. The identifications of this thesis will help further implement and influcence exercise therapy as a treatment option in the management of primary dysmenorrhea.

3.1.1 Data collection

The data was collected through a systematic search, conducted through the databases; PubMed, ScienceDirect and CINAHL. This thesis was conducted on the studies published in between 2014 and 2022 in the intention of including the most recent publications on the topic. Table 1 summarizes the inclusion and exclusion criteria. Used search words were primary dysmenorrhea, dysmenorrhea, exercise therapy and therapeutic exercise.

	Inclusion criteria	**Exclusion criteria**
Publication year	After the year 2014	Before the year 2014 and after the year 2022

Publication language	Studies that are published in English	Tanslations or publications of studies in any other languages
Method	All types of study methods	Articles that are not relevant to the thesis
Contents	Articles in which women with primary dysmenorrhea (PD) were treated with excercise as a treatment method	Articles that are not related to exercise therapy and primary dysmenorrhea (PD)

Table 1. Inclusion and exclusion criteria

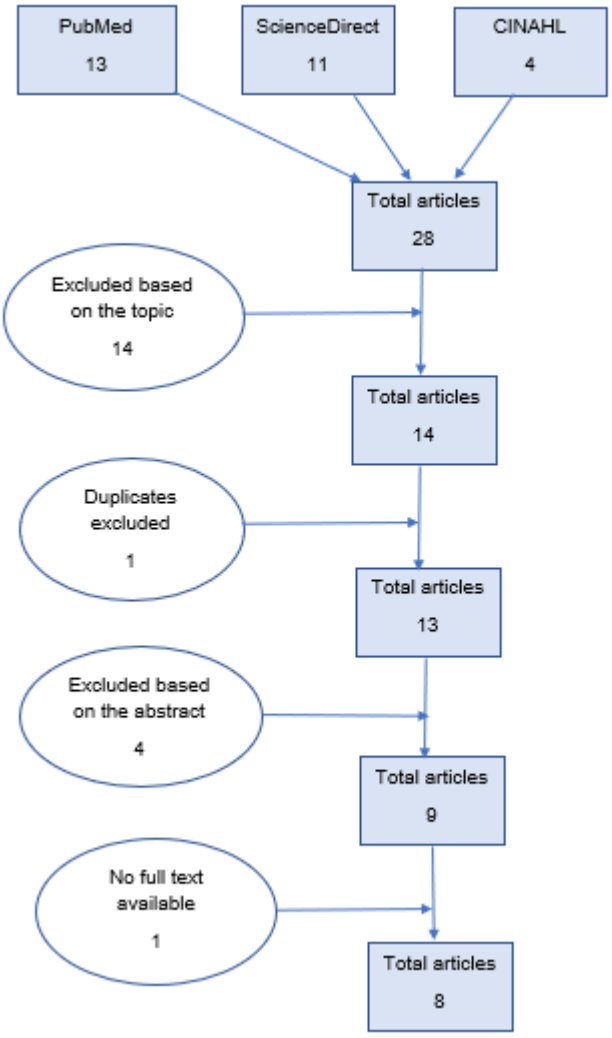

Figure 1. Flowchart of search process

The search technique used for this bachelor's thesis is depicted in Figure 1. The following databases were used to complete this bachelor thesis: PubMed, ScienceDirect, and CINHAL. Topic, abstract, duplication, and the availability of the full text were used to filter the total number of articles. Only 8 articles that met the eligibity criteria, were included for this bachelor thesis. The filters used on the databases were full text articles, clinicals trials and review articles. The duration of publication was limited to 01.01.2014-31.12.2022 time frame on each database.

4 Results

Authors, year and place	Purpose of the study	Methods	Participants	Intervention	Results and conclusion
Kadam & Garad 2022	Determination of level of dysmenorrhic pain among college students. Evaluation of the effect on selected stretching exercises on the level of pain. Correlation of pain level with selected demographic variables.	Quantitative research Quasi experimental one group pretest posttest design	36 nursing students with primary dysmenorrhea in the age of 17-30, with regular menstrual cycles and non athletic (did not practcice stretching on a regular basis)	Stretching exercises for 4 weeks/ one menstrual cycle, 3 times per weeks 2 times a day	Level of pain before and after the stretching exercise program showed a statistical significance of P<0.0001 Correlation between the age of females and the reduction of pain level showed a reduction but not statistically significant. Number of sanitary pads used on day 1,2 and 3 of menstruation did not show a significant reduction, before and after the intervention.

López-Liria et al., 2021	To find out/ describe the effectiveness of some physiotherapy techniques in the treatment of primary dysmenorrhea	Systematic review and meta-analysis	9 articles, 692 participants in total who suffered from primary dysmenorrhea.	9 randomized control trials were chosen from the last 6 years, on the databeses Scopus, Web of Science, PubMed, PEDro and Medline under the criteria of eligibility:PICOS (participants, intervention, comparator, outcomes, study design)	Stretching and aerobic exercises, Isometric exercises with massage therapy, stretching, Kegels exercises, jogging, progressive relaxation exercises reduce pain intensity, duration and overall symptoms associated with primary dysmenorrhea over 2-3 months of treatment and in the absence of any pharmacological treatment.
Carroquino-Garcia et al., 2019	investigation of the effect of physical exercise on pain intensity in primary dysmenorrhea and to assess its effectiveness in decreasing the pain duration and improving quality of life.	Systematic review and meta-analysis	16 articles, 11 were used to conduct 3 different meta-analyses	16 randomized control trials were selected from Web of Science, PubMed, Dialnet, CINAHL, PEDro and Scopus, that were published until January 31, 2018.	Stretching exercises, aerobic exercises, Kegels exercises, isometrics and jogging reduces pain intensity and duration in primary dysmenorrhea over a period of 2-3 months of engaging. Aerobic exercises showed significant improvement in quality of life over 12 weeks period.

				3 metanalyses were performed.	Usage of mefenamic acid and application of hot water bottles during primary dysmenorrhea did not show significant difference compared to following a therapeutic exercise program as a method of treatment.
Heidarimoghadam et al., 2019	to determine the impact of an exercise program based on the FITT and the ACSM protocol on the intensity and duration of dysmenorrhea	Randomized control trial	86 medical students with mild to moderate dysmenorrhea (43 in each group).	The experimental group underwent a sports-specific version of the FIIT program for 8 weeks, including three sessions each week (a total of 24 sessions). The control group spent one hour and thirty minutes per week participating in two physical education classes and group activities like volleyball and badminton.	BMI, age of menarche, cycle length, and menstrual cycle intervals showed no discernible variation between groups. The experimental group's mean dysmenorrhea duration was shorter by the initial menstrual cycle following the intervention. During the first two menstrual cycles following the intervention, a statistically significant reduction in the intensity of discomfort in the experimental group.

Kannan et al., 2015	to assess the results of a treadmill-based exercise intervention for PD in women in terms of pain reduction and quality of life	Randomized control trial	Women with regular periods and no pelvic abnormality or pathologies, 70 multiethnic, non-pregnant, 18 to 43-year-olds without PD who are not on a formal exercise programPD with pain for at least two months running at a 4 on a 0–10 numeric rating scale (NRS).	The exercise intervention continued for 7 months, starting with a 1-month training session at the physiotherapy school and concluding with a 6-month home exercise regimen. With no exercise during the menstrual week, the exercise intervention was carried out in 3-week intervals.	Six women out of the 79 who volunteered, were rejected during the initial telephone screening process, and three were excluded throughout the screening process at school of physiotherapy because they did not match the criteria for being eligible. The remaining 70 women were randomly divided to the usual care control (n = 35) or intervention group (n = 35). The randomization, enrollment, and recruitment processes were finished.
Kanann et al., 2019	(continuation of the previous study)	Randomized control trial	(continuation of the previous study)	(continuation of the previous study)	At 4 weeks, Exercise significantly reduced the quality, intensity, and interference of pain compared to the control. Exercise's positive effects on pain persisted for 4 and 7 months, and the exercise had a significant and persistent

					positive impact on PGIC, daily functioning, and quality of life. At all of the assessment time points, no positive benefits of exercise on sleep were found.
Azima, Bakhshayesh, Kaviani, Abbasnia & Sayadi 2015	to contrast the impact of isometric exercise and massage on primary dysmenorrhea.	Randomized control trial	120 Shiraz University dorm residents with primary dysmenorrhea who were majoring in non-medical professions.	The massage, isometric exercise, and control groups were assigned at random to the student groups. The first group was given two cycles of lavender oil effleurage massage. The second group engaged in isometric exercises for 8 weeks. The control group received no treatment at all.	In both the massage and exercise groups, the level of pain had greatly decreased, with the massage group experiencing a greater reduction. In terms of the mean pain duration following the third cycle, the results showed a significant difference between the three groups. There was no discernible difference in the three groups' average levels of anxiousness. Only after the third cycle did intragroup comparisons reveal a noticeably lower anxiety level in the massage group.

Kirmizigil & Demiralp 2019	To determine how a combined exercise program affects pain,menstruation symptoms and sleep in women with primary dysmenorrhea.	Randomized control trial	28 women who met the trial's inclusion criteria (14 in each group)	The exercise group took part in a routine of exercise thrice each week for 8 weeks. All sessions included the use of visual aids and music, and all exercises included diaphragmatic breathing.	No statistically significant differences between the groups, in terms of sociodemographic traits, amount of physical activity, menstrual traits, or methods of dealing with menstrual pain. Post intervention, there was a statistically significant difference in the levels of pain across the groups.

The systematic review was conducted in February of 2021. This was done to determine how effectively various physiotherapy treatments worked for treating primary dysmenorrhea. The articles were picked from february of the previous six years (2015–2021), during which the target population experienced PD. Scopus, Web of Science, PubMed, PEDro and Medline were the databases used. The inclusion criteria of PICOS (participants, intervention, comparator, outcomes, and study design) was applied to choose the publications. In each of the aforementioned databases, the search terms "physiotherapy" AND "dysmenorrhea," "physical therapy" AND "dysmenorrhea," and "manual therapy" AND "dysmenorrhea" were used. There were only randomized controlled trials in each of the selected papers. For inclusion, the mode of intervention had to be physical therapy or conservative methods. Articles that included treatments for any other pelvic disorders including endometriosis or dyspareunia was not included. Articles that suggested using contraceptives or other pharmaceutical treatments as a form of treatment were not included. Articles authored in languages other than English or Spanish were not included. Based on inclusion criteria, 296 articles out of 351 were eliminated, while 39 were found to be potentially relevant after a thorough study of the

entire texts. Type of treatment, number of sessions, symptom relief and length of treatment were considered.The Cochrance risk of bias tool was used to evaluate the quality of studies, and the PEDro scale was used to assess the quality of randomized control trials. The strength of the evidence was evaluated using GRADE, which stands for Grading of Recommendations Assessment, Development, and Evaluation. Nine items in total were chosen. The I2 statistic was used in a meta-analysis using the Review Manager program (RevMan version 5.4.1), and if the I2 value was greater than 50%, a random effects model was applied. 4 of the 9 papers selected used exercise as a form of treatment.The duration and intensity of the pain were reduced with isometric exercises combined with massage. Starting on the third day of menstruation, the isometric exercises continued for 8 weeks, 5 days a week, 2 sessions each day, and 10 repetitions per session. After completing three months' worth of 50-minute sessions, three times per week, of stretching, kegals, running, and relaxation exercises, it was discovered that symptoms and pain were reduced. Stretching and aerobic exercise both showed positive effects on pain and symptom reduction over an 8-week period, according to one investigation that compared their impacts on symptoms and pain reduction. Over the course of three menstrual cycles, progressive relaxation techniques reduced symptoms and pain in terms of duration and intensity. (López-Liria et al., 2021.)

This systematic review was conducted in 2018, and the active bibliographic search took place between February 2017, and May 2018. Dialnet, PubMed, Web of Science, CINAHL, Scopus and the Physiotherapy Evidence Database (PEDro) were the databases used. Up until January 31, 2018, all randomized controlled studies were taken into consideration. Exercise was used as a form of treatment in at least one of the intervention groups in studies with women who had primary dysmenorrhea and were between the ages of 16 and 25. Studies which evaluated pain and/or quality of life were were also included.Studies including women with abnormal menstrual cycles, those with gynecological problems, those who had undergone surgery, those with significant illnesses, and studies in which the women were treated for primary dysmenorrhea with intracavitary or oral contraceptives were all omitted from this systematic review. In order to reduce publication bias, this systematic review adhered to PRISMA guidelines and used ClinicalTrials.gov as the search engine. Out of 455 research, the methadological quality was assessed using the PEDro scale. The final three meta-analyses comprised eleven of the sixteen studies that matched the inclusion criteria. Two of these three meta-analyses focused on pain severity, and the third one examined pain duration. Great heterogeneity was discovered in the first two meta-analyses, and a random-effects

model was applied. The results of the third meta-analysis were homogeneous, and a fixed-effect model was employed. A funnel plot and the Begg and Egger tests were used to measure publication bias. Using the GRADE Pro/Guideline Development Tool, the Grading of Recommendations Assessment, Development and Evaluation (GRADE) for pain intensity, pain duration, and quality of life evaluated the strength of the available evidence. Stretching , kegel exercises, isometric exercises, running, aerobic workouts, and relaxation techniques were all used in the experimental groups. Thirteen research focused solely on one type of exercise, and three studies incorporated various exercise types. Exercises were done 1, 2, 3, 4 or 5 days a week for 8 or 12 weeks. Some newspapers failed to mention how many sessions there were each week. In other trials, there were even 1 or 2 sessions each day. Sessions could be 10, 10-15, 15, 20, 30, 45, 50 or 60 minutes. Some studies additionally clarified whether or not the exercises were overseen or observed. When exercises were being watched, trained researchers, trained instructors, a physical education teacher and an investigator, or a specialist, were watching them. Mefenamic acid, ginger tablets, ibuprofen, or a hot water bottle were given to the control group instead of no treatment at all. In the majority of the studies that were considered, the groups of patients who engaged in physical activity experienced a considerably higher reduction in pain intensity. In two investigations, there were no discernible differences between groups in which the control group received mefanamic acid administration and those in which the control group received hot water bottle administration. Contrary to pain intensity, only 8 papers included pain duration as a variable, and of those 8, 5 showed a significant reduction in pain. Statistically significant differences were discovered in the third meta-analysis: the experimental group's menstrual pain lasted noticeably less time than the control group's did. Only four articles examined quality of life, and three of them discovered that those who engaged in physical activity saw a much bigger improvement in quality of life. One study stated that aerobic exercises showed statistically significant impact on quality of life over a 12 week period. (Carroquino-Garcia et al., 2019.)

To determine the intensity of discomfort experienced by college students with dysmenorrhea, this study was carried out in a college in the city of Pune. The goals of this study were to examine the degree of pain, evaluate the impact of particular stretching exercises on the degree of pain, and determine if the degree of pain associated with dysmenorrhea correlates with particular demographic factors. According to the study, the sample size was estimated using the purposive sampling method and was 36 with a 95% confidence level. Females who suffered with primary dysmenorrhea, with regular

menstrual cycles, in the age of 17-30 and are given the consent to participate in the study were included. Females who were diagnosed with PCOD (Polycystic Ovarian Disease) and females who were already practicing exercises or yoga on a regular basis were excluded from the study. Selected stretches were offered for four weeks, three days a week, twice daily. Data was collectect pre and post intervention after one menstrual cycle using a self structured questionnaire. The intensity of the pain was assessed using the VAS (visual analouge scale). Age, BMI, menarche age, menstrual cycle length, number of sanitary pads used on days 1, 2, and 3 of the cycle, beginning of menstrual pain, and drug history were the sociodemographic information gathered. Pain was assessed on the day 1,2 and 3. The number of sanitary pads used and the level of pain was measured after 4 weeks/one menstrual cycle of stretching exercise program. The number of sanitary pads used were reduced yet not statistically significant. The level of pain reduction stated a statistical significance with P <0.0001. (Kadam & Garad 2022.)

At Hamadan University of Medical Sciences in Iran, 86 single female students participated in the current investigation, which was a randomized clinical trial. Girls between the ages of 18 and 24 who are single or unmarried and who have experienced mild-moderate dysmenorrhea over the previous three menstrual cycles according to the McGill Pain Scale ; no known chronic illnesses or reproductive system disorders; regular cycles every 21 to 35 days; no use of any specific chemical or herbal drugs affecting dysmenorrhea during the period of study; no disability; no prohibitions on sports activities due to specific medical problems and no endurance exercises were included. Reluctance to continue studying, a lack of consistent exercise, and the onset of any health issue that prohibited them from continuing the exercise were also exclusion factors. Ten professors of midwifery and physical education evaluated and adjusted the menstrual status questionnaires and other demographic data gathering instruments. Through convenience sampling, 258 students first answered questionnaires. Only those who met the entry requirements for the study, had mild to moderate dysmenorrhea (1 score of 6.6), and selected physical education and sport sciences units 1 and 2, were included. In general, 11 students from the Faculty of Medicine, 23 students from the Faculty of Rehabilitation, 13 students from the Faculty of Health, 13 students from the Faculty of Nursing and Midwifery, and 26 students from the Faculty of Paramedicine are among those who come to study from any college. Students who chose physical education number one were put in the intervention group, while those who chose number two were put in the control group. Students were given a questionnaire to complete that asked them to rate their level of pain using the McGill pain scale and how long it lasted each

day before the activities were assigned in order based on the results of the fourth random blocking and a demographic data survey. For the experimental group, sports sessions were held in accordance with the designed sports version of the FIIT protocol for each of the eight weeks with three sessions (a total of 24 sessions). A sports instructor and a professional researcher taught and executed a designed program in each session.

According to the FITT protocol, the sport version was created as follows:

F: Frequency of program sessions, which include eight weeks with three sessions each, each lasting a specific amount of time.

I: Using the Karvonen rule and the maximal heart rate, the following formula was applied to determine the intensity of the exercise: Heart rate reserve, or HRR, is calculated as (HRmax - HR rest) + HR rest. All members of the intervention group received training in heart rate measurement and calculation before to, during, and after exercise as well as at rest in order to assess the exercise intensity.

T: The exercise duration is determined in accordance with the ACSM guidelines. According to this protocol, training sessions began at 20 minutes each and were progressively increased to 47 minutes during sessions by adding a few minutes (2–3 minutes) at a time until the duration reached 47 minutes and remained there.

T: Throughout the 24 sessions, the type of exercise changed, but it always involved a variety of aerobic exercises with walking as the fundamental base. In every training session, the first five minutes were used to warm up the body and the final five minutes to cool it down. The majority of the time was allotted to long-duration workouts like track and field, jump rope, and set-up. Heart rate was measured once prior to exercise, once while exercising, once at its conclusion, and once again while resting after exercise.

The control group participated in group exercises like volleyball and badminton for one hour and thirty minutes each week while attending physical education class 2 once a week during the period of study. They did not receive any endurance workouts. Following the start of the intervention, both groups again answered the questions on the duration and severity of their discomfort throughout their first two menstrual cycles. Using SPSS 20, the collected data were compared and examined between the groups. The data's normality was examined using Kolmogorov-Smirnov intervention, and means

comparisons were made using Repeated Measure ANOVA, Independent t-tests, and paired t-tests. For statistical analysis, Fisher's intervention with a significance threshold of P0.05 was utilized. This study did not examine the effects of confounding factors like stress and nutrition. There was no discernible difference between the two groups when the BMI, start age, length, and intervals of menstrual cycles were compared. Both groups' participants were mostly moderate menstrual bleeders who frequently experienced dysmenorrhea during some of their menstrual cycles. The first menstrual cycle following the intervention's mean comparison revealed that the experimental group's mean dysmenorrhea duration was shorter compared to control group. The experimental group's mean level of dysmenorrhea severity was considerably lower than control group's at the first menstrual cycle following intervention, according to a mean comparison. The second menstrual cycle following the start of the intervention showed that the experimental group's mean dysmenorrhea severity was considerably less severe than the control group.(Heidarimoghadam et al., 2019.)

A prospective, two-arm, single-blind (assessor), randomized control experiment was carried out by Kannan et al., (2015) at the Otago School of Physiotherapy in Dunedin, New Zealand. The study's purpose was to assess how an exercise program for women with primary dysmenorrhea affected pain severity and quality of life. Based on the findings of a prior feasibility research, which was carried out in 2010 to investigate the utilization of a treadmill-based exercise regimen for reducing menstrual discomfort related to primary dysmenorrhea, the sample size was determined. Public and university advertising was used to find participants. Flyers were distributed throughout the University of Otago, Dunedin campus, Dunedin Hospital, Women's and Children's Health clinic waiting area, sports centers and clubs, general practitioners, community churches, Dunedin Family Planning Clinic and physiotherapy clinics, child care facilities and super markets. They also contained simplified inclusion and exclusion criteria and the contact information of the Clinical Research Administrator (CRA). Seventy-nine women volunteered ro participate; six were disqualified during the first telephone screening process, and three more were disqualified later on because they did not match the eligibility requirements. The remaining 70 were randomly assigned to either the intervention group, which consisted of 35 people, or the usual care control group, which comprised 35 people. The majority of the participants were university students who belonged to multiethnic (New Zealand Europeans, Asians, Africans, Pacific Islanders, and Maori) groups. Women who met the following inclusion criteria were recruited for the study: Non-pregnant individuals in the age range of 18 to 43 who are in good general

health, have primary dysmenorrhea, are not on an exercise regimen, have regular menstrual cycles, have no pelvic abnormalities, and have had dysmenorrhic pain for at least two consecutive months. Females with secondary dysmenorrhea, those with intrauterine devices, those taking oral contraceptive pills (OCPs), those receiving hormone therapy, and those whose menstrual cycle interval surpassed 34 days were all excluded from the study. The exercise intervention lasted for 7 months, starting with a 1-month training session at the physiotherapy school and concluding with a 6-month home exercise regimen. With no exercise during the menstrual week, the exercise intervention was carried out in 3-week intervals. The training time at the physiotherapy school began following the end of the first menstruation and finished before the beginning of the second. Participants engaged in strenuous aerobic exercise on a treadmill for 30 minutes at a heart rate between 70% and 85% of their MHR during the training session. Warm-up exercises lasting 10 minutes were performed before to the treadmill workout, and cool-down exercises lasting 10 minutes comprised abdominal and gluteal muscle strengthening as well as stretching for the mid and lower back and pelvic region. There were no limitations on the use of analgesics by any participant in whatever quantity. The Polar Fitness heart rate monitor was used to keep track of the patient's heart rate throughout the intervention. To track their treadmill mileage, participants also wore pedometers. The Borg's rate of perceived exertion (RPE) scale was utilized to control the treadmill's exercise intensity while individuals were using it. According to the feedback from the participants, the treadmill's speed was increased or decreased to maintain the participants' level of exertion between RPE 14 and 16, which was regarded as vigorous intensity. The heart rate was also monitored while on the treadmill to ensure that it did not exceed an intensity of 85% of age-adjusted MHR. While participants were still on the treadmill, heart rates were taken every 10 minutes. Participants were required to complete a home exercise program for the following six months after the three-week training period (the first menstrual cycle) at the school. Each participant received a booklet including instructions for strengthening and stretching exercises as well as a adherence diary, including the average distance they walked on the treadmill at the school of physiotherapy. The participants were instructed to follow the aerobic exercise's intensity and duration. Both primary and secondary outcomes were examined in this study. The McGill Pain Questionnaire (Sf-MPQ) was used to evaluate pain, which was the primary outcome. Secondary outcome variables included quality of life, physical functioning, sleep, ratings of overall improvement and treatment satisfaction from participants, protocol adherence to exercise sessions to the home program and at the school of physiotherapy. The 12-Item Short Form Health Survey (SF-12) was used to

assess quality of life, while the BPI-sf, a shorter version of the brief pain inventory, was utilized to assess physical functioning. The Women's Health Initiative Insomnia Rating Scale (WHIIRS), a self-report measure that shows how frequently people suffer specific sleep difficulties over the past month, was used to monitor sleep. Patient Global Impression of Change (PGIC) was used to gauge participant evaluations of overall improvement and treatment satisfaction. Each intervention group participant's attendance at every session allowed for an evaluation of the protocol's adherence to exercise at the school. An exercise adherence journal that was given to each member of the intervention group allowed for the evaluation of adherence to the home exercise regimen. At the school of physiotherapy, participant recruitment, enrollment, and exercise intervention training had all been finished by the time the study was published. The final follow-up evaluations were anticipated to be submitted, and a home exercise program and follow-up assessments (Weeks 16 and 28) were in progress.

Kannan et al., (2019) is the continuation of kannan et al., (2015) intervention. The article published on 2019 reports the results of the intervention. Statistical analysis was done using SPSS version 22.0 and the intention-to-treat principle. P 0.05 was chosen as the cutoff for statistical significance. Missing data were replaced with group means. Two, five, and seven participants from the control group and three, two, and eight from the intervention group, respectively, were lost to follow-up at 1, 4, and 7 months. For each group's 35 participants, a final analysis was conducted. Negative incidents were not reported. Participants engaged in individual exercise performance during the unsupervised exercise sessions. Exercise had statistically significant effects on pain quality and intensity at one month compared to the control group, and those effects persisted at four and seven months. At one month, no statistically significant difference for the Present Pain Index, but at four and seven months, there was. The physical and mental component summaries on the SF-12 quality of life questionnaire did not indicate a significant effect at one month, but statistically significant results were seen after four and seven months. Similar results were found on the Brief Pain Inventory-short form, where data on pain severity did not significantly change at 1 month but did at 4 and 7 months. The data on pain interference revealed benefits of exercise at 1, 4, and 7 months that were statistically significant. At 4 and 7 months, the percentage of pain reduction with analgesics demonstrated statistically significant improvements. At months 1, 4, or 7, exercise had no discernible impact on sleep. At one month, there was no discernible difference in the PGIC scores due to exercise ($p > 0.05$). At 4 and 7 months, however,

considerably more people in the experimental group judged their overall change as "much improved" or "very much improved " compared to the people in the control group.

120 non-medical students with primary dysmenorrhea who were living at Shiraz University dorms participated in this randomized controlled trial. The research took eight weeks. Complete information regarding the study was given to participants, and written agreement was obtained. The subjects' reported hours of pain were used to calculate pain duration and intensity using a visual analogue scale (VAS). The participants' levels of anxiety were measured using Spielberger's standard anxiety questionnaire. Study participants had to be enrolled in non-medical fields of study, have primary dysmenorrhea that was determined by demographic questions and a gynaecologist's confirmation, have pain intensity of 5 or above on a VAS scale, be nulliparous, not use oral contraceptives, have no systemic or reproductive system diseases, and have no restrictions on performing isometric exercises. The exclusion criteria were a lack of interest in participating in the trial, the use of alternative treatments during the study, a lavender oil allergy, the use of any medications, the presence of any disease, and the presence of any physical or mental health issues. Using permuted-block randomization, the 120 participants are split into 3 groups with 40 people each. Three groups two experimental, one controlled were used. Lavender oil was administered as a treatment in one of the experimental groups (the massage group), and a series of isometric exercises were performed in the other group. This investigation was not blinded. The group members' levels of anxiety, pain intensity, and length of discomfort were all assessed during the first month prior to the intervention, when dysmenorrhea symptoms were at their worst. Applying lavender extract to the inner arm for 15 minutes examined the skin's receptivity to it. Study participants were instructed to get in touch with the researcher when menstruation discomfort was at its worst. Following a brief explanation of the process, the massage group had a 15-minute clockwise ef-fleurage massage using lavender extract based on 10% pure olive oil on the upper region of the umbilicus and pubic symphysis. Following the massage, the patients' pain duration and intensity were assessed using the VAS. The anxiety level was measured 24 hours after the second massage on the second day of menstruation, and all the procedures from the first day were evenly repeated for all participants at approximately the same hour of the day. Since the third day of their menstrual cycle, the members of the exercise group have been instructed to complete isometric exercises five days a week, twice daily, and ten times total for eight weeks. Pain intensity and duration were assessed throughout the course of three cycles. Four and eight weeks

after completing the exercises, on the start of the subsequent menstrual cycles, the anxiety level was assessed. At the conclusion of weeks 4 and 8 following the cycle, the pain severity, duration, and level of anxiety were assessed in the control group, which received no interventions. For each of the three groups, the amount of pain and anxiety was assessed over the course of three successive cycles. The participants were asked to fill out Spielberger's questionnaire and gauge their own level of discomfort in order to reduce the possibility of inaccuracy. Dunnett's posthoc test 1-way, analysis of variance (ANOVA) and repeated-measures ANOVA were used to analyse the data using SPSS statistical software (version 20). 34 people from each group finished the study, bringing the total to 102, while 18 participants were dropped from the study due to severe pain, incapacity to perform the exercises, poor performance on the exercises, and unwillingness to continue. Three groups showed a significant difference in pain intensity by the second and third cycles. In terms of pain intensity, the results were more substantial in the massage group. Both the massage and activity groups had considerably shorter pain durations compared to control group. More differences were seen in the massage group than in the exercise group. The study's results showed no discernible differences in the study groups' mean anxiety levels at the beginning of the study, but the massage group's anxiety levels significantly decreased by the third cycle. (Azima, Bakhshayesh, Kaviani, Abbasnia & Sayadi 2015.)

In the randomized control trial conducted by Kirmizigil & Demiralp (2019) 28 participants (14 in each group) were randomly allocated into control and intervention groups by a statistician using Random Allocation Software utilizing the one block simple randomization method. The University Women's Health Unit recruited women with primary dysmenorrhea within the ages of 18 and 35 who had applied for treatment there. The inclusion criteria for this study required that participants have regular menstrual cycles (one every 24-35 days), at least a severity of 5 on the Visual Analog Scale (VAS) for abdominal pain, and no prior history of abortion or childbirth. Women who utilized intrauterine devices and developed secondary dysmenorrhea were not included in the study. Additionally, people with neuromuscular and heart problems as well as those who regularly used medicine were not included. The 45-minute workout consisted of two stretching exercises, Kegel exercises, two core exercises, two pelvic area exercises and one yoga pose. Before beginning the combined workouts, warm-up exercises were done for five minutes. For eight weeks, the exercise group underwent this treatment three times each week. All sessions included the use of music and visuals, and all activities included diaphragmatic

breathing. Following the pre-evaluation, a two-day orientation phase was held to familiarize participants with the exercise program. During this time, the description and goal of the exercises were explained. In the socio-demographic assessment, BMI was calculated and risk variables for dysmenorrhea like educational attainment, alcohol consumption, menstrual cycle characteristics and cigarette smoking were noted. VAS was used to assess perceived soreness. The Menstrual Symptom Questionnaire (MSQ) was utilized to assess symptoms. The Pittsburgh Sleep Quality Index (PSQI) was utilized to evaluate sleep quality. In order to enrol women with comparable levels of physical activity, the levels of physical activity were measured by the International Physical Activity Questionnaire (IPAQ) at the baseline point of the trial. Using IBM SPSS Statistics 22, the data were examined. In terms of sociodemographic traits, degree of physical activity, menstrual features, and pain-coping strategies, there were no statistically significant differences. In the time span between T0 (baseline) and T2 (post intervention), there was a statistically significant difference in bodily pain in the experimental group. Only abdominal pain was included in the intergroup assessment of pain severity at T2, and this revealed a statistically significant difference in the comparison of the groups. In comparison to the baseline values, the control group did not exhibit any time-dependent changes in any outcome measures. In the intragroup analysis, the combined exercise group had statistically significant differences in all MSQ parameters and two PSQI subscale scores between T0 and T2.

5 Discussion

The articles used for this bachelors thesis had included women in the age group of 17-43, which varied from each study to another. The background of study population showed a vast difference. All the participants of Heidarimoghadam et al., (2019) had a medical or paramedical students but Azima et al excluded any participant who had a medical background. The study conducted by Kannan et al., (2019) had the most diversity in ethnicity among the participants which genaralised the results of the study. Women who used any specific chemical or natural medicine were not included in the studies by Heidarimoghadam et al., (2019), Azima et al., (2015) and kannan et al., (2019) specified it as oral contaraceptive and and excluded. 3 of the studies were conducted for

8 weeks (2 menstrual cycles) (Azima et al; Heidarimoghadam et al., 2019; Kirmizigil & Demiralp 2019). Kannan et al., 2019 was conducted for 7 months and was the longest duration among the selected studies. The shortest study was conducted by Kadam & Garad 2022 for one month.

Both systematic review and meta-analyses used similar methods and same databases. Carroquino-Garcia et al., (2019) conducted 3 metanalyses which reported sataistical significance were found in using exercise as a treatment method for primary dysmenorrhea in terms of reducing pain. As a result, one study that discovered substantial differences of aerobic exercise applied over 12 weeks revealed a stronger effect of exercise on quality of life. Both of the reviews stated that Isoemtric exercises, stretching and relaxation exercises were founf to be beneficial (López-Liria et al., 2021; Carroquino-Garcia et al., 2019). FIIT protocol indicated singificant effect on primary dysmenorrhea in terms of dysmenorrhea duration and severity (Heidarimoghadam et al. 2019). Azima et al., (2015) stated significant improvement in pain duration intensity and anxiety at the end of the third menstrual cycle following the intervention. Exercise group showed significantly low pain duration but not intensity compared to massage group but no improvement in anxiety. Sleep quality was measured in 2 studies. According to Kirmizigil & Demiralp (2019) which used Pittsburgh Sleep Quality Index (PSQI) stated statictical significance at 8 weeks post intervention, yet to kannan et al., 2019 which used women's health initiative insomnia rating scale (WHIIRS), stated no significance at 1,4 or 7 months.

In conclusion of this bachelors thesis the articles used within the years of 2014-2022 indicates strong evidence of how exercise can be used as a treatment and has positive effects on treating primary dysmenorrhea.

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