

Comparing the Effects of Aerobic and Stretching Exercises on Intensity of Primary Dysmenorrhea Among Nursing Students

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Abstract

Background: Primary dysmenorrhea, defined as spasmodic and painful cramps in the lower abdomen during menses, in the absence of any pelvic pathology. It is one of the most common gynecological disorders among adolescent girls. Globally, the burden of dysmenorrhea range from 50% to 95%. It results in negative physical, social and psychological consequences. More regular physical activity is effective in reducing dysmenorrhea complications. **The aim of this study** was to; compare the effects of aerobic and stretching exercises on intensity of primary dysmenorrhea among nursing students. **Research design:** A **Quasi experimental design** was selected in carrying out this study. **Subjects:** A **purposive sample** of 150 female students, who complained of mild to moderate dysmenorrhea and selected from faculty of nursing. They were divided into control group and two intervention groups (**aerobic and stretching exercises**) performed exercises 3 times a week for 12 weeks (3 subsequent menstrual cycles). **The tools** used for data collection were: a structured Interview Questionnaire, visual Analogue Scale (VAS), WaLIDD Scale and Moo's Menstrual Distress Questionnaire (MDQ). **The results** of the present study revealed that female student's age ranged between 18-22 years. Intensity of pain was decreased in stretching & aerobic groups compared to control group with statistical significant difference ($p < 0.001$). Furthermore, WaLIDD total score was reduced

with statistically significant differences ($p < 0.001$) in stretching and aerobic groups vs. control group. Menstrual distress symptoms were improved in exercises groups (stretching and aerobic) vs. control group. **Conclusion:** Both aerobic and stretching exercises were effective in reducing intensity of dysmenorrhea and improving menstrual distress symptoms. **Recommendations:** female student can select aerobic or stretching exercises according to lifestyle and interest. Further training program combined aerobic and stretching exercises is suggested. Enhance student's awareness and knowledge about effect of physical exercises (stretching and aerobic) by adding this topic into curriculums.

Key words: Primary dysmenorrhea (PD), Aerobic exercises, stretching exercises, VAS, WaLIDD Scale, Moo's (MMDQ)

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1. Introduction

Primary dysmenorrhea (PD) is one of the most common menstrual disorders. It is defined as menstrual pain that develops due to uterine menstrual contractions while the prevalence of dysmenorrhea varies between 41.7% and 89.1% around the world^[1]. It can be divided into two main categories: primary (spasmodic) and secondary (congestive)^[2].

PD manifests through a wide variety of symptoms, either physical or affective Fisher et al^[3], such as back pain, abdominal and pelvic pain, headaches, migraines, insomnia, nausea, dizziness, fatigue, sweating, cramps, irritability, depression, and emotional instability, with a negative impact on overall quality of life compared to healthy women^[1,4].

Dysmenorrhea may be classified as mild, moderate or severe, depending on the degree of pain^[5]. Additionally, the diagnosis of PD is based upon a characteristic clinical history, normal physical examination, and absence of pelvic disease^[6]. Pharmacological as well as non-pharmacological complementary and alternative therapies are potential options for managing PD^[7]. NSAIDs, OCPs, physical exercises, and other complementary therapies are among the recommended treatments for PD. Physical exercise is nearly a new non-medical intervention to relieve PD associated pain^[8].

Exercise acts as non-specific analgesia by improving pelvic blood circulation and stimulating the release of beta-endorphins^[9]. Aerobic exercise stimulates the release of endorphins that relieve pain by inhibiting the pain pathways^[10]. Additionally, it reduces the symptoms of dysmenorrhea in women who exercise regularly as they exhibit lower levels of physical symptoms across their menstrual cycle^[11].

On the other hand, Stretching exercise are important to reduce Physical and Psychological symptoms of primary dysmenorrhea such as lack of concentration, behavioral changes, breast pain and anxiety. They also improve flexibility, restore mobility, relax uterine muscles and maintain good abdominal tone^[12].

Nurses can play an active role in pain management through posing comfort measures and reassurance to relief pain associated with PD^[13]. The nurse plays a substantial role in diagnosing, educating, reassuring, and providing them with the therapy required for optimizing the overall treatment outcomes of PD^[14,15]. Nurses emphasize, health program for improving a student's level of wellness in all dimensions, such as healthy lifestyle, nutrition, exercise, family relationships and coping with stress and adaptations behaviors^[16]. Therefore, the present study aimed to compare the effects of aerobic and stretching exercises on intensity of primary dysmenorrhea among nursing students.

2. Subjects & Methods

2.1. Design:

A Quasi experimental design was used to carry out the current study.

2.2. Setting:

The current study was carried out at faculty of nursing, Zagazig University.

2.3. Subjects:

The present study enrolled 150 female students, who selected from the study setting and involved 4 academic years. The students divided into one control and two intervention groups, 50 students in each group (control, stretching and aerobic exercises groups). Control group observed without any exercises and exercises groups (trained on exercises 3 times / week) for 12 weeks intervention (3 subsequent menstrual cycles).

Group I:	Control group	(n=50)
Group II:	Stretching exercises group	(n=50)
Group III:	Aerobic exercises group	(n=50)

Sampling Technique:

The female students were selected through the following inclusion and exclusion criteria

Inclusion Criteria:

1. Single female students.
2. Regular menstrual cycle (28 – 35 days).
3. Mild to moderate primary dysmenorrheal pain; (VAS) scoring ≤ 6 .

Exclusion Criteria:

1. History of medical or gynecological diseases.
2. Professional athletic female students.
3. Receiving special dietary regimen.
4. History of joint, motion, muscle, and bone diseases that reduce their abilities to exercise.

2.4. Tools of data collection:

The following tools were used to conduct the present study:

Tool I: A structured Interview Questionnaire (Appendix 1):

It was developed by the researcher in the light of related literature to collect the basic data about:

Part 1: Demographic data such as: age, phone number, academic year, residence, income level, height and weight. The estimation of (BMI) was measured according to the following equation $BMI = \text{weight} / \text{height}^2$.

Part 2: Menstrual history included the following: age at menarche, duration, menstrual cycle length, amount of blood loss during menses.

Tool II: visual Analogue Scale (VAS) (Appendix 2):

It was developed to assess pain intensity of dysmenorrhea. It was used in the pre, post intervention and follow-up for 12 weeks to record the intensity of menstrual pain by female students among the studied groups.

Scoring system:

VAS score was categorized as the following:

No pain	= 0
Mild pain	= 1-3
Moderate pain	= 4-6
Severe pain	= 7-8
Intolerable pain	= +8

Tool III: WaLIDD Scale (Appendix 3):

It was developed by Teherán et al^[17] to assess degree of dysmenorrhea. It composed of 4 subcomponents (working ability, location, intensity, days of pain). It used for 12 weeks intervention (3 consecutive menstrual cycles) among the studied groups. The pain locations for WaLIDD scale were (no part of the body, lower abdomen, lumbar region, lower limbs and/or inguinal region).

Working ability	Location	Intensity (Wong-Baker)	Days of pain
0: None	0: None	0: Does not hurt	0: 0
1: Almost never	1: 1 site	1: Hurts a little bit	1: 1-2
2: Almost always	2: 2-3 sites	2: Hurts a little more -hurts even more	2: 3-4

3: Always	3: 4 sites	3: Hurts a whole lot – hurts worst	3: ≥ 5
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Scoring system:

The scores corresponding to WaLIDD score was as follows:

Without dysmenorrheal	= 0
Mild dysmenorrheal	= 1–4
Moderate dysmenorrheal	= 5–7
Severe dysmenorrheal	= 8–12

Tool VI: Moo's Menstrual Distress Questionnaire (MDQ) (Appendix 4):

It was developed by Moos^[18] to assess the severity of menstrual symptoms associated with dysmenorrhea. Also, it involved 8 domains, (47 symptoms on the MMDQ), which occurred in each menstrual cycle. Each of these eight subcomponents included symptoms as follows: (pain, concentration, behavioral change, autonomic reaction, water retention, negative effect and control)

Scoring system:

The Scale of MMDQ was reviewed by the supervisors, a panel of experts & modified as follows (no, mild, moderate, severe symptoms). It was used to record associated menstrual distress symptoms in each menstrual cycle after training on exercises in stretching and aerobic groups for 12 weeks by female students.

2.5. Pilot study:

The pilot study was carried out on 10% of female students (15 students) from the calculated total sample size. They were excluded from main study sample. The aim was to test clarity of the questions, comprehensiveness of the items, to estimate the exact time required for filling out the tools sheet and the format of the tools.

2.6. Field work:

The fieldwork was conducting within the period of 10 months, starting from the first of August 2020 to the end of May 2021. The researcher started to collect data through study phases.

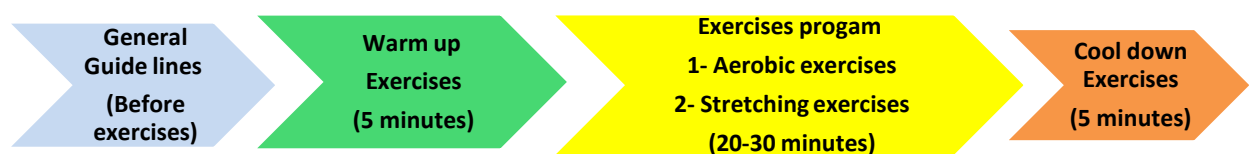
In the first phase (*Interviewing phase*), the students were selected from faculty of nursing, Zagazig University according to the previously mentioned criteria. Then, oral consent was obtained for their participation, after that they were divided into control group and 2 intervention groups (stretching and aerobic exercises). The questionnaire was read, explained &

all basic data was obtained through the pretest interview. This was done individually or in small groups, ensuring privacy.

In the second phase (*Assessment & implementation phase*)

- Program assessment phase and program planning phase, the program was designed after substantial review of literature. **Self learning booklet** was prepared by the researcher in the light of the literature on the subject and was revised by the supervisors. Finally, it was given to students in the beginning of the program together with the pretest. **Booklet outlines** for 2 intervention groups (stretching and aerobic exercises) such as definition, benefits, general measures before practicing exercises, protocol of exercise, warm up exercises, types & steps of exercises and calm down exercises.
- Program implementation phase, 50 female students in each group (stretching and aerobic) performed exercises for (12 weeks 3 times per week for 30-45 minutes each time); meanwhile control group was assessed without any exercises during their menstrual cycles. The researcher used illustrations (**videos – GIF pictures- booklet & posters**).

In the third phase, program evaluation and follow up phase was done after exercises intervention. Days of menstruation was excluded from the exercise program to assess pain & menstrual symptoms accurately. Evaluation & follow up was done for 12 weeks for control, stretching and aerobic exercises groups to compare the effects of aerobic and stretching exercises on intensity of primary dysmenorrhea among nursing students. The follow up process was done via phone calls & social media (Whatsapp, Messenger...Etc).



Aerobic and Stretching Exercises training program

2.7. *Validity*

It was determined by a panel of five experts in the field of Obstetrics and Gynecological & Psychiatric & mental health who reviewed the content of the tools for clarity, understandability and comprehensiveness.

2.8. *Ethical consideration:*

Firstly, the research protocol was approved by the Research Ethics Committee (REC) in Zagazig University. Participants were given the opportunity to refuse participation and they were

notified that they could withdraw at any time of the data collection, also they were assured that the information would be confidential and used for the research purpose only. The researchers assured maintaining anonymity and confidentiality of the students' data.

2.9. Statistical design:

After the collection of data, Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Microsoft office excel software was used to construct the required graphs. After data manipulation was done all numeric data were expressed in the mean and standard deviation (SD). Categorical data were expressed in the form of frequencies and percentages. Qualitative categorical variables were compared using chi-square test. Statistical significance was considered at p -value <0.05 .

3. Results

Concerning the demographic data of the studied groups, female student's age ranged between 18-22 years with a mean of age partially similar (20.42 ± 0.22 , 20.4 ± 0.19 and 20.35 ± 0.21 respectively) in control, stretching & aerobic groups. Besides the majority of female students were rural dwellers & vast majority had sufficient income among the three groups with no statistical significant difference. Meanwhile, the students in the three studied groups had normal body mass index with a mean of (24.1 ± 42.27 , 22.86 ± 0.39 & 23.58 ± 0.37 respectively).

Table 1 demonstrates menstrual characteristics in the studied groups. The age at menarche ranged between 13-15 years (66.0%, 76.0% and 80% respectively) in control, stretching & aerobic groups. Their duration of menses ranged between 4-5days (60.0%, 60.0% & 74.0% respectively) among studied groups. Meanwhile, the vast majority of students in the studied groups had moderate amount of blood loss with normal menstrual cycle length (21-35 days) with no statistical significant difference.

As regards pain intensity according to VAS, **table 2** shows no significant difference between studied groups before exercises (5.82 ± 0.09 , 5.94 ± 0.03 & 5.88 ± 0.05 respectively). Meanwhile, intensity of pain was decreased among the stretching, aerobic groups in comparison with control group with statistical significant difference ($p < 0.001$).

Table 3 illustrates anatomical pain locations for WaLIDD Scale in the current study. As seen, a sizable portion of students were affected at all sites (the most common sites were lower abdomen, lumbar region, lower limbs & inguinal region respectively) before exercises. Also, their pain locations were improved during 3 consecutive menstrual cycles in stretching & aerobic groups vs. control group with statistical significant differences ($p < 0.001$).

Table 4 reveals WaLIDD total score for dysmenorrhea with a mean of (6.26 ± 0.12 in control, 6.7 ± 0.08 in stretching & 6.68 ± 0.08 in aerobic groups) before exercises. Furthermore, WaLIDD total score was reduced in stretching and aerobic groups in comparison with control group with statistical significant differences ($p < 0.001$).

Regarding Moo's Menstrual Distress Questionnaire **Figure 1** shows that all MMDQ subcomponents (pain, concentration, behavioral change, autonomic reaction, water retention, negative effect and control) were decreased in stretching and aerobic in comparison with control group. Meanwhile, arousal was increased in stretching and aerobic exercises compared to control group.

Table 5 shows correlation coefficients, with highly statistically significant ($p < 0.01$) between Moo's menstrual distress domains and pain scales (VAS and WaLIDD scale) used to assess dysmenorrhea in the studied groups.

Table 1: Distribution of the studied groups according to their menstrual characteristics data (n=150):

Menstrual Characteristics Data		Groups						Test	p-value
		Control (n=50)		Stretching (n=50)		Aerobic (n=50)			
		No	%	No	%	No	%		
Age at menarche	<13 years	17	34.0	10	20.0	9	18.0	X ² = 5.869	0.209
	13-15 years	33	66.0	38	76.0	40	80.0		
	>15 years	0	0.0	2	4.0	1	2.0		
Duration of menses	2-3 days	7	14.0	4	8.0	4	8.0	X ² = 4.158	0.385
	4-5 days	30	60.0	30	60.0	37	74.0		
	6-7 days	13	26.0	16	32.0	9	18.0		
Menstrual cycle length	<21 days	2	4.0	0	0.0	2	4.0	X ² = 4.098	0.393
	21-35 days	46	92.0	49	98.0	48	96.0		
	>35 days	2	4.0	1	2.0	0	0.0		
Amount of blood loss	Mild	2	4.0	3	6.0	9	18.0	X ² = 8.721	0.068
	Moderate	48	96.0	46	92.0	41	82.0		
	Severe	0	0.0	1	2.0	0	0.0		

Values with different superscripts in the same row are significantly different ($P < 0.05$)

X^2 = Chi-Square test

Table 2: Distribution of the studied groups according to visual Analogue Scale (VAS) of dysmenorrhea (n=150):

visual Analogue Scale (VAS) of Dysmenorrhea	Groups			Test (p-value)
	Control (n=50)	Stretching (n=50)	Aerobic (n=50)	
Before exercise	5.82 ± 0.09	5.94 ± 0.03	5.88 ± 0.05	F= 292.040 ($p < 0.001$)
1 st cycle	6.4 ± 0.09	4.52 ± 0.09	4.36 ± 0.1	

2 nd cycle	6.8 ± 0.09	2.4 ± 0.13	2.28 ± 0.12	
3 rd cycle	6.9 ± 0.08	0.82 ± 0.11	0.62 ± 0.09	

Values with different superscripts in the same row are significantly different ($P < 0.05$)

F = two way ANOVA test

Table 3: Distribution of the studied groups according to their anatomical pain locations for WaLIDD Scale (n=150):

Anatomical pain locations for WaLIDD Scale\$		Groups						Test (X ²)	p-value
		Control (n=50)		Stretching (n=50)		Aerobic (n=50)			
		No	%	No	%	No	%		
No part of the body	Before exercise	1	2.0	0	0.0	0	0.0	2.013	0.365
	1 st cycle	0	0.0	0	0.0	0	0.0	-	-
	2 nd cycle	0	0.0	2	4.0	1	2.0	2.041	0.360
	3 rd cycle	0	0.0	19	38.0	23	46.0	29.960	< 0.001
Lower abdomen	Before exercise	48	96.0	49	98.0	50	100.0	2.041	0.360
	1 st cycle	49	98.0	44	88.0	44	88.0	4.211	0.122
	2 nd cycle	46	92.0	40	80.0	37	74.0	5.691	0.058
	3 rd cycle	49	98.0	25	50.0	20	40.0	41.090	< 0.001
Lumbar region	Before exercise	40	80.0	39	78.0	38	76.0	.233	0.890
	1 st cycle	37	74.0	22	44.0	24	48.0	10.735	0.005
	2 nd cycle	38	76.0	7	14.0	8	16.0	54.328	< 0.001
	3 rd cycle	40	80.	3	6.0	3	6.0	85.849	< 0.001
Lower limbs	Before exercise	24	48.0	20	40.0	27	54.0	1.979	0.372
	1 st cycle	26	52.0	13	26.0	10	20.0	13.154	0.001
	2 nd cycle	25	50.0	4	8.0	5	10.0	32.023	< 0.001
	3 rd cycle	25	50.0	2	4.0	1	2.0	48.566	< 0.001
Inguinal region	Before exercise	20	40.0	27	54.0	19	38.0	3.084	0.214
	1 st cycle	23	46.0	6	12.0	11	22.0	15.614	< 0.001
	2 nd cycle	22	44.0	3	6.0	5	10.0	27.250	< 0.001
	3 rd cycle	21	42.0	1	2.0	2	4.0	37.798	< 0.001

*P.value ($P < 0.05$) significantly different

\$ The total is not mutually exclusive

More than one answer was allowed

Table 4: Distribution of the studied groups according to WaLIDD total score of Dysmenorrhea (n=150):

WaLIDD total score of Dysmenorrhea	Groups			Test (p-value)
	Control (n=50)	Stretching (n=50)	Aerobic (n=50)	
Before exercise	6.26 ± 0.12	6.7 ± 0.08	6.68 ± 0.08	F= 267.327 (p < 0.001)
1 st cycle	6.5 ± 0.1	4.56 ± 0.1	4.44 ± 0.11	

2 nd cycle	6.9 ± 0.09	2.4 ± 0.13	2.32 ± 0.13	
3 rd cycle	7.04 ± 0.08	0.84 ± 0.11	0.64 ± 0.1	

Values with different superscripts in the same row are significantly different ($P < 0.05$)

F = two way ANOVA test

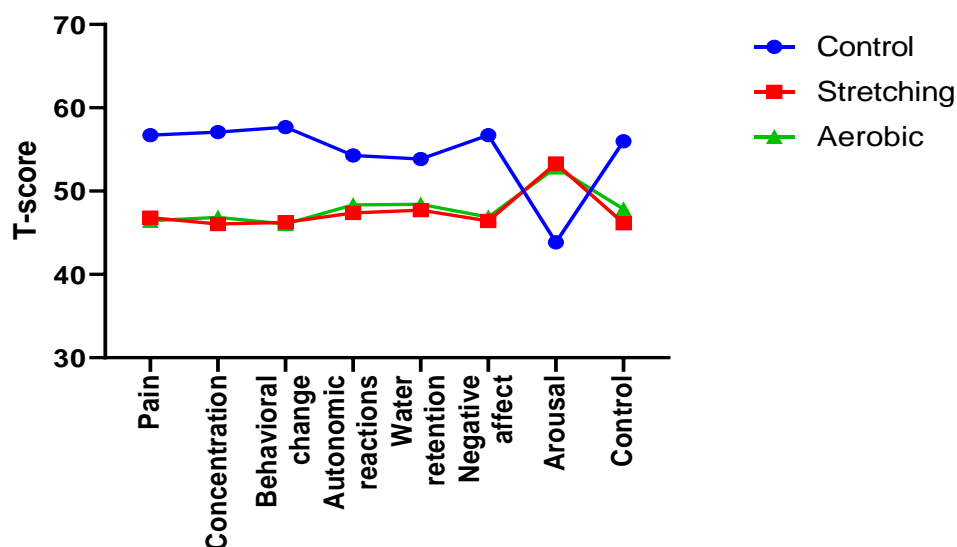


Figure 1: Distribution of the studied groups according to Moo's Menstrual Distress Questionnaire (n= 150)

Table 5. Pearson correlation coefficients between Moo's menstrual distress domains and pain scales (VAS and WaLIDD scale) used to assess dysmenorrhea:

	VAS	WaLIDD total score
Pain	0.244**	0.875**
Concentration	0.261**	0.816**
Behavioral change	0.240**	0.887**
Autonomic reactions	0.142**	0.610**
Water retention	0.102*	0.434**
Negative affect	0.229**	0.836**
Arousal	- 0.183**	- 0.722**
Control	0.196**	0.676**

** Correlation is significant at the 0.01

* Correlation is significant at the 0.05

4. Discussion.

Primary dysmenorrhea (PD) is defined as painful menstruation in the absence of a pelvic pathology; one of the most common complaints in young women. It is a significant clinical problem and results in considerable public health burden worldwide^[19]. Globally, the prevalence

of dysmenorrhea varies from 20% to 90%^[20]. Also, **Iacovides et al**^[21] showed that dysmenorrhea negatively impacts the life of affected women including their relationships with family members and friends, school or work performance in addition to social and recreational activities.

In the treatment of PD, pharmacologic and non-pharmacologic treatment methods are available^[22]. Exercise acts as non-specific analgesia by improving pelvic blood circulation and stimulating the release of beta-endorphins. The primary goal of treatment is to reduce the pain and improve the quality of life of patients suffering from dysmenorrhea^[9].

Concerning Pain intensity and menstrual distress symptoms, the existing study results achieved study aim and showed that there were highly statistically significant differences ($p < 0.001$) in VAS and WaLIDD total score in intervention groups (stretching and aerobic groups) compared to control group. Moreover, All MMDQ subcomponents were improved in exercises groups compared to control group.

The studied groups were homogeneous regarding demographic data. The present study results clarified that female student's age was 18-22 with a mean of age partially similar (20.42 ± 0.22 , 20.4 ± 0.19 and 20.35 ± 0.21 respectively) in control, stretching & aerobic groups. In addition, the students in the studied groups had normal BMI. The possible explanation might be attributed to minimize the effects of group differences that could affect outcome measures.

In the same context with this result, **Indu et al**^[23] in North India in their study found that mean age of 20.97 ± 1.43 years, normal BMI. These results nearly matches with the study of **Abd Elmoniem et al**^[24] in Egypt who mentioned that mean age of the studied students was (19.96 ± 2.26) (20.45 ± 2.33) (19.66 ± 1.76) in stretching, hot application, and routine care groups respectively. Regarding BMI, there was no significant difference among the studied groups. Similarly, **Elsayed et al**^[25] who reported that no statistically significant difference between both groups regarding age and BMI. In agreement with this result, **Babajani**^[26] in Iran found that dysmenorrhea generally seen in age group of 17-23 years.

In the term of menstrual characteristics the present study stated that, the age at menarche ranged between 13-15 years and duration of menses was more than two thirds (ranged between 4-5 days) among studied groups. Additionally, the vast majority of students in the studied groups had moderate amount of blood loss with normal menstrual cycle length (21-35 days). Possible explanation regarding normal menstrual criteria might be due to primary dysmenorrhea characterized by painful menstruation that occurs in the absence of any detectable pelvic pathology^[27]. Additionally, **Dong**^[28] emphasized that, menstrual history is also essential and should include the age at menarche, cycle regularity, cycle length, last menstrual period, and duration and amount of menstrual flow.

In the same context with this result, **Indu et al**^[23] in North India in their study found that, mean age of menarche 13.37 ± 1.40 years, normal menstrual cycle length (90.74%), number of pads/day 3-5 moderate amount of bleeding (86.34%) and menstruation duration (3-7 days) (73.78%) among undergraduate medical students. In addition, a study conducted by **Abreu-Sánchez et al**^[29] in Southern Spain reported that mean age of menarche was 12.16 ± 1.54

years. The mean number of days per cycle was 29.84 ± 8.07 , the length of menses (days of bleeding) was 4.97 ± 1.25 days and 61% had a moderate amount of menstrual flow.

Concerning achieving research aim the present study revealed that, there was no significant difference on intensity of pain between studied groups before exercises. Furthermore, there was highly statistical significant difference ($p < 0.001$) on intensity of pain by VAS in stretching and aerobic groups compared to control group after exercises intervention. The explanation of pain intensity of primary dysmenorrhea might be attributed to the intensity of the pain depends upon the perception of an individual^[30]. Also, overproduction of prostaglandins by the endometrium, causing uterine hypercontractility that results in uterine muscle ischemia, hypoxia, and, subsequently, pain^[6]. As well as, light to moderate intensity exercises reduce stress, anxiety & depression and improve mental health. Exercise, a natural remedy for negative effects because it releases powerful endorphin chemicals in the brain, which act like the body's built-in painkillers and mood-lifters^[31].

The study result was in acceptance by with an Egyptian study carried by **Abdul Aziz et al**^[32] revealed that, there was a significant decrease in VAS and MDQ with ($P < 0.001$) post treatment in both groups compared with that pretreatment value. In confirmation with, **Mostafa et al**^[33] at Cairo University in Egypt revealed that there was a significant difference in the numeric pain scale between groups ($p=0.001$). Additionally, **Parra-Fernández et al**^[15] in Spain indicated that the use of physical activity help to alleviate menstrual pain.

In agreement with this result **Vaziri et al**^[34] in Iran and **Kiranmayi et al**^[12] in India reported that, Both aerobic and stretching exercises were effective in reducing the severity of dysmenorrhea. The values of numerical pain rating scale were statistically significant with ($P < 0.001$) in aerobic and stretching exercises groups.

In the same stream regarding stretching exercises, **Ibrahim et al**^[35] in Saudi Arabia mentioned that, a statistically significant reduction in pain intensity in favor of supervised active stretching group ($p < 0.001$). Besides, **Agrawal & Ahmed**^[36] in India results stated that, there was significant reduction in numerical rating scale ($p < 0.0001$) in stretching and core strengthening exercises groups in girls suffering from PD. Additionally, **Aiyegbusi et al**^[37] in Nigeria stated that core strengthening and stretching exercises were effective in significantly reducing pain. Similarly, the study conducted by **Armour et al**^[38] at Western Sydney University revealed that stretching exercises were helpful to reduce the duration and intensity of pain. Likewise, results of **Berde et al**^[39] in India showed that core strengthening exercises was statistically significant in reducing intensity of pain VAS score ($p=0.0004$) than chair aerobics and improving the quality of life after 8 weeks intervention in females with PD

In confirmation of study results concerning aerobic exercises effects, **Stella Adaora et al**^[40] in India concluded that, 45-minute, 4-session per week for 12 weeks aerobic exercise training programs were effective not only to reduce pain but to improve quality of life in females with primary dysmenorrhea. As well as, **Elbandrawy & Elhakk**^[41] stated that, both aerobic and isometric exercises were effective in reducing the severity of dysmenorrhea with significant

differences in the aerobic exercise group regarding VAS ($p = .001$). Further, **Kannan et al**^[42] (2019) in New Zealand stated that, aerobic exercise had significant effects on primary dysmenorrhea-related pain and QoL with ($p < .05$). With similarity, **Dehnavi et al**^[43] in Iran concluded that the severity of menstrual pain decreased at the end of 8 weeks of aerobic exercise intervention.

On the other hand **Rastogi et al**^[44] in India reported that, aerobic exercise was more effective than active Stretching in terms of reducing the intensity of dysmenorrhea after the 8-weeks treatment. Also, **Tharani et al**^[45] in India showed that, aerobic dance was significantly efficient than stretching exercises in reduction of pain intensity and duration as well as stress in primary dysmenorrhea at $P \leq 0.001$.

The current study revealed that the most common sites of anatomical pain locations for WaLIDD Scale were lower abdomen, lumbar region, lower limbs & inguinal region respectively in the studied groups before exercises. Meanwhile, the pain locations improved after exercises intervention with highly statistically significant ($p < 0.001$) among studied groups. In the same vein, **Sharghi et al**^[4] defined PD as spasmodic and painful cramps in the lower abdomen that begin shortly before or at the onset of menses. Also, PD manifested by severe cramping or spasms in the pelvic and lumbar region, which may be accompanied by a variety of symptoms ^[21]. Symptoms of PDM include cramping pain in the lower abdominal area which may, or may not, radiate to the lower back **Hailemeskel et al**^[46]. As well, **Sutra et al**^[47] mentioned that, Primary dysmenorrhea pain is spasmodic in nature and pain felt in lower abdomen, it may radiate to lower back and thighs.

Concerning dysmenorrhea grade according to WaLIDD total score the existing study mentioned that, there was no significant difference between studied groups before exercises. Moreover, WaLIDD total score reduced with highly statistically significant ($p < 0.001$) in stretching & aerobic groups in comparison with control group after 12 weeks intervention. Possible explanation of reducing intensity of pain may be due to exercise acts as non-specific analgesia by improving pelvic blood circulation and stimulating the release of beta-endorphins; which reduce the pain and improve the quality of life of patients suffering from dysmenorrhea^[9].

This finding is reported by study results conducted by **El-Kholy and Shalaby**^[48] in Egypt revealed that mean scores of the students dysmenorrheal severity, and duration had significantly decreased among the study group compared to the control group ($P = 0.0001$). Besides, **Chougule et al**^[49] in India revealed that, there was statistically significant on VAS and WaLIDD scores with (p value 0.000) in reducing low back pain. This is similar to the result of **Helal et al**^[50] in Egypt who showed that, the total WaLIDD score showed a statistically significant reduction at post-treatment in comparison to, pre-treatment ($p < 0.05$). In addition, **Shahrjerdi et al**^[51] in Iran demonstrated that, there was a significant decrease in pain intensity ($P = 0.008$) and pain duration ($P = 0.021$) in the experimental in comparison with control group. Additionally, **Parikh et al**^[52] in India, core strengthening exercises was more statistically significant to reduce degree of pain in dysmenorrhea according to WALIDD scale.

As regards **Moo's Menstrual Distress Questionnaire**, the current study results reported that all subcomponents (pain, concentration, behavioral change, autonomic reaction, water retention, negative effect and control) were improved in exercises groups vs. control group. Meanwhile, arousal elevated in stretching and aerobic compared to control group after 12 weeks exercise intervention. This might be attributed to; dysmenorrhea symptoms improvement may be due to exercises which cause hormonal changes in the uterine lining and reduces PD symptoms^[8].

This finding regarding symptoms of dysmenorrhea was inconsistent with the study in India by **Agrawal and Ahmed**^[36] mentioned that, there was statistically significant reduction in MDQ scores ($p < 0.0001$). In addition, **Agre et al**^[53] in India stated that, there was significant difference observed in all subcomponents of MDQ scale at 8 weeks with ($P < 0.001$) in intervention groups. Likewise, **Patel et al**^[54] in India showed that, eight domains of MMDQ showed significant improvement after eight weeks of intervention with p value ($p < 0.0001$). Furthermore, **Sandhiya & Selvam**^[55] clarified that, there was significant difference in MMDQ ($p = 0.011 < 0.05$). Additionally, **Ibrahim et al**^[35] in Saudi Arabia revealed that, a significant improvement in menstruation symptoms was found in supervised active stretching exercises ($p = 0.007$).

Finally, the present study showed that, there were correlation coefficients with highly statistically significant ($p < 0.01$) between Moo's menstrual distress domains and pain scales (VAS and WaLIDD scale) used to assess dysmenorrhea in the studied groups.

Limitation of the Study

The duration of data collection was delayed due to Covied_19 (Corona pandemic). All the protective measures were done to guard against corona pandemic such as; wearing masks, dividing the students in small groups... Etc. The follow up phase was done through social media (Whatsapp, Messenger...Etc) and phone calls.

5. Conclusion

The current study results bring about the conclusion that:

Primary dysmenorrhea, characterized by painful cramps of the uterus, is the leading morbidity among gynecological disorders and the leading cause of pelvic pain. It affects the physical, psychological, and social status of female adolescents. Therefore, both aerobic and stretching exercises were effective in reducing intensity of dysmenorrhea and improving menstrual distress symptoms among female nursing students. Students with dysmenorrhea can choose either of them depending on their lifestyle conditions and interest. Moreover, Physical activities and exercises could provide a safe non-pharmacological alternative for pain relief in females with primary dysmenorrhea.

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Declaration of Conflicting Interests

The author(s) declare(s) that there is no conflict of interest.

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References:

- 1- Hu, Z, Tang, L, Chen, L, Kaminga, A. C., and Xu, H. (2020): Prevalence and risk factors associated with primary dysmenorrhea among Chinese female university students: a cross-sectional study. *J Pediatr Adolesc Gynecol.*; 33 (1):15–22. Doi: 10.1016/j.jpag.2019.09.004.
- 2- Fallatah, S. A., Khan, A. M. M. E., Al Reqe, H. M., Alalshaikh, Z. A., Alnabhani, J. M. A., Alomari, M. A., ... & Alhawiti, B. H. M. (2018): The prevalence of dysmenorrhea among women. *The Egyptian Journal of Hospital Medicine*, 70(4), 520-525.
- 3- Fisher, C., Sibbritt, D., Hickman, L., and Adams, J. (2016): A critical review of complementary and alternative medicine use by women with cyclic perimenstrual pain and discomfort: a focus upon prevalence, patterns and applications of use and users' motivations, information seeking and self-perceived efficacy. *Acta Obstet Gynecol Scand.*; 95(8):861–871. Doi: 10.1111/aogs.12921.
- 4- Sharghi, M., Mansurkhani, S. M., Larky, D. A., Kooti, W., Niksefat, M., Firoozbakht, M., and et al. (2019): An update and systematic review on the treatment of primary dysmenorrhea. *JBRA Assist Reprod*; 23:51–7.
- 5- Abu Helwa, H. A. A., Mitieb, A. A., Al-Hamshri, S., & Sweileh, W. M. (2018): Prevalence of dysmenorrhea and predictors of its pain intensity among Palestinian female university students. *BMC Women's Health*; 18(1):18. <https://doi.org/10.1186/s12905-018-0516-1>.
- 6- Guimarães, I., & Póvoa, A. M. (2020): Primary Dysmenorrhea: Assessment and Treatment. *Rev. Bras. Ginecol. Obstet.* 42 (08), Aug 2020, <https://doi.org/10.1055/s-0040-1712131>
- 7- Kho, K. A., and Shields, J. K. (2020): Diagnosis and Management of Primary Dysmenorrhea. *JAMA*. 2020; 323(3):268–269. doi:10.1001/jama.2019.16921
- 8- Jaleel, G., Shaphe, M. A., Khan, A. R., Malhotra, D., Khan, H., Parveen, S., Qasheesh, M., Beg, R. A., Chahal, A., Ahmad, F and Ahmad, M. F. (2022): Effect of Exercises on Central and Endocrine System for Pain Modulation in Primary Dysmenorrhea. *J Lifestyle Med*. Jan 31; 12(1):15-25. doi: 10.15280/jlm.2022.12.1.15. PMID: 35300040; PMCID: PMC8918380.
- 9- Nagy, H., and Khan, M. A. B. (2022): Dysmenorrhea. [Updated 2022 Jul 18]. In: StatPearls [E-Book Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK560834/>.

- 10- Dos Santos, I., Lunardi, A. C., de Oliveira, N., de Almeida, M. O., & Costa, L. (2019): Effects of aerobic exercise on pain and disability in patients with non-specific chronic low back pain: a systematic review protocol. *Systematic reviews*, 8(1), 101. <https://doi.org/10.1186/s13643-019-1019-3>
- 11- Nwaezuoke, C. A., and Gbonjubola, Y.T. (2022): Aerobic exercise as a non-medicinal option in the management of primary dysmenorrhea: A critical review. *Adesh Univ J Med Sci Res* 2022; 4:3-9.
- 12- Kiranmayi, P., Ponmathi, P., and Sivakumar, V. P. R. (2016): Comparison of Aerobic versus Stretching Exercise Programmes on Pain and Menstrual Symptoms in Subjects with Primary Dysmenorrhea. *J Women's Health Care* 5:327. doi:10.4172/2167-0420.1000327.
- 13- Aboushady, R.M.N., and El-saidy, T, M .K. (2016): Effect of Home based Stretching Exercises and Menstrual Care on Primary Dysmenorrhea and Premenstrual Symptoms among Adolescent Girls. (*IOSR-JNHS*); 5(2):10-17. DOI: 10.9790/1959-0502041017
- 14- Rafique, N., and Al-Sheikh, M. H. (2018): Prevalence of menstrual problems and their association with psychological stress in young female students studying health sciences. *Saudi Med J*; 39:67–73.
- 15- Parra-Fernandez, M. L., Onieva-Zafra, M. D., Abreu-Sanchez, A., Ramos-Pichardo , J. D., Iglesias-Lopez, M. T., and Fernandez-Martinez, E. (2020): Management of primary dysmenorrhea among university students in the south of Spain and family influence. *Int J Environ Res Public Health*; 17(15), 5570. <https://doi.org/10.3390/ijerph17155570>.
- 16- Ahmed, W. (2016): Health promoting and Quality for Nursing Students at Assuit University, Submitted for Partial Fulfillment of the Requirements for doctorate Degree in Community Health Nursing.
- 17- Teherán, A. A., Piñeros, L. G., and Pulido, f. (2018): WaLIDD score, a new tool to diagnose dysmenorrhea and predict medical leave in university students. *International Journal of Women's Health*; 10 35–45.
- 18- Moos, R. H. (1968): The development of menstrual distress questionnaire. *Psychosom Med*; 30:857–867.
- 19- Matthewman, G., Lee, A., Kaur, J. G., and Daley, A. J. (2018): Physical activity for primary dysmenorrhea: A systematic review and meta-analysis of randomized controlled trials. *Am. J. Obstet. Gynecol.*, 219, 255. doi:10.1016/j.ajog.2018.04.001.
- 20- Nakame, R. M., Kiwanuka, F., and Robert, A. (2019): Dysmenorrhea among students aged 18–45 years attending University in Uganda: A cross-sectional multicenter study of three Universities in Uganda. *Nurs Open*. 2019 Apr; 6(2): 268–275.Doi: 10.1002/nop2.207.
- 21- Iacovides, S., Avidon, I and Baker, F. C. (2015): What we know about primary dysmenorrhea today: a critical review. *Hum Reprod Update*; 21(6): 762–778. <https://doi.org/10.1093/humupd/dmv039>.

- 21- Li, R., Li, B., Kreher, D. A., Benjamin, A. R., Gubbels, A., and Smith, S. M. (2020): Association between dysmenorrhea and chronic pain: a systematic review and meta-analysis of population-based studies. *American journal of obstetrics and gynecology*. 2020 Mar 7.
- 23- Indu, V., Gaurika, J., Dinesh, S., and et al. (2020): Menstrual Problems in Undergraduate Medical Students: A Cross-sectional Study in a Medical College of North India. *J South Asian Feder Obst Gynae* 2020; 12(2):85–90.
- 24- Abd Elmoniem, S. O., Abd-Elhakam, E. M., & Abd El Aliem, R. S. (2020): Effect of heat application versus stretching exercises on Relieving Discomforts of Primary Dysmenorrhea among University Student Girls. *IOSR-JNHS*; 9(4), 20-32.
- 25- Elsayed, H.A., Fahmy, N.M., Ramadan ,S.A and Afifi .H.A.E.,(2016): Effect of Local Heat Application on Relieving Primary Dysmenorrhea among Nursing Students, Submitted for Partial Fulfillment of Master Degree in Maternal and Newborn Health Nursing (Obstetrics and Gynecological Nursing), Faculty of Nursing, Benha University.
- 26- Babajani, Z.S. (2017): Effectiveness of cognitive behavioural therapy on premenstrual syndrome through compliance to treatment in Iranian sample.2017 June; 19(6):e10723.
- 27- Arik, M. I., Kiloatar, H., Aslan, B., & Icelli, M. (2022): The effect of tens for pain relief in women with primary dysmenorrhea: A systematic review and meta-analysis. *Explore*, 18(1), 108-113.
- 28- Dong, A. (2021): Dysmenorrhea Clinical Presentation. Updated: Nov 15, 2021. Available at: <https://emedicine.medscape.com/article/253812-clinical>
- 29- Abreu-Sánchez A, Parra-Fernández ML, Onieva-Zafra MD, Ramos-Pichardo JD, and Fernández-Martínez E. (2020): "Type of Dysmenorrhea, Menstrual Characteristics and Symptoms in Nursing Students in Southern Spain" *Healthcare* 8 (3): 302. <https://doi.org/10.3390/healthcare8030302>.
- 30- Harel, Z. (2018): Dysmenorrhea in adolescents and young adults: from pathophysiology to pharmacological treatments and management strategies. *Expert Opin Pharmacother*; 9(15):2661–2672.
- 31- Jindani, F., Turner, N., & Khalsa, S. B. S. (2015): A Yoga Intervention for Posttraumatic Stress: A Preliminary Randomized Control Trial Evidence-Based Complementary and Alternative Medicine Volume 2015, Article ID 351746, 8 pages.
- 32- Abdul Aziz, K. S., Mowafy, H. E., Hasanin, M. E., & Ghazal, N. H. H. M. (2021): Effect of muscle energy technique versus aerobic exercise on chronic cyclic pelvic pain. *The Egyptian Journal of Hospital Medicine*, 84(1), 2219-2225.
- 33- MOSTAFA, N.T., EL-KOSERY, S. M., and Yosseuf, H. H. (2020): Effect of body mass index on primary dysmenorrhea and daily activities in adolescents. *The Medical Journal of Cairo University*, 88(March), 79-84. doi: 10.21608/mjcu.2020.93963.
- 34- Vaziri, F., Hoseini, A., Kamali, F., Abdali, K., Hadianfard, M., and Sayadi M. (2015): Comparing the Effects of Aerobic and Stretching Exercises on the Intensity of Primary

Dysmenorrhea in the Students of Universities of Bushehr. *J Family Reprod Health*. jfrh.tums.ac.ir; 9(1):23-28.

- 35- Ibrahim, Z. M., Alharkan, B. S., Alanzi, E. H., Alnasban, H. A., Alsuwailem, M. M., & Al Khalil, W. K. (2022): Efficacy of active stretching exercises on symptoms of primary dysmenorrhea in young adult females: a randomized controlled trial. *Physiotherapy Quarterly*. <https://doi.org/10.5114/pq.2023.115416>.
- 36- Agrawal, R., & Ahmed, R. (2021): A Comparative Study of Stretching Exercises Versus Core Strengthening Exercises on Primary Dysmenorrhea in Young Sedentary Females. *European Journal of Biomedical*, 8(8), 368-374.
- 37- Aiyegbusi, A. I., Adeagbo, C. A., and Uwem-Umoh, S. I. (2020): Comparative efficacy of core strengthening and stretching exercises on systemic and quality-of-life symptoms in adolescent college students with primary dysmenorrhea. *New Nigerian Journal of Clinical Research*, 9(16), 59.
- 38- Armour, M., Smith, C. A., Steel, K. A., & Macmillan, F. (2019): The effectiveness of self-care and lifestyle interventions in primary dysmenorrhea: a systematic review and meta-analysis. *BMC Complementary and Alternative Medicine*, 19(22), 1-16. <https://doi.org/10.1186/s12906-019-2433-8>.
- 39- Berde, S.D., Yadav, T.S., Gosavi, P. M., and et al. (2019): Effect of core strengthening exercises & chair aerobic exercises in primary dysmenorrhoea. *Int J Health Sci Res*; 9(3):77-82.
- 40- Stella Adaora, N., Suresh, A., Mohan, P., Ali, Z., Cardoza, J. V., & Bitra, M. (2021): A Study on Effects of Aerobic Exercises on Quality of Life in Primary Dysmenorrhea in Bangalore. *NVEO-NATURAL VOLATILES & ESSENTIAL OILS Journal*| NVEO, 5304-5312.
- 41- Elbandrawy, A. M., & Elhakk, S. M. (2021): Comparison between the effects of aerobic and isometric exercises on primary dysmenorrhea. *Acta Gymnica*, 51. <https://doi.org/10.5507/ag.2021.014>.
- 42- Kannan, P., Chapple, C. M., Miller, D., Claydon-Mueller, L., & Baxter, G. D. (2019): Effectiveness of a treadmill-based aerobic exercise intervention on pain, daily functioning, and quality of life in women with primary dysmenorrhea: A randomized controlled trial. *Contemporary clinical trials*, 81, 80-86.
- 43- Dehnavi, Z. M., Jafarnejad, F., and Kamali, Z. (2018): The Effect of aerobic exercise on primary dysmenorrhea: A clinical trial study. *J Educ Health Promot*; 7:3. Doi: 10.4103/jehp.jehp_79_17. PMID: 29417063; PMCID: PMC5791467.
- 44- Rastogi, T., Hassan, K., and Khan, U. (2020): A Study To Compare The Effects Of Aerobic Exercise Program & Active Stretching In Primary Dysmenorrhoea In Ovo-Lacto Vegetarian Females. *Subharti Journal of Interdisciplinary Research*; 3 (2) : Issue 2. PP: 17-23.
- 45- Tharani, G., Dharshini, E., Rajalaxmi, V., Kamatchi, K., and Vaishnavi, G. (2018): To compare the effects of stretching exercise versus aerobic dance in primary dysmenorrhea among collegiate. *Drug invention today*; 10(1):2844-2848. ISSN: 0975-7619.

- 46- Hailemeskel, S., Demissie, A., and Assefa, N. (2016): Primary dysmenorrhea magnitude, associated risk factors, and its effect on academic performance: evidence from female university students in Ethiopia. *Int J Womens Health*; 8:489-496.
- 47- Sutra, A., Paldhikar, S., Shikalgar, N., and Ghodey, S. (2016): Effect of aerobic exercises on primary dysmenorrhea in college student. *IOSR Journal of Nursing and Health Science*; 5(5):20-24.
- 48- El-Kholy, E. A., & Shalaby, A. E. (2022): Effect of Pilates Exercises on Primary Dysmenorrhea among Adolescent Female Students. *Tanta Scientific Nursing Journal*, 26(3), 264-280.
- 49- Chougule, P, Methe, A. D., Shah, D., and et al. (2021): Effect of 90-90 supported hip shift hemibridge with balloon exercise on primary dysmenorrhea in obese undergraduate females an experimental study. *Int J Health Sci Res*; 11(7): 9-16. DOI: <https://doi.org/10.52403/ijhsr.20210702>.
- 50- Helal, M. O., Osman, D. A., Kamel, H. H., and Hasanin, M.E. (2021): Effect of Core Muscles Strengthening on Primary Dysmenorrhea associated with malposture: a Randomized Controlled Trial. *Europ. J. Appl. Sci.*, 13 (1): 22-27. DOI: 10.5829/idosi.ejas.2021.22.27.
- 51- Shahrjerdi, S., Mahmoudi, F., Sheikhhoseini, R., and Shahrjerdi , S. (2019): Effect of Core Stability Exercises on Primary Dysmenorrhea: A Randomized Controlled Trial. *Jmr*; 13(2):113-122.
- 52- Parikh, H., Khokhar, S. M., & Kazi, S. A. (2021): Comparative Study of Effect of Moist Pack V/S Effect of Core Strengthening Exercises in Primary Dysmenorrhea for Three Consecutive Months. *Editorial Advisory Board*, 15(4), 32.
- 53- Agre, S., Agrawal, R., & Zehra, A. M. (2021): Comparative effect of lower limb and abdominal isometric exercises and yoga poses on primary dysmenorrhea. *Indian Journal of Public Health*, 12(4), 357.
- 54- Patel, D., Sutar, A., and Ghodey, s. (2019): Effect of Knee-to-Chest Position on Primary Dysmenorrhea in School Going Girls. *JMSCR Volume 07 Issue 03 M*. Page 540-544. DOI: <https://dx.doi.org/10.18535/jmscr/v7i3.98>.
- 55- Sandhiya, M., & Senthil Selvam, P. (2022): Efficacy of Core Stability Exercise and Aerobic Exercise in Improve In Quality Of Life in Underweight Female with Primary Dysmenorrhea.-A Pilot Study. *Specialusis Ugdymas*, 1(43), 1106-1114.