

Comparison between the Effect of Rocking, Stretching, and Kegel Exercises on Pain Intensity of Primary Dysmenorrhea among University Female Students

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Abstract

Background: Dysmenorrhea impacts the quality of life of girls by impeding their ability to concentrate, causing disruptions in their regular physical activity, and having negative effects on their psychosocial well-being. Multiple studies have demonstrated that exercise may alleviate dysmenorrhea. **Aim:** compare between the effect of Rocking, Stretching, and Kegel exercises on pain intensity of primary dysmenorrhea among university female students. **Method:** A quasi-experimental design was employed (pretest/posttest). **Sitting:** Study was done at Faculty of Nursing, Menoufia University. **Sample:** The study included a purposive sample of 369 female nursing students. Four instruments were utilized; first is a self-administered questionnaire; the second was menstrual cycle assessment sheet; the third was instrument pain intensity assessment sheet, and fourth was dysmenorrhea assessment sheet. **Results:** Kegel exercise group showed a statistically significant decrease in the mean pain score between pre intervention assessment and 4 weeks' assessment. Kegel exercises had a positive effect on reducing the dysmenorrhea pain intensity among the female students with primary dysmenorrhea more than pelvic rocking exercises and stretching exercises. Pelvic rocking exercise showed a statistically significant decrease in the mean pain score between pre intervention assessment and 4 weeks' assessment. Regarding Stretching exercises, there was a statistically significant decrease in the mean pain score between pre intervention assessment and 4 weeks' assessment. **Conclusion:** Kegel exercises, pelvic rocking exercises, and stretching exercises are effective, and inexpensive non-pharmacological nursing interventions that relive primary dysmenorrhea. **Recommendation** Kegel exercise should be incorporated into nursing curriculum and practice as a method of relieving primary dysmenorrhea among adolescent female students.

Keywords: Exercises, Pain Intensity, Primary Dysmenorrhea

Introduction

Menstruation, the most significant physiological transition that occurs in females, is linked to a multitude of complications, with dysmenorrhea being the most prevalent (Udayar et al., 2022). Dysmenorrhea is a distressing menstrual cycle that impedes the ability of women to carry out routine activities and negatively impacts their quality of life by reducing academic performance and productivity (Kusumaningrum et al., 2020). According to Barati et al. (2021), Dysmenorrhea is a painful menstruation that incapacitating adolescent females from performing their normal daily living and has adverse effects on their quality of life as it affects their academic achievement and productivity.

Furthermore, according to Takhelchangbam et al. (2021), the prevalence of dysmenorrhea

among menstruating women around the world ranges from 15.8% to 89.5%, with 2% to 29% of affected women reporting severe pain. According to a study by Manjunath (2020), the prevalence of dysmenorrhea was high in Egypt (75.0%) compared to Ethiopia (85.1%), Nigeria (83.1%), the United States (85.0%), Australia (88.0%), Japan (15.8%), and India (79.7%). Of the cases diagnosed, 55.3% were classified as mild, 30.0% as moderate, and 14.8% as severe.

Furthermore, according to Aljahgali et al. (2022), dysmenorrhea can be categorized as either primary or secondary. In the absence of an organic cause or underlying pathology, primary dysmenorrhea (PD) occurs. Normal onset occurs between six and twelve months after menarche. PD commences on the initial day of menstruation and peaks within twenty-four hours. As a result, Hashemi et al. (2022) discovered that prostaglandins, which induce uterine ischemia and pain by stimulating

uterine contraction, account for the majority of its symptoms. In contrast, secondary dysmenorrhea is frequently observed in women over the age of 30 and is attributed to pelvic pathology, including ovarian cysts or tumors, endometriosis, and cervical stenosis, according to Momma et al. (2022).

Additionally, Yasar (2021) asserts that the nurse assumes a critical function in pain management by providing reassurance and comfort measures to alleviate discomfort. These are non-pharmacological or pharmacological measures. Non-pharmacological interventions enhance an individual's perception of agency, mitigate feelings of vulnerability, augment physical activity and functional capability, and restrict the need for analgesic medication, thereby mitigating the adverse effects of the treatment. In addition, Brown and Brown (2021) noted that exercise may alleviate dysmenorrhea and its associated symptoms, according to findings from randomized physical trials.

Additionally, Ben (2020) discovered that supportive pelvic muscles contract and relax repeatedly during Kegel exercises. Furthermore, Pelvic rocking exercises, as described by Sandhiya et al. (2021), involve the profound contraction of the pelvic as well as abdominal muscles. This contraction induces a mild displacement of the uterine muscles, thereby enhancing their strength. In addition, Kemigisha et al. (2020) reached the conclusion that abdominal stretching is a physical exercise consisting of 10–15 minutes of abdominal muscle stretching, which increases flexibility, strength, and endurance.

Significance of the study:

Life quality is impacted by dysmenorrhea due to various factors, including sleep disturbances, decreased concentration in girls, disruptions in regular physical activity, detrimental effects on psychosocial well-being, and increased rates of Women's absenteeism from work and education (Chen et al. 2021). Exercise potentially a successful dysmenorrhea treatment, according to a number of studies (Kas et al., 2020; Barati et al., 2021; Oraon et al., 2019). In addition, Christiana et al. (2019) demonstrated that the severity and duration of dysmenorrhea can be diminished through

exercise-induced relaxation, stress relief, enhanced blood flow, and the release of endorphins. As a result, the purpose of this research is to compare the effect of various physical exercises on the intensity of dysmenorrhea pain among female university students.

The aim of the study:

To compare between the effects of Rocking, Stretching, and Kegel exercises on primary dysmenorrhea pain intensity among university female students.

Research hypothesis:

- 1- University Female Students who practice Kegel exercise exhibit less dysmenorrhea intensity than those who practice pelvic rocking exercise and those who practice stretching exercises.
- 2- University Female Students who practice pelvic rocking exercise exhibit less dysmenorrhea intensity than those who practice stretching exercises.

Operational Definitions:

Effect. It is measured in terms of the difference between the post-test and pre-test pain scores using instrument III and IV.

Pelvic rocking exercise. In this study pelvic rocking exercise is demonstrated by the students in the morning and the evening and repeat it 10 times in each for the period of 4 weeks and then 8 weeks

Stretching exercises. In this study stretching exercises were demonstrated by the students 3 times per week and repeated 10 times each time for the period of 4 weeks and then 8 weeks

Kegel exercise. In this study Kegel exercise is demonstrated by the students three times in a day and repeat it 10 times in each for the period of 4 weeks and then 8 weeks

Method

Research Design: A quasi-experimental design (pre-posttest) for three groups was applied in this study.

Research Settings:

The study was conducted at one of the Delta Nursing Colleges (Shebin El-Koom city, in Menoufia Governorate), in Egypt.

The Faculty of Nursing was established in 2000 under Presidential Decree No. 200 of 2000. This faculty consists of 8 main nursing departments were included in it namely (Adult Health Nursing, Maternal and Newborn Health Nursing, Pediatric Nursing, Community Health Nursing, Nursing Management, Critical Care Nursing, Geriatric Nursing, and Mental Health).

Sample Type:

A purposive sample of 369 female nursing students in the first, second, third, and fourth academic year in the second semester; were divided into three groups at random:

Group I: female nursing students with primary dysmenorrhea (n=123) underwent Kegel Exercise, 23 students of the total sample were excluded (12 students for pilot study and 11 students withdraw from the study and refused to complete the posttest) so the total sample of group 1 was (100 students).

Group II: female nursing students with primary dysmenorrhea (n=123) underwent pelvic Rocking exercise, 16 students of the total sample were excluded (12 students for pilot study and 4 students withdraw from the study and refused to complete the posttest) so the total sample of group 2 was (107 students).

. Group III: female nursing students with primary dysmenorrhea (n=123) underwent stretching Exercises, 43 students of the total sample were excluded (12 students for pilot study and 31 students withdraw from the study and refused to complete the posttest) so the total sample of group 3 was 80 students.

Inclusion criteria for the participants:

The participants in this study fell within the age range of 16 to 25 years, were unmarried, and presented with moderate to severe primary dysmenorrhea. They did not have a history of gynecological issues such as polycystic ovarian syndrome or endometriosis, did not currently use anti-inflammatory or antispasmodic drugs, and did not have any medical conditions

including cardiac or renal disease. Additionally, they reported regular menstrual cycle intervals ranging from 21 to 35 days and lasting 3 to 7 days. Participants were willing to partake in the research.

Exclusion criteria for the participants:

Possessing a history of menstrual cycle irregularity, having been on hormonal therapy for the previous six months, utilizing analgesics throughout the study period, or having any form of pelvic pathology.

Sample Size:

The sample size and power analysis were estimated utilizing the Epi-Info software statistical package to determine the appropriate sample size needed to compare between rocking, stretching and Kegel exercises in decreasing pain intensity of primary dysmenorrhea among university students. The calculation of the sample size was estimated utilizing the following parameters: total population size of 2600 student with a Confidence Level of 95%, and with Margin error 5, and. The sample size was 335. The sample will be increased by 10% to ensure representativeness. The actual sample size is 370 students (123 students in each group).

Based on the following formula:

$$- x = Z (c/100) 2 r (100-r)$$

$$- n = N x / ((N-1) E^2 + x)$$

$$- E = \text{Sqrt} [(N - n) x / n (N-1)]$$

In this context, N denotes the size of the population, r signifies the proportion of responses that are of interest to the researchers, and $Z(c/100)$ represents the critical value for the confidence level c. The participants were selected with great care in accordance with their consent to partake in the research. N equals $(2z_{1-\alpha} + z_{1-\beta})^2 \sigma^2 (1+m-1) p$. The study involved a total of 335 female nursing students, as indicated by the sample size that was calculated.

Sample Procedure:

The participants included (369) female nursing students taken from the above-mentioned setting. All of the individuals who met the inclusion criteria were granted enrollment in the current study. The chosen students were subsequently allocated into three

groups (G1, G2, and G3) through the implementation of basic randomization with the envelope technique. As a result, a collection of airtight compartments containing a card that bears the inscription "Stretching exercises," "Pelvic rocking exercise," or "Kegel exercise." Each of the 336 female students who consented to participate in the present study was requested to select one envelope. The groups to which the students were assigned depended on the card that was chosen. By employing this method, sample contamination and bias were prevented.

Instruments for data collection:

The data collection for the current study was conducted using the subsequent instruments:

Instrument I: A Self-administered Questionnaire

It was developed by the researchers based on a review of recent related literature (Udayar et al., 2022; Alahakoon and Wickramaratne, 2021; Aljahgali et al., 2022; Oraon et al., 2019) and used to collect the necessary data about the study participants. It comprised three main parts:

Part I: Socio-demographic characteristics: It included Socio-demographic characteristics of the female nursing students such as age, academic year, place of residence, family income, type of family, and family history of dysmenorrhea.

Part II: Anthropometric measurements: It contained Anthropometric Measurements of the female nursing students such as (Weight, Height, and Body Mass Index)

Instrument II: Menstrual cycle assessment sheet: It was designed by the researchers after reviewing a recent related literature (George et al., 2022) to assess the menstrual history and dysmenorrhea characteristics for each female student. It included two main parts:

First Part: Menstrual history. It used to assess basic characteristics of menstrual cycle for each student such as (age of menarche, interval, duration, rhythm, and amount of menstrual bleeding by counting number of pads per day).

Second Part: Dysmenorrhea characteristics.

It used to assess the characteristics of dysmenorrhea as (onset, duration, frequency, location, and radiation of dysmenorrhea, activities interfere with this pain, activities done during dysmenorrhea as well as non-pharmacological techniques to relieve dysmenorrhea).

Instrument III: Pain Intensity assessment sheet.

This instrument was developed by the researchers after reviewing recent related literature (KHADIGA et al., 2019). It was designed to assess the intensity of dysmenorrhea and behavior of the students during dysmenorrhea. It was used in pre and post-test. It included the following two parts:

Part I: Visual Analogue Scale (VAS). The researchers adopted this method for determining the intensity of pain. The self-assessment scale comprises a 10 cm straight line that symbolizes a spectrum of pain intensity. In addition to a verbal descriptor scale ranging from no pain to the worst pain, the scale also incorporates a facial grimace scale for interpreting expressed pain (Moghadam and Afra Khosravi, 2012). To determine the intensity of the student's pain, they were instructed to indicate their preference by pointing to the corresponding number on the line or by observing the expression of pain on their face.

Pain intensity scoring system:

- The pain intensity is represented on the line by the corresponding scores (McCaffery and Pasero, 2018). The cumulative score was as follows, ranging from 0 to 10:
- Pain severity levels are as follows: zero (0%), mild (1-2), moderate (3-6), severe (7-9), and worst (10).

Part II: A Modified Behavioral Pain Scale:

The English language iteration was created by Mateo and Krenzisscheck in 1992. It was applied in English to measure how people behaved in response to pain. Posture, gross motor activity, facial expression, and verbalization are its four dimensions.

The researchers asked for one of three options in each of these four primary behavioral responses. The options for posture include relaxed, guarded, or tense posture. The options for gross motor activity are extremely restless, mildly restless, and tranquil. There are three options for facial expression: no frowning, slight frowning, and persistent frowning or grimacing. Finally, parturient verbalization ranged from typical no sound to grunts and sobbing.

Scoring system:

Each of the twelve alternatives is assigned a score of one, two, or three. Total scores vary between 0 and 12. From a statistical perspective, the pain intensity corresponding to this score was calculated as follows: The following are the severity of behavioral responses to pain: 0 (no responses), 4 (mild responses), 6–8 (moderate responses), 7–10 (severe responses), and 11 (unbearable responses).

Instrument IV: Dysmenorrhea assessment sheet

This instrument was developed by the researchers after reviewing recent related literature (El-Kholy and Shalaby, 2022; Hassan et al., 2022). It was designed to assess the duration (frequency) and intensity of dysmenorrhea. It was used in pre- and post-tests. It includes two parts:

First Part: WALIDD primary dysmenorrhea intensity scale.

The researchers adapted this instrument, which was initially created by Teherán et al. (2018), for the purpose of measuring the severity of primary dysmenorrhea. It comprises four items: Working ability (zero: no; one: almost never; two: almost always; three: always). Second Item: The second item is location, which can be zero, one site, two or three sites, or four sites; Item 3: Intensity of dysmenorrhea (0: no pain, 1: mild discomfort, 2: severe pain, 3: excruciating pain) Fourth item: Pain days (zero, one to two, three to four, and three to five days).the instrument produced individual scores for each variable ranging from 0 to 3, and the cumulative score ranged from 0 to 12. The intensity of dysmenorrhea was assessed and ranked as follows: Absent dysmenorrhea (zero), Alternaria minor (ranging

from 1 to 4) Severe dysmenorrhea (between 5 and 7) Severe dysmenorrhea (ages 8 to 12 years old)

Second Part: Retrospective Symptom Scale (RSS).

The instrument in question was first created in 1978 by Cox and Meyer, and it was later updated and revised in 2021 by Chen et al. This measure was modified by researchers to assess the frequency and severity of emotional and physical symptoms commonly associated with dysmenorrhea. Two scores are given: an Average Severity Ratings score (RSS COX2) and a Total Frequency Ratings score (RSS COX1). The former indicates the total amount of time that symptoms have been present during the last time that they occurred, while the latter refers to the average severity.

The scale comprises 15 items, with severity ratings ranging from 4 ("extremely bothersome") to 0 ("did not occur"). Frequency ratings span from 0 ("did not occur") to 4 ("lasted several days"). The cumulative scores for 15 symptoms were determined by adding the products of the severity and frequency ratings (Jin et al., 2017). Total scores for each subject ranged from 0 to 120. Subsequently, the average symptoms and subject rating scores were classified as follows: 0–30 for no associative symptoms, 30–60 for mild associative symptoms, and 60–90 for moderate associative symptoms.90-120 severe associative symptoms.

Validity:

Four professors and experts, including three from the Faculty of Nursing's Maternal and Newborn Health Nursing department and one from the Obstetrics and Gynecology department of the Faculty of Medicine, assessed the instruments' validity. They examined the internal validity and content accuracy of these instruments subsequent to the development of the questionnaires and conducting cross-checking. The items were evaluated in terms of their completeness, relevance, content coverage, and question clarity (content validity). Adjustments were implemented in accordance with the suggestions provided. for example associated symptoms with dysmenorrhea the researchers

added all of them because some of students complaining from more than one.

Reliability:

The investigators assessed the internal consistency of the instruments through the utilization of test-retest reliability. This was accomplished on at least two occasions by administering the identical instrument to the same participants under identical conditions. To ensure ascertain the dependability of the instruments utilized in the research, an Alpha Cronbach test was performed to determine the internal consistency of the instruments; the results were 0.89 for instrument I, 0.90 for instrument II, and 0.89 for instrument III. The coefficient indicates that the internal consistency of the items is average, implying that they are satisfactory.

Approval:

The responsible authorities at the Faculty of Nursing, Menoufia University were provided with a formal correspondence from the Faculty Dean that elucidated the objectives of the research. This letter was obtained in order to proceed with the study.

Ethical Considerations:

Formal permission from the Ethics and Research Committee at the Faculty of Nursing, Menoufia University was obtained (code no.942) on 15\3\2023. Students acceptance to participate in the study was documented in written consent forms. To explain the goal and research methodology to nursing students, a preliminary interview was done. students were informed that participation was optional and that they could end their contribution in the study at any moment short of suffering slightly repercussions.

Pilot study:

In order to determine the time required to respond to the questions and assess the instruments' practicability and clarity, the pilot study from the aforementioned setting comprised 10% of the total sample (36 students, 12 students from each group). The purpose of this study was to ascertain these factors. They were deliberately excluded from the study intervention in order to ensure the integrity of the findings and facilitate any

required adjustments. Preceding the actual study, the requisite adjustments were implemented in response to the findings of the pilot study. The instruments were subsequently prepared to gather the essential data for the research.

Study Fieldwork:

The current investigation was conducted in five consecutive stages: preparatory, planning, assessment, implementation, and evaluation. The data was gathered during the course of six months, specifically from early March 2023 to late August 2023.

1. Preparatory Phase: An extensive review related to the study area was carried out, including available books, scientific magazines, electronic dissertations, the internet, articles, and periodicals.

2. Assessment phase: The researchers greeted and introduced themselves to each female student in each group at the outset of the interview. Their objective was to recruit and elicit their cooperation for the study, in addition to obtain their acceptance. Further, they were duly informed by the researchers that their involvement was not mandatory and that they retained complete autonomy to withdraw from the study at any point. Following obtaining informed consent from all female students who satisfied the inclusion criteria, data pertaining to socio-demographic attributes, menstrual history, and dysmenorrhea characteristics were collected through interviews and pretest questionnaires. Furthermore, the intensity of pain is evaluated by the researchers using instrument II, while the frequency and severity of dysmenorrhea are assessed using instrument III. The evaluation in question was regarded as an initial assessment of dysmenorrhea. Each student underwent the interview for approximately 30 minutes.

3. Planning phase: In this phase, the researchers set the study goals and objectives, prepare the sources and teaching techniques. The goal of this teaching strategies was to teach each female student in each group about how to perform Kegel or pelvic rocking or stretching exercise to assess its effect on dysmenorrhea. To attain

the goal and objectives of the study, the researchers developed and prepared the information contents and the teaching strategies including group discussion, lectures, brainstorming, demonstration and re-demonstration, and the use of visual aids like pictures, handouts, poster, and videos.

4. Implementation phase: It started immediately after assessment (pre-intervention). The study subjects were divided into three groups randomly (G1, G2, G3) 100,107,80 respectively. Each student in each group received one training session in the laboratory of the Maternal and Newborn Health Department on the third floor of the faculty, to provide information about the exercise as definition and advantages of the exercise and how to do the relevant exercise. The exercise was demonstrated first by the researchers and then the students were allowed to do exercise as supervised by the researchers. This instruction was given to each female student separately or in a group from 5 to 10 students according to the availability of the female students. The researcher took the WhatsApp number of each student to send videos and brochures contain written illustrated exercise with instruction and pictures to send a message to remind them to do the exercise in the allotted time. The teaching aids in each group were pictures of the exercise technique, a PowerPoint presentation, demonstration and re-demonstration and a watching video to facilitate and illustrate teaching.

Study group 1 (Kegel exercise group): The researchers instructed every female student to void her bladder, emphasizing that the right muscles should be engaged during the exercise. To determine which muscles should be contracted, the students imagined emptying her bladder, ceased emptying her bladder, and assumed a supine position. Each participant in the exercise regimen was instructed to maintain a relaxed body and take deep breaths. Each student was then instructed to contract and maintain the contracting of the pelvic floor muscle groups for an initial duration of 3 to 5 seconds (with an increase to 10 seconds), followed by a relaxation of the corresponding muscles for an additional 3 to 5 seconds (with

an increase to 10 seconds). Finally, each student was requested to repeat this exercise 3 times per day (minimum 30-45 times) in the morning, noon, and evening. (Ben, 2020). This session took about 45-60 minutes, so the researchers sent a message to remind them to do Kegel exercise in the morning, noon, and evening.

Study group 2 (Pelvic rocking exercise group): The female students were instructed by the researchers to assume the following positions: bend the knees, maintain a flat foot on the floor, position one hand beneath the back curve, position another hand over the abdomen, and subsequently contract the buttocks and abdominal muscles concurrently while lying on their backs with the heads supported by pillows. Then, each student was instructed to hold (1-2-3-4) for one breath before exhaling (4-3-2-1) to relax the muscles and feel her back with the underside of her hand. After that, it was instructed that every student replicate the final two steps approximately ten times, or twice daily (Kanedi, 2019). This session took about 45-60 minutes, students were given schedule to do the exercise two times per day for four weeks, so the researchers sent a message to remind them to do this exercise in the morning and the evening (minimum 10 exercises at each time

Study group 3 (Stretching exercises group): The researchers encouraged each female student to do all four stretch movements, each exercise remains for 5 seconds and repeated it 10 times. (three times per week). The researchers asked the students to avoid performing the exercise during the menstruation (Kisner and Colby,2007; Murtiningsih et al.,2019).

The initial stretching exercise involved the researchers instructing the students to assume a standing position, bend their trunk forward from the hip joint in a straight line, with the shoulder and back aligned, and maintain the upper body parallel to the floor for a duration of five seconds (ten repetitions). The second stretching exercise involved having the students stand, elevate one heel off the floor, and subsequently perform the exercise with the other heel alternately (20 repetitions). The third stretching exercise involved instructing the

students to widen their shoulders, position their trunks and hands in a forward-stretching motion, and subsequently assume a squatting position for five seconds while completely bending their knees (ten repetitions). As the fourth stretching exercise, participants were instructed to place their feet beyond the width of their shoulders. The instructor then instructed the class to bend and touch her left ankle with her right hand while extending her left hand above her head. The aforementioned exercise was replicated ten times for the opposing foot using the identical methodology (Thermacare, 2010).

This session took about 45-60 minutes, students were given schedule to do the exercise three times per week for four weeks, so the researchers sent a message to remind them to do this exercise three times per week (minimum each step repeated 10 exercises at each time).

Evaluation phase

In this phase, the post-test was administered after four weeks of implementing the exercise in each group to compare between the effect of the Kegel exercise, Pelvic rocking exercise and abdominal stretching exercise on dysmenorrhea intensity utilizing instrument II and dysmenorrhea duration utilizing instrument III among female students with primary dysmenorrhea. Also, to assess the difference between the pre- and post-test 1 (following 4 weeks) and posttest 2 (following 8 weeks). The same instruments used in the pretest were reused (instrument II, and instrument III).

Statistical Design:

Using version 28 of the Statistical Package for the Social Sciences (SPSS), the gathered information was classified, coded, computerized, tabulated, and analyzed.

Two types of statistics were used, as follows:

- 1) For quantitative data, descriptive statistics were represented as means and standard deviation ($X \pm SD$), whereas for qualitative data, they were expressed as numbers and percentages.
- 2) The ANOVA (f) test is a significance test that is employed to compare three or more groups that consist of quantitative variables.

An LSD post-hoc test was conducted in the event that the ANOVA test yielded a significant result.

- 3) A nonparametric test of significance, the Kruskal-Wallis test is employed to compare three or more groups that do not follow a normal distribution and consist of quantitative variables.

P-value at 0.05 was used to determine significance regarding:

- A P-value greater than 0.05 is considered to be statistically insignificant.
- A P-value less than or equal to 0.05 indicates statistical significance.
- A P-value less than or equal to 0.001 indicates strong statistical significance.

Limitation of the study:

- Limitations: having to delegate performing the exercises to the participants in their homes (after providing training and ensuring that all groups have learnt to properly perform the exercises) and this led to withdrawing most of the students from the study or not performed the exercise at the appropriate time despite sending messages on WhatsApp to remember them.
- Students faced difficulty in performing the stretching exercises so, most of the students of this group withdrew and refused to complete the posttest.

Results

Table (1) shows that there were no statistically significant differences between the three groups regarding age and place of residence ($p = 0.224$ and $p = 0.585$ respectively). However, there were statistically significant differences between the three groups regarding academic year, family income, type of family ($p = 0.000$ for all variables).

Figure (1) displays there were statistically significant differences between the three groups regarding family history of dysmenorrhea with ($p = 0.000$)

Table (2) shows that there were no statistically significant differences between the three groups regarding all variable of, menstrual history including age of menarche, interval of the menstruation, duration of the menstruation and

severity of the menstrual flow ($p = 0.457$, $p = 0.519$, $p = 0.133$ and $p = 0.685$ respectively).

Table (3) The findings presented in Table 3 indicate that there were no statistically significant differences among the three groups pre-intervention and post-intervention by 4 ($p = 0.204$ and $p = 0.427$, respectively). Nevertheless, a statistically significant difference was observed among the three groups with respect to the average pain score eight weeks prior to and following the intervention ($p = 0.013$). The results of the post-Hoc test indicated that the mean pain score of the Kegel exercise group was significantly lower than that of the pelvic rocking exercise group ($p = 0.003$). Additionally, the mean pain score of the Kegel exercise group was significantly lower than that of the stretching exercise group ($p = 0.003$).

Table (4) shows that there were no statistically significant differences between the three groups regarding the primary dysmenorrhea intensity in the pre intervention and 8 weeks after intervention ($p = 0.606$ and $p = 0.199$ respectively). However, there were statistically significant differences between the three groups regarding the primary dysmenorrhea intensity at 4 weeks after intervention. The percentage of students who have mild dysmenorrhea increased in the three groups than before the intervention. However, the highest percentage was among the Kegel exercise group 22% compared to 11.2% and 8.8% for the other groups.

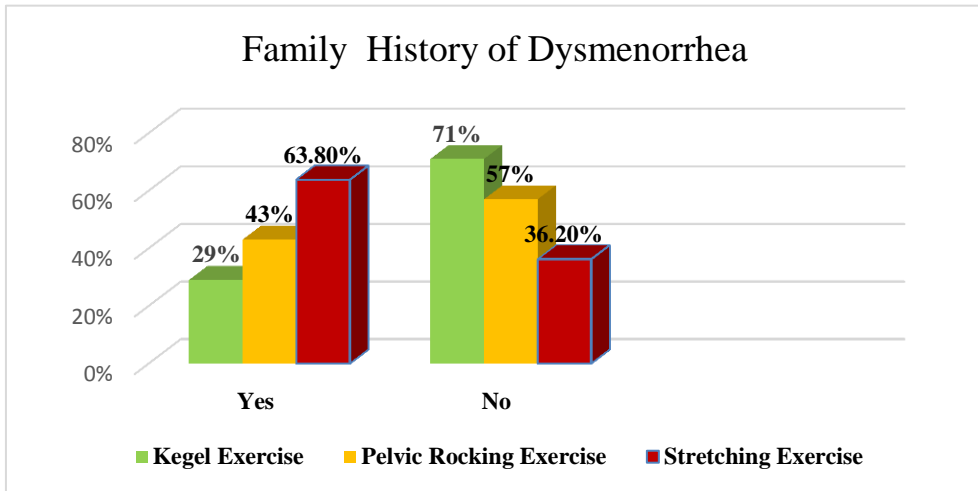
Table (5) shows that there were no statistically significant differences between the three groups regarding the categories of Retrospective Symptom Scale in the pre intervention, 4 weeks and 8 weeks after intervention ($p = 0.619$, $p = 0.155$ and $p = 0.592$).

Table 1: Comparison of the Demographic data between the Three Groups [Kegel Exercise, Pelvic Rocking Exercise and Stretching Exercises]

Demographic Characteristics	Kegel exercise (n = 100)		(n = 107)		(n = 80)		x ²	p
	No.	%	No.	%	No.	%		
Age							22.118	.139
16-18	11	11	19	17.8	2	2.5		
19-21	74	74	72	67.2	61	76.2		
22-24	15	15	16	15	17	21.3		
Academic Year							76.116^a	.000**
First	11	11	21	19.6	0	0		
Second	32	32	50	46.7	7	8.8		
Third	46	46	15	14	55	68.7		
Fourth	11	11	21	19.6	18	22.5		
Family Income							19.143^a	.000**
Enough	86	86	68	63.6	47	58.8		
Not Enough	14	14	39	36.4	33	41.2		
Type of Family							25.176^a	.000**
Nuclear	78	78	59	55.1	34	42.5		
Joint	9	9	18	16.8	15	18.8		
Extended	13	13	30	28	31	38.8		
Family History of Dysmenorrhea							21.849^a	.000**
Yes	29	29	46	43	51	63.8		
No	71	71	61	57	29	36.2		
Place of Residence							3.077^a	.215
Urban	39	39	54	50.5	33	41.25		
Rural	61	61	53	49.5	47	58.75		

NB ** highly statistical significant difference

Figure 1: Comparison of the Family History of Dysmenorrhea between the Three Groups [Kegel Exercise, Pelvic Rocking Exercise and Stretching Exercises]



P=.000**

Table 2: Comparison of the Menstrual History between the Three Groups [Kegel Exercise, Pelvic Rocking Exercise and Stretching Exercises]

Menstrual history	(n = 100)		(n = 107)		(n = 80)		F	Sig.
	No.	%	No.	%	No.	%		
Age of menarche								
Less than 9 years	0	0	0	0	0	0		
9-14 years	61	61	62	57.9	44	55.0		
15≥ years	39	39	45	42.1	36	45.0		
Mean +SD	14.1700±1.63951		14.3271±1.83146		14.4500±1.91529		.785	0.457
Interval of the menstruation								
Less than 21 days	0	0	0	0	0	0		
21-35 days	100	100	107	100	80	100		
≥36days	0	0	0	0	0	0		
Mean +SD	27.8700±3.06711		27.4673±3.45133		27.5125±4.06901		.656	0.519
Duration of the menstruation								
Less than 3 days	0	0	0	0	0	0		
3-5 days	69	69.0	71	66.4	47	58.8		
6-8 days	31	31	36	33.6	33	41.3		
Mean +SD	5.0900±1.41489		5.1121±1.39627		5.4875±1.38704		2.034	0.133
Severity of the menstrual flow\number of pads changed/day								
0-2 Pads Minimal	40	40.0	41	38.3	29	36.3		
3-5 Pads Moderate	58	58.0	62	57.9	49	61.3		
6-9 Pad Severe	2	2.0	4	3.7	2	2.5		
Mean +SD	2.9800±1.27905		3.0935±1.32845		3.0875±1.27482		0.378	0.685

NB. ** highly statistical significant difference

Table 3: Comparison of the Means Pain Scores between Three groups (Kegel Exercise, Pelvic Rocking Exercise and Stretching Exercises)

Pain Mean Score	Group 1 Kegel exercise (n = 100)		Group 2 Pelvic rocking exercise (n = 107)		Group 3 Stretching exercises (n = 80)		F	P
	Mean	Sd	Mean	Sd	Mean	Sd		
Pre-Intervention pain score	7.09	2.113	6.77	2.099	6.54	2.050	1.599	0.204
4 weeks post intervention pain score	6.06	2.554	6.45	2.241	6.41	2.079	.853	0.427
8 weeks post intervention pain score	3.71	2.459	4.33	2.691	4.86	2.652	4.417	0.013

Table 4: Comparison of the WALIDD Primary Dysmenorrhea Intensity scale between the Three groups [Kegel Exercise, Pelvic Rocking Exercise and Stretching Exercises]

Primary Dysmenorrhea Intensity	G 1 Kegel exercise (n = 100)	G 2 Pelvic rocking exercise (n = 107)	G 3 Stretching exercises (n = 80)	Kruskal- Wallis test	P
	No / %	No / %	No / %		
Pre intervention				2.720	0.606
Without dysmenorrhea	0	0	0		
Mild dysmenorrhea	8 (8.0%)	7 (6.5%)	3 (3.8%)		
Moderate dysmenorrhea	51 (51.0%)	63 (58.9%)	48 (60.0%)		
Sever dysmenorrhea	41 (41.0%)	37 (34.6%)	29 (36.3%)		
4 weeks post intervention				8.577	0.199
Mild dysmenorrhea	22 (22.0%)	12 (11.2%)	7 (8.8%)		
Moderate dysmenorrhea	41 (41.0%)	61 (57.0%)	46 (57.5%)		
Sever dysmenorrhea	37 (37.0%)	34 (31.8%)	27 (33.8%)		
8 weeks post intervention					
Without dysmenorrhea	2 (2.0%)	1 (0.9%)	1 (1.3%)		
Mild dysmenorrhea	50 (50.0%)	50 (46.7%)	28 (35.0%)		
Moderate dysmenorrhea	38 (38.0%)	41 (38.3%)	32 (40.0%)		
Sever dysmenorrhea					

Table 5: Comparison of the Retrospective Symptom Scale (RSS) between the Three groups (Kegel Exercise, Pelvic Rocking Exercise and Stretching Exercises)

Time	Symptoms	Group 1 Kegel exercise (n = 100)	Group 2 Pelvic rocking exercise (n = 107	Group 3 Stretching exercises (n = 80)	Kruskal- Wallis test	P
		Number (Percent)	Number (Percent)	Number (Percent)		
Pre intervention	None associative symptom	26 (26.0%)	25 (23.4%)	19 (23.8%)	4.427	0.619
	Mild associative symptom	54 (54.0%)	60 (56.1%)	46 (57.5)		
	Moderate associative symptom	18 (18.0%)	21 (19.6%)	11 (13.8%)		
	Sever associative symptom	2 (2.0%)	1 (0.9%)	4 (5.0%)		
4 weeks post intervention	None associative symptom	36 (36.0%)	31 (29.0%)	20 (25.0%)	9.345	0.155
	Mild associative symptom	52 (52.0%)	60 (56.1%)	46 (57.5%)		
	Moderate associative symptom	12 (12.0%)	15 (14.0%)	10 (12.5%)		
	Sever associative symptom	0 (0.0%)	1 (0.9%)	4 (5.0%)		
8 weeks post intervention	None associative symptom	55 (55.0%)	54 (50.5%)	34 (42.5%)	4.630	0.592
	Mild associative symptom	38 (38.0%)	43 (40.2%)	39 (48.8%)		
	Moderate associative symptom	7 (7.0%)	9 (8.4%)	7 (8.8%)		
	Sever associative symptom	0 (0.0%)	1 (0.9%)	0 (0.0%)		

Discussion

The findings of the present study revealed that Stretching exercises, pelvic rocking exercises, and Kegel exercises are all effective in the treatment of primary dysmenorrhea. However, Kegel exercises are more effective than pelvic rocking and stretching exercises at reducing the intensity of dysmenorrhea pain (Goda et al., 2020; Hassan et al., 2022)

Concerning sociodemographic characteristics, the findings of the current investigation revealed that age and place of residence did not differ significantly among the three cohorts. Nevertheless, academic year, family income, family structure, and familial history of dysmenorrhea did differ significantly among the three cohorts. The fact that every participant in the study was a female student selected from the Faculty of Nursing (aged 16-

25) does not come as a surprise. Additionally, it was observed that all female students experienced primary dysmenorrhea, which is the most prevalent menstrual issue among adolescent girls. The severity of the condition ranged from mild to severe. This suggests that primary dysmenorrhea remains a significant public health concern, as it can negatively impact social activities, quality of life, employment, and psychological well-being.

This is consistent with the findings of Mohamed and Hafez (2017), who evaluated the impact of pelvic rocking exercises on primary dysmenorrhea among adolescent girls attending Minia University in Egypt, and El-Kholy and Shalaby (2022), who examined the effect of Pilates exercises on primary dysmenorrhea among adolescent female students in Tanta, Egypt. The results of their investigation indicated that the age, place of residence, and body mass

index of the two groups (control and study) were identical, as no statistically significant differences were found between the two groups.

Furthermore, the results of this research align with those of **Hassan et al.** (2022), who examined the impact of Kegel exercises versus pelvic rocking exercises on the severity of primary dysmenorrhea in adolescents attending secondary female schools at Um AL-Jamal secondary mixed school in Al-Mafraq, Jordan. The results of their study indicated that the mean age of the participants was 20.8 ± 1.8 years (with a range of 17-30 years). Furthermore, there were no significant differences observed in terms of family income or place of residence between the two groups.

With respect to the menstrual history of the three groups, the current study revealed that there were no statistically significant differences in any aspect of the menstrual cycle (age at which menarche, frequency and length of menstruation, and intensity of menstrual flow). Additionally, the current investigation demonstrated that every participant has a regular menstrual cycle, which was a prerequisite for inclusion in the study design. This result aligns with the findings of a study conducted at Minia University, Egypt, by **Mohamed and Hafez** (2017), which indicated that approximately 75% of the student population have a regular menstrual cycle.

Furthermore, it is worth noting that the aforementioned findings diverged from those of Mohamed and Mansour (2013), who examined the impact of dysmenorrhea on the quality of life of a cohort of female university students enrolled at Cairo University in Egypt, and **Anju Verma** (2014), who assessed the efficacy of pelvic rocking exercises in mitigating dysmenorrhea among female students attending specific nursing colleges in New Delhi, India. They reported that irregular periods affect nearly half of the study participants.

In relation to the severity of menstrual pain as assessed by the Visual Analogue Scale, the findings of this research indicated that no statistically significant differences were noted among the three groups about the average pain score during the pre-intervention and four-week post-intervention periods. In contrast, the Kegel exercises group experienced a significantly reduced mean pain score in comparison to the

groups that performed pelvic rocking exercises and stretching exercises. One possible explanation for this phenomenon is that performing the Kegel exercise enhanced muscle blood flow of the pelvic floor, which in turn stimulated the production of energy that accelerated the nerve impulse transmission, thereby reducing tense muscles and alleviating pain (**Sandhiya et al.**, 2021). Additionally, increased venous return is facilitated by the contraction of the pelvic floor muscles repeatedly, which increases the production of analgesic beta-endorphins (**Huang and Chang**, 2022).

Furthermore, the results of this research were corroborated by Indian study conducted by **Sandhiya et al.** (2021), who investigated the impact of pelvic floor muscle exercise on the quality of life of women diagnosed with primary dysmenorrhea. Their investigations demonstrated that group A (performing pelvic floor exercises) experienced a significant reduction in the mean values of the McGill pain questionnaire and post-treatment VAS scores, in comparison to group B (performing stretching exercises or maintaining their positions).

In contrast, a research investigation conducted by **Rejeki et al.** (2021) aimed to assess the impact of abdominal stretching on the severity of menstrual cramp pain at Muhammadiyah University in Indonesia. Similarly, **Syaiful and Naftallin** (2018) conducted a study in Indonesia concerning the influence of abdominal strength training exercises on menstrual cramp pain intensity. The results of their study showed that the intensity of pain associated with dysmenorrhea decreased significantly following the addition of abdominal stretching, in comparison to the control group.

Furthermore, the findings of the present investigation were in contrast with those of a study conducted in New Zealand by **Kannan et al.** (2019), which examined the efficacy of an aerobic exercise intervention utilizing a treadmill and focused on quality of life, daily functioning, and pain in women diagnosed with primary dysmenorrhea. In their research, the authors concluded that treadmill-based aerobic exercises do indeed improve quality of life, functional activities, and pain in women with primary dysmenorrhea.

Regarding to primary dysmenorrhea intensity using WALIDD Intensity score, the findings of the present study showed that there were a statistically significant differences between the three groups regarding the primary dysmenorrhea intensity in the pre-intervention and 4 weeks' post-intervention. However, Kegel exercises showed the largest percentage of reduction in dysmenorrhea intensity compared to groups doing pelvic rocking exercises and stretching exercises. This may be rationalized as physical exercise may help to transfer vast products and prostaglandins rapidly as a root of menstruation pain from uterine muscles.

Sharma and Augustina (2022), who evaluated the effectiveness of core muscle strengthening in women with dysmenorrhea in Chennai, India, and **Hassan et al.** (2022), who conducted research in Jordan, both corroborated these findings. They noted that the duration and severity of dysmenorrhea were significantly reduced in the Kegel exercise-performing group compared to the control group.

Furthermore, the results of this research align with those of two other studies: one conducted by **Christiana et al.** (2019), which examined the impact of Kegel exercises on menstrual pain among female students in Banyuwangi, Indonesia, and the other by **Karimi and Ghasemi** (2014), which compared the effects of stretching exercises and Kegel exercises on the pain experienced by Iranian women with primary dysmenorrhea. According to their findings, Kegel exercises reduce the duration and severity of dysmenorrhea more significantly than stretching exercises.

On the contrary, the findings of the present study were rejected by **Khan et al.** (2022), who investigated the impact of myofascial release exercises versus pelvic floor muscle exercises on women with primary dysmenorrhea in Pakistan, and **Blakey et al.** (2018), who examined the correlation between exercise participation and primary dysmenorrhea in Birmingham. They reported that practice exercises have no correlation with the severity of dysmenorrhea. The observed differences could potentially be attributed to the difference in sample sizes and the extended duration of exercise implementation.

Regarding retrospective associated symptoms, the current study revealed that there were no statistically significant differences between the three groups regarding the categories of Retrospective Symptom Scale in the pre intervention, 4 weeks, and 8 weeks after intervention. This is not surprising because of the short duration of practicing these exercises and difference in the sample size. Also, Fist already pain decreased but symptoms was present secondly the studied students not able to differentiate minimal change and finally this can be by chance due to nature of the community.

This result was consistent with research conducted in Turkey by **Cronk et al.** (2021) and in Iran by **Sarhadi et al.** (2015). According to their findings, exercising does not result in a reduction in the pain symptoms associated with primary dysmenorrhea. This could potentially be attributed to the limited sample size and brief study duration. The conclusions of this study were corroborated by **Nejad et al.** (2015) in another study. Their research revealed that neither the duration nor the severity of symptoms associated with dysmenorrhea were impacted by continuous exercise.

This result contradicted the findings of **Heidarimoghadam et al.** (2019), who conducted research in Iran, and **Bustan and Seweng** (2018), who investigated the same topic in Indonesia. According to their findings, aerobic exercise and abdominal stretching reduced the physical and emotional symptoms associated with dysmenorrhea. This discrepancy between the present study and another investigation was caused by the lengthy duration of the study (6 months) and the presence of varying sample sizes of females.

Furthermore, this finding contradicted the results of **Nwaezuoke and Gbonjubola's** (2022) investigation into aerobic exercise as a non-pharmaceutical treatment option for primary dysmenorrhea. They discovered that stretching exercises and yogic postures had identical effects on symptoms associated with dysmenorrhea, with neither benefiting over the other.

Conclusion

In this study, concluded that Kegel exercises, pelvic rocking exercises, and stretching exercises are effective, and inexpensive non-

pharmacological nursing interventions that relieve primary dysmenorrhea. Kegel exercises had a positive effect on reducing the dysmenorrhea pain intensity among the female students with primary dysmenorrhea more than pelvic rocking exercises and stretching exercises.

Recommendation

- Health education programs in colleges and universities should prioritize regular Kegel exercise performance as a means to reduce primary dysmenorrhea and raise awareness about it as a non-pharmacological method of menstrual pain relief.

We recommended Further research:

- Similar research could be conducted over a longer period of time and with a greater number of samples.
- Conducting an investigation to identify the risk factor for dysmenorrhea is possible.
- The impact of pelvic rocking exercise and pharmacological management on the reduction of dysmenorrhea in girls can be determined through a comparative study.

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