

## Effect of Heat Application versus Stretching Exercises on Relieving Discomforts of Primary Dysmenorrhea among University Student Girls

Somaya Ouda Abd Elmoniem<sup>1</sup>, Eman Mohammed Abd-Elhakam<sup>2</sup> & Rehab Soliman Abd El Aliem<sup>3</sup>

<sup>1, 2, 3\*</sup> *Obstetrics and Woman's Health Nursing, Faculty of Nursing, Benha University, Benha, Egypt*

*\*Corresponding Author: rehabsoliman53@yahoo.com.*

### **Abstract:**

**Background:** Primary dysmenorrhea is the most common gynecologic complaint and the leading cause of recurrent short-term university or work absenteeism among young female adults. The present study aimed to study the effect of heat application versus stretching exercises on relieving discomforts of primary dysmenorrhea among university student girls.

**Research design:** A quasi-experimental.

**Sample:** A purposive sample of 180 university student girls were randomly divided into 3 equal groups, (intervention groups: two groups (1&2) Stretching exercise and heat application group) and control group). Each group had 60 student girls.

**Setting:** The study was conducted in the Faculty of Nursing at Benha University.

**Tools** Three tools were used in this study; 1) A Structured Self-Administering Questionnaire, 2) Assessment of studied sample symptoms of primary dysmenorrhea & 3) Numeric pain rating scale

**Results:** There was no statistically significant difference between the three studied groups regarding dysmenorrhea associated discomfort symptoms ( lower abdominal pain and headache pre-intervention and pain radiating down the legs, fatigue in the third cycle)  $p$ -value  $>0.05$  but there were highly significant differences during different phases of assessment regarding other dysmenorrhea associated discomfort symptoms. Also, there was a highly statistically significant difference between the three studied groups during different phases of assessment regarding severity, frequency and duration of dysmenorrhea  $p$  value  $< 0.001$  and Stretching exercise was more effective than heat application and control group in reducing the severity, frequency and duration of dysmenorrhea

**Conclusion:** results revealed that both heat application and stretching exercises have appositive effect in reducing discomforts of primary dysmenorrhea among university student girls. It cleared also that stretching exercises more effective in relieving these discomforts than heat application.

**Recommendations:** Health education of adolescent girls about the benefits of the use of heat application and physical exercises to relieve pain and associated symptoms of dysmenorrhea.

**Keywords:** Primary dysmenorrhea, Heat application, Stretching exercises, Student girls.

Date of Submission: 30-06-2020

Date of Acceptance: 16-07-2020

### **I. Introduction**

Dysmenorrhea and associated discomforts are very common in young women  $<25$  years. It is a major health problem that affects around three-quarters of all young women under the age of 25 worldwide [1]. The term Dysmenorrhea return to A Greek word for difficult monthly flow and describes painful menstruation which classified into two subtypes: Primary and Secondary Dysmenorrhea. Primary dysmenorrhea PD occurs when there is no identifiable pelvic disease and tends to occur within 12 months of menarche. It starts some hours before menstruation and continues up to 12-72 hours and is like delivery of pains along with cramps in the lower abdomen radiating toward the inner side of the thighs while Secondary dysmenorrhea is a menstrual pain associated with underlying pathology and its onset might be years after menarche [2].

The etiology of primary dysmenorrhea includes an excess or imbalance in the amount of prostaglandin secretion from the endometrium during menstruation [3] and the major symptoms includes pain which adversely affect daily life and Student Girls performance at University. Dysmenorrhea is the leading cause of recurrent short-term school absenteeism among female adolescents. Half of such cases experience other systemic symptoms, such as nausea, vomiting, diarrhea, fatigue, irritability, and dizziness [4].

The experience of pain with menstruation is common for 70–91% of teenagers. Also, several physicals, psychological, and emotional symptoms occur premenstrually and during menstruation, which is reported by 96% of teenagers. Menstrual pain and symptoms cause university absence in 14–51% of young adults and interference with life activities for 15–59% [5].

Since dysmenorrhea has been treated successfully with stress reduction techniques. Stretching exercises and heat applications are widely accepted as a means of moderating stress and stress-related symptoms. Stretching exercise is known to raise endorphins hormone levels in the brain that raise the pain threshold and is shown to improve the mood of exercising subjects [6].

However, Researches results have indicated that the application of heat can affect menstruation in many ways including reducing the symptoms of premenstrual syndrome and dysmenorrhea. besides stretching exercises have been found to reduce menstrual discomfort through the increase in vasodilatation, and decrease in ischemia; release of endogenous opiates, especially beta-endorphins and suppression of prostaglandins and shutting off blood flow from viscera resulting in less pelvic congestion .this in turn, reduce menstrual discomforts and pain [7].

Heat therapy on the lower abdomen produced a moderate improvement in pain intensity compared to ibuprofen. Heat application work via both increasing blood flow in the abdominal area and by the 'gate control' theory of pain inhibition, where topical heat activates thermoreceptors, inhibiting concurrent nociception and reducing pain signals reaching the brain. While these are promising findings several caveats may reduce heats' effectiveness. Most women in the community are unlikely to be able to maintain constant heat at 38 to 40 degrees for 8–12 h using heat packs or hot water bottles, the most common forms of heat used [8].

### **Significance of the study:**

The prevalence of PD was investigated in different parts of the world and was found to vary with the geographical location. Specifically, the prevalence of PD was reported at 87.8% and 72.7% among university students in Turkey, 89.1% in Iran, 65% in India, 76% in Malaysia, and 60% in Canada. In Arab countries such as Oman, Iraq, Lebanon, and Saudi Arabia, the reported prevalence of PD was 94%,89.4%,74.3%,and 60.9%, respectively( *Unsal et al., 2015*)[9].In **Egypt**, which is a large country in terms of land area and population size, the prevalence of dysmenorrhea was examined only in two districts, and studies have reported a prevalence of 76.1% and 90.4% among secondary school girls and nursing university students in Asyut, respectively, compared with 75% and 78.8% among general and technical secondary school girls in Mansoura, respectively., Taken together, these findings indicate that dysmenorrhea represents a common complaint in various populations (*Kamel et al., 2017*)[10].

Dysmenorrheal discomforts have negative impacts on the student girls' academic attendance and performance, social activities, and quality of life, the health burden and social and economic cost of dysmenorrheal are high. Non-attendance has been reported as between one third to one half missing university or work at least once, and 5% to 14% absent more frequently (*Ju, et al.2014*)[11].

Most young women do not seek medical treatment but prefer to use self-care methods; therefore other low costs, easy to learn self-care methods as stretching exercise and heat application may be a valuable approach to standard management and proper nursing intervention for dysmenorrheal discomforts which urges us to conduct the current study especially when we found that dysmenorrheal discomforts were the hidden cause for besides there were no previous studies are undertaken about this topic at Faculty of Nursing Benha University.

### **1.2. Aim:**

Study the effect of heat application versus stretching exercises on relieving discomforts of primary dysmenorrhea among university student girls.

This aim was achieved through:

- Assessing the effect of heat application on relieving discomforts of primary dysmenorrhea.
- Assessing the effect of stretching exercises on relieving discomforts of primary dysmenorrhea.
- Comparing the effectiveness of heat application and stretching exercises on relieving discomforts of primary dysmenorrhea among adolescents.

### **1.3. Research Hypotheses:**

1- University student girls who use heat application will have fewer discomforts of primary dysmenorrhea, than those who do not.

2- University student girls who apply stretching exercises will have fewer discomforts of primary dysmenorrhea, than those who do not.

3- Stretching exercises are more effective in relieving the discomforts of primary dysmenorrhea than heat application.

## **II. Subjects and Method**

**2.1 Research design:** A Quasi-experimental design (Randomized Controlled Trial) was utilized to conduct this study.

**2.2. Setting:** The study was carried out in the Faculty of Nursing at Benha University.

### **2.3. Sampling:**

**Type:** A purposive sample was used.

**Size:** The total sample size was (180) female nursing students who fulfill inclusion criteria, the participants were randomly divided into 3 equal groups, (intervention groups: two groups (1&2) exercise and heat application group) and control group. Each group had 60 student girls.

**Technique:** for constructing the groups, simple random sampling was achieved by asking each girl to pick a piece of folded paper. The paper carry number (1) means stretching exercises group, the paper carries the number (2) means heat application group and the paper which carried the number (3) means a control group that left for routine care of menstrual cycle.

### **Inclusion criteria**

- 1- Single university student girls.
- 2- Suffering from primary dysmenorrhea.
- 3- Free from any gynecologic disorders.
- 4- Accepting to participate in the study.
- 5- Didn't use drugs for pain relief during the study.
6. Pain intensity of 5 or above in numeric pain rating scale (N R S)
7. Have regular menstruation.

### **Exclusion criteria:**

- 1-Married university student girls.
- 2-Suffering from secondary dysmenorrhea.
- 3- Usage of analgesics for pain relief (Paracetamol, Ibuprofen).
- 4-Have irregular menstruation.

### **2.4.Tools of data collection:**

Three tools were used in this study;

**Tool one: A Structured Self-Administering Questionnaire:** This tool was designed by the researchers after reviewing related literature, which included two parts:

**Part 1:** Socio-demographic data such as age, academic year, marital status, Residence. BMI, Weight, and Height.

**Part 2:** Menstrual history included age of menarche, duration of menstruation, regularity, and interval of menstruation.

**Tool two: Assessment of studied sample for associated discomfort symptoms of primary dysmenorrhea** such as (pain, headache, fatigue, diarrhea, nausea, vomiting and muscle cramping).

### **Tool three: The numeric pain rating scale (NRS):**

This tool adopted from (*sriwatanakul, et al. 1983*) [12], to assess the pain score of dysmenorrhea before and after the intervention. Which is valid reliable and proven in different studies as a measure of pain intensity.

The numeric pain rating scale (NRS) is a 10 points scale on which, zero represents no pain, 1 to 3 represent mild pain, 4 to 7 represent moderate and pain score between 7 and 10 were considered to be a severe form of pain. Tool one and tool two developed by the researchers after reviewing the pertinent review, tool three was adopted from textbooks and scientific journals all tools revised and evaluated by three experts in maternal and newborn health nursing department in the faculty of Nursing, Benha University.

### **2.5. Validity and reliability**

The tools were reviewed for content validity by a jury panel of three experts in the field of Obstetrics and Woman Health Nursing. According to the experts' judgment on the clarity of sentences and the appropriateness of contents, simple modifications were done by a rephrasing of some sentences in the Numeric pain rating scale. The reliability was done by Cronbach's Alpha coefficient test and was equal 0.74, which indicated a high internal consistency of tool.

## **2.6. Ethical consideration**

Permission to conduct the study was obtained from the high authority of nursing college. Verbal consent was obtained from each participant to be involved. The researchers were offered adequate information about the study's purposes and its significance. Participation was voluntary. Participants were assured that their responses would be confidential and information that might reveal their identity would not be recorded, and only aggregated data would be communicated.

## **2.7. Pilot study**

The pilot study was carried out on 10.0% of the overall sample (18 student girls) to ascertain the relevance, clarity, and applicability of the tools, estimate the time required to fill the study tools. As well as, detect any problems peculiar to the process of collecting data. According to the results of the pilot study, no modifications were done. Student girls within the pilot study were included in the study sample.

## **2.8. Procedure**

This Randomized controlled study was implemented from the beginning of October 2019 to the end of March 2020. Subjects included in the study were between 18-25 years with primary dysmenorrhea selected from university student girls at the faculty of Nursing, Benha University. The samples were assigned to intervention groups (1 and 2) and a control group (3) by randomization. All participants experienced moderate to severe symptoms of dysmenorrhea. All subjects participated in an introductory session. The researchers explained the purposes of the study to the studied sample and told them that; sharing in the study was voluntary, any data given was confidential and used only for research purpose and any participant can be withdrawn at any time from the study without giving rational. Thereafter, all subjects completed the different parts of the questionnaire. In the first part of the questionnaire, demographic characteristics regarding age and mass body index were assessed. In the second part of the questionnaire, menstrual history and menstrual characteristics including the age of menarche, duration of menstruation, regularity, and interval of menstruation were assessed. In the third part, female girls were asked to quantify pain intensity by numerical rating pain score (NRS). also associated symptoms of dysmenorrhea or discomforts assessed with each group.

As the participants were randomly divided into 3 groups, (2 intervention groups (1, 2) and control group 3); each group contained 60 university student girls. The intervention applied to group 1 and 2 (stretching exercises for group1, heat application for group 2) and third group (3) left for routine care used by university student girls to overcome the discomforts of dysmenorrhea. The interviewing questionnaires take 5 minutes to be filled, physical exercises practiced before the days of menses.

### **Stretching exercises Group**

Stretching exercises were practiced (4 days per week, 2 times a day, and 10 min) at home and they were asked to avoid performing stretching exercises during the period cycle. The researchers gave training to the samples about how to perform stretching exercises and gave them an Arabic booklet about it which illustrated by pictures. It divided into four sequential practiced exercises: **The first stretching exercise:** The participants were asked to stand and bend the trunk forward from the hip joint so that the shoulders and back were positioned on a straight line and the upper body was placed parallel to the ground for 5 seconds and repeated; 10 times. **The second stretching exercise:** The participants were asked to stand then raise 1 heel off the ground, then repeat the exercise with the other heel alternatively. The exercise was repeated 10 times. **The third stretching exercise:** The participants were asked to spread their feet shoulder-width, place trunk, and hands in forwarding stretching. **The fourth stretching exercise:** The participants were asked to spread feet wider than shoulder-width. Then asked them to bend and touch the left ankle with her right hand while putting her left hand in a stretched position above the head so that the head was in the middle and turned toward left hand, this exercise was repeated for the opposite foot with the same method for 10 times.

### **Heat application Group**

The warm application was applied to the lower abdomen and/or lower back in the form of a hot water bottle, bag, or traditional application of warm material soaked in warm water at the days of menses. It is important to avoid burning the skin with a heating pad or hot water bottle that is too hot; a temperature of approximately 104°F (40°C) is recommended. The heat can be applied as often as it is needed.

And then all the participants were examined for pain intensity using NRS (10-point scale) in the first session (1st menstruation), and reassessed in second and third coming cycles.

## **2.9. Data analysis**

Data were entered into SPSS statistical software (v. 20) and analyzed using the chi-square test, Mean and SD test, correlation coefficient test, and post hoc test. Besides,  $P < 0.05$  was considered statistically significant.

### **III. Results**

Table (1) shows that the age of more than half of studied students (107) was 18-20 years old with mean age (19.96±2.26) (20.45±2.33) (19.66±1.76) years in stretching exercise, heat application and control groups respectively, Also revealed that more than half of studied students (94) were living in rural areas. There were no significant differences regarding socio-demographic characteristics between study and control groups.

Table(2) demonstrates that were no significant difference between Mean ±SD of age of menarche, interval of menstruation in stretching exercise group, heat application group, and control group of studied students and also insignificant difference regarding menstruation characteristics ( duration, rhythm, amount, natural of bleeding ).

Table (3) reports that there were an insignificant differences between stretching exercise group, heat application groups, and control group regarding dysmenorrhea assessment items as (start occurrence, time of pain occurrence, and site of menstrual pain) pre-intervention.

Table (4) Represents the frequency distribution of the studied students self-reported dysmenorrhea associated symptoms and shows the insignificant differences regarding lower abdominal pain and headache (pre-intervention ) and pain radiating down the legs & fatigue in ( third cycle ) , while a significant and highly significant differences during different phases of assessment and the other dysmenorrhea associated symptoms.

Figure (1) shows that the severity of pain had decreased after intervention with highly significant differences between three groups. This figure shows also that stretching exercise was more effective than heat application in reducing the severity of pain.

Figure (2) notifies that the frequency of dysmenorrhea were decreased after intervention with highly significant differences between the three groups. This figure shows also that stretching exercise was more effective than heat application in reducing the frequency of dysmenorrhea.

Figure (3) presents that the duration of dysmenorrhea were decreased after intervention with highly significant differences between the three groups. This figure shows also that stretching exercise was more effective than heat application in reducing the duration of dysmenorrhea.

Table (5) shows the highly significant correlation between body mass index in the stretching exercise group and severity of pain pre, second and third cycle and frequency of menstruation during the pre and second cycle. While the insignificant correlation between body mass index and frequency, duration of menstruation in heat application group pre-intervention and also an insignificant correlation between body mass index and frequency of menstruation in control group pre-intervention.

Table (6) clarifies the significant correlation between the severity of pain and frequency of dysmenorrhea in three studied groups during pre and second cycles while insignificant correlation during third cycles in stretching exercise group and heat application groups . Also the significant correlation between the severity of pain and duration of dysmenorrhea ( pre-intervention ) in stretching exercise group while insignificant correlation in heat application and control groups( pre-intervention ) , also an insignificant correlation in stretching exercise group and heat application group during the second and third cycle . Moreover there were a significant correlation between the severity of pain and duration of dysmenorrhea in routine care group during second and third cycle.

Table (7) represents that stretching exercise group had less absenteeism due to the frequency of dysmenorrhea during second and third cycle post-intervention with insignificant correlation comparing to heat application and control groups, also insignificant correlation between the duration of dysmenorrhea in stretching exercise group at different time of assessment and less absenteeism in compare to heat application and control groups.

**Table (1): Frequency distribution of studied students regarding socio-demographic characteristics (n=180).**

| Socio-demographic characteristics | Stretching exercise (60) |      | Heat application (60) |      | control group (60) |      | X <sup>2</sup> /t-test<br>F-test | p-value             |
|-----------------------------------|--------------------------|------|-----------------------|------|--------------------|------|----------------------------------|---------------------|
|                                   | No                       | %    | No                    | %    | No                 | %    |                                  |                     |
|                                   | Age                      |      |                       |      |                    |      |                                  |                     |
| 18-20                             | 37                       | 61.7 | 30                    | 50.0 | 40                 | 66.7 |                                  |                     |
| 21-23                             | 18                       | 30.0 | 20                    | 33.3 | 16                 | 26.7 |                                  |                     |
| >23                               | 5                        | 8.3  | 10                    | 16.7 | 4                  | 6.7  |                                  |                     |
| Mean ±SD                          | 19.96 ±2.26              |      | 20.01 ±2.33           |      | 19.66 ±1.76        |      |                                  |                     |
| <b>Residence</b>                  |                          |      |                       |      |                    |      | 7.66                             | 0.122 <sup>ns</sup> |
| Rural                             | 26                       | 43.3 | 40                    | 66.7 | 28                 | 46.7 |                                  |                     |
| Urban                             | 34                       | 56.7 | 20                    | 33.3 | 32                 | 53.3 |                                  |                     |
| <b>Academic grade</b>             |                          |      |                       |      |                    |      | 13.83                            | 0.062 <sup>ns</sup> |
| First years                       | 25                       | 41.7 | 16                    | 26.7 | 28                 | 46.7 |                                  |                     |
| Second years                      | 19                       | 31.7 | 15                    | 25.0 | 18                 | 30.0 |                                  |                     |
| Third years                       | 10                       | 16.7 | 24                    | 40.0 | 9                  | 15.0 |                                  |                     |
| Fourth years                      | 6                        | 10.0 | 5                     | 8.3  | 5                  | 8.3  |                                  |                     |
| <b>BMI</b>                        |                          |      |                       |      |                    |      | F test<br>1.275                  | 0.21 <sup>ns</sup>  |
| Mean ±SD                          | 29.95 ±2.94              |      | 31.44 ±2.73           |      | 30.98 ±0.71        |      |                                  |                     |

ns. no Statistical significant differences P>0.05.

**Table (2): Frequency distribution of studied students regarding the menstrual history (n=180).**

| Menstrual history               | Stretching exercise (60) |      | Heat application (60) |      | Control Group (60) |      | X <sup>2</sup> | p-value |
|---------------------------------|--------------------------|------|-----------------------|------|--------------------|------|----------------|---------|
|                                 | No                       | %    | No                    | %    | No                 | %    |                |         |
| <b>Age of menarche</b>          |                          |      |                       |      |                    |      | 14.21          | 0.007*  |
| 11<13 years                     | 12                       | 20.0 | 12                    | 20.0 | 6                  | 10.0 |                |         |
| 13<15                           | 32                       | 53.3 | 28                    | 46.7 | 47                 | 78.3 |                |         |
| 15-17                           | 16                       | 26.7 | 20                    | 33.3 | 7                  | 11.7 |                |         |
| Mean ±SD                        | 13.43 ± 1.44             |      | 13.11 ± 2.04          |      | 13.20 ± 1.07       |      | 8.30           | 0.081   |
| <b>Duration of menstruation</b> |                          |      |                       |      |                    |      |                |         |
| 1-3                             | 12                       | 20.0 | 19                    | 31.7 | 17                 | 28.3 |                |         |
| 4-6 day                         | 20                       | 33.3 | 14                    | 23.3 | 26                 | 43.4 |                |         |
| 7-10                            | 28                       | 46.7 | 27                    | 45.0 | 17                 | 28.3 |                |         |
| Mean ±SD                        | 5.65±2.07                |      | 5.40±2.04             |      | 4.93±1.71          |      | 5.69           | 0.058   |
| <b>Interval of menstruation</b> |                          |      |                       |      |                    |      |                |         |
| <28                             | 32                       | 53.3 | 20                    | 33.3 | 22                 | 36.7 |                |         |
| >28                             | 28                       | 46.7 | 40                    | 66.7 | 38                 | 63.3 | 0.45           | 0.79    |
| <b>Rhythm of menstruation</b>   |                          |      |                       |      |                    |      |                |         |
| Regular                         | 12                       | 20.0 | 13                    | 21.7 | 15                 | 25.0 |                |         |
| Irregular                       | 48                       | 80.0 | 47                    | 78.3 | 45                 | 75.0 |                |         |
| <b>Amount of menstrual</b>      |                          |      |                       |      |                    |      | 2.13           | 0.34    |
| Mild 1 pad                      | 19                       | 31.7 | 13                    | 21.7 | 13                 | 21.7 |                |         |
| Moderate 2-3pad                 | 41                       | 68.3 | 47                    | 78.3 | 47                 | 78.3 |                |         |
| <b>Natural of bleeding</b>      |                          |      |                       |      |                    |      | 4.32           | 0.11    |
| Liquid bleeding                 | 48                       | 80.0 | 44                    | 73.3 | 53                 | 88.3 |                |         |
| Blood clotting                  | 12                       | 20.0 | 16                    | 26.7 | 7                  | 11.7 |                |         |

ns. no Statistical significant differences P>0.05.

**Table (3): Frequency distribution of studied students regarding dysmenorrhea assessment (n=180).**

| Item                                  | Stretching exercise group (60) |      | Heat application group (60) |      | Control group (60) |      | X <sup>2</sup> | p-value |
|---------------------------------------|--------------------------------|------|-----------------------------|------|--------------------|------|----------------|---------|
|                                       | No                             | %    | No                          | %    | No                 | %    |                |         |
| <b>1st occurrence of menstruation</b> |                                |      |                             |      |                    |      | 5.51           | 0.16    |
| -With the onset of menarche           | 16                             | 26.7 | 13                          | 21.7 | 17                 | 28.3 |                |         |
| - 6 months after onset menarche       | 26                             | 43.3 | 21                          | 35.0 | 20                 | 33.3 |                |         |
| - After 1 year from onset menarche    | 6                              | 10.0 | 10                          | 16.7 | 13                 | 21.7 |                |         |
| -After 2 years from onset menarche    | 12                             | 20.0 | 16                          | 26.7 | 10                 | 16.7 |                |         |
| <b>Time of pain occurrence</b>        |                                |      |                             |      |                    |      | 3.82           | 0.43    |
| -a day before the menstrual cycle     | 14                             | 23.3 | 20                          | 33.3 | 20                 | 33.3 |                |         |
| -With menstrual beginning and         | 34                             | 56.7 | 27                          | 45.0 | 24                 | 40.0 |                |         |

|   |    |      |    |      |    |      |      |      |
|---|----|------|----|------|----|------|------|------|
| continues for 24 hour<br>-With menstrual beginning and<br>continues for 48 hour | 12 | 20.0 | 13 | 21.7 | 16 | 26.7 |      |      |
| <b>Site of menstrual pain</b>   |    |      |    |      |    |      |      |      |
| • - lower abdominal   | 16 | 26.7 | 12 | 20.0 | 20 | 33.3 | 8.09 | 0.23 |
| • - pain lower back   | 16 | 26.7 | 20 | 33.3 | 12 | 20.0 |      |      |
| • - lower abdomen and back  | 12 | 19.9 | 11 | 18.3 | 18 | 30.0 |      |      |
| • - Suprapubic pain   | 16 | 26.7 | 17 | 28.3 | 10 | 16.7 |      |      |

\* Statistical significant differences  $P \leq 0.05$ , \*\*highly statistically significant differences  $P \leq 0.001$ .

**Table (4): Frequency distribution of the studied students regarding dysmenorrhea associated symptoms, pre, and post-intervention**

| Items                        | Time of assessment | Stretching exercise (60) |      | Heat application (60) |      | Control group (60) |      | X <sup>2</sup> | p-value |
|------------------------------|--------------------|--------------------------|------|-----------------------|------|--------------------|------|----------------|---------|
|                              |                    | No                       | %    | No                    | %    | No                 | %    |                |         |
| Lower abdominal pain         | Pre                | 44                       | 73.3 | 41                    | 68.3 | 49                 | 81.7 | 2.862          | .239    |
|                              | second cycle       | 24                       | 40.0 | 35                    | 58.3 | 51                 | 85.0 | 25.85          | .000**  |
|                              | third cycle        | 12                       | 20.0 | 28                    | 46.7 | 31                 | 51.7 | 14.56          | .001**  |
| low back pain                | Pre                | 44                       | 73.3 | 53                    | 88.3 | 53                 | 88.3 | 6.48           | .039    |
|                              | second cycle       | 26                       | 43.3 | 40                    | 66.7 | 36                 | 60.0 | 7.05           | .029    |
|                              | Third cycle        | 6                        | 10.0 | 19                    | 31.7 | 19                 | 31.7 | 10.16          | .006    |
| Suprapubic spasm             | Pre                | 24                       | 40.0 | 40                    | 66.7 | 37                 | 61.7 | 9.79           | .007    |
|                              | second cycle       | 16                       | 26.7 | 40                    | 66.7 | 27                 | 45.0 | 19.36          | .000    |
|                              | third cycle        | 6                        | 10.0 | 12                    | 20.0 | 20                 | 33.3 | 9.87           | .007    |
| pain radiating down the legs | Pre                | 20                       | 33.3 | 39                    | 65.0 | 41                 | 68.3 | 18.13          | .000    |
|                              | second cycle       | 6                        | 10.0 | 25                    | 41.7 | 16                 | 26.7 | 15.60          | .000    |
|                              | third cycle        | 6                        | 10.0 | 13                    | 21.7 | 13                 | 21.7 | 3.72           | .155    |
| Headache                     | Pre                | 42                       | 70.0 | 47                    | 78.3 | 49                 | 81.7 | 2.42           | .298    |
|                              | second cycle       | 18                       | 30.0 | 40                    | 66.7 | 29                 | 48.3 | 16.15          | .000    |
|                              | third cycle        | 12                       | 20.0 | 26                    | 43.3 | 19                 | 31.7 | 7.54           | .023    |
| Nausea                       | Pre                | 16                       | 26.7 | 26                    | 43.3 | 31                 | 51.7 | 8.06           | .018    |
|                              | second cycle       | 0                        | 0.0  | 19                    | 31.7 | 13                 | 21.7 | 21.51          | .000    |
|                              | third cycle        | 0                        | 0.0  | 0                     | 0.0  | 13                 | 21.7 | 28.02          | .000    |
| Vomiting                     | Pre                | 16                       | 26.7 | 46                    | 76.7 | 31                 | 51.7 | 30.03          | .000    |
|                              | second cycle       | 10                       | 16.7 | 27                    | 45.0 | 18                 | 30.0 | 11.36          | .003    |
|                              | third cycle        | 0                        | 0.0  | 13                    | 21.7 | 4                  | 6.7  | 17.27          | .000    |
| Diarrhea                     | Pre                | 6                        | 10.0 | 33                    | 55.0 | 26                 | 43.3 | 28.36          | .000    |
|                              | second cycle       | 0                        | 0.0  | 20                    | 33.3 | 14                 | 23.3 | 22.91          | .000    |
|                              | third cycle        | 0                        | 0.0  | 7                     | 11.7 | 7                  | 11.7 | 7.59           | .022    |
| Fatigue                      | Pre                | 54                       | 90.0 | 40                    | 66.7 | 53                 | 88.3 | 13.58          | .001    |
|                              | second cycle       | 26                       | 43.3 | 40                    | 66.7 | 27                 | 45.0 | 8.14           | .017    |
|                              | third cycle        | 12                       | 20.0 | 20                    | 33.3 | 20                 | 33.3 | 3.46           | .177    |

ns. no Statistical significant differences  $P > 0.05$ .

**Figure (1): Statistically relation among studied groups regarding the severity of pain.**

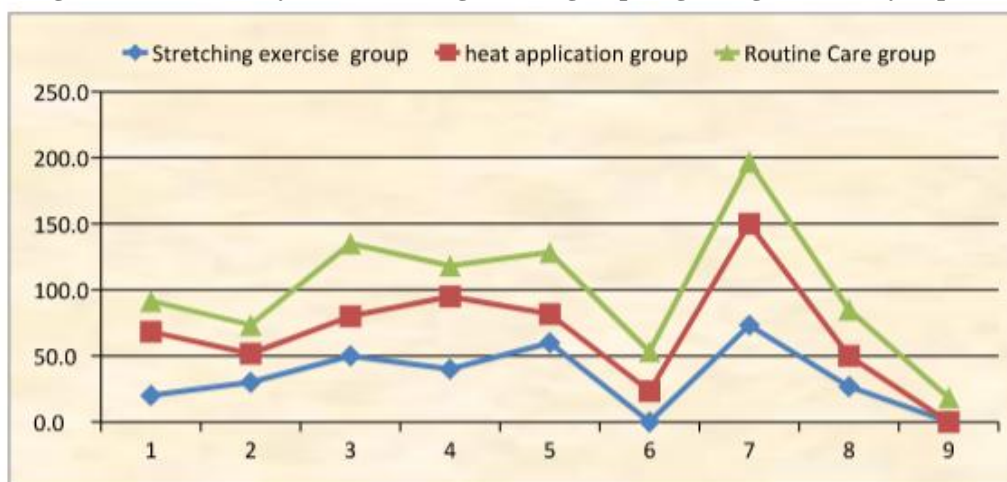


Figure (2): Statistically relation among studied groups regarding the frequency of dysmenorrhea

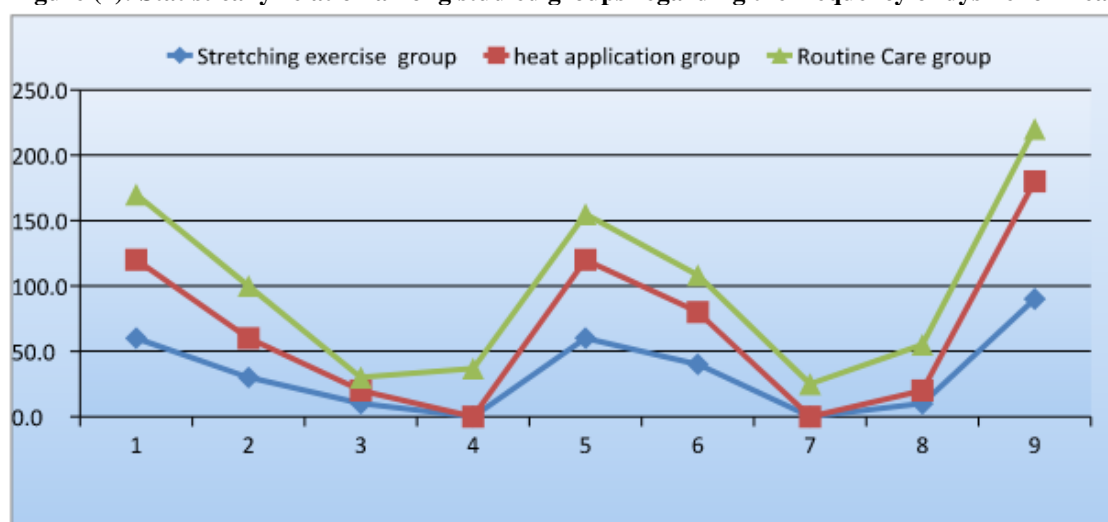


Figure (3): Statistically relation among studied groups regarding the duration of dysmenorrhea

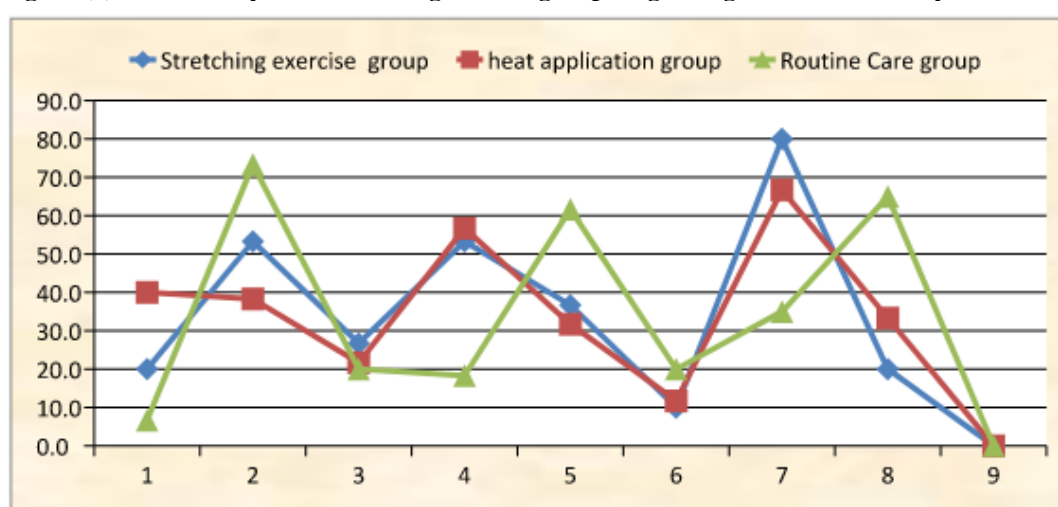


Table (5): Correlation between body mass index of studied groups and severity of pain, frequency of menstruation, and duration of menstruation throughout the intervention phases .

| Item                      | Time of assessment | Body mass index           |         |                        |         |               |         |
|---------------------------|--------------------|---------------------------|---------|------------------------|---------|---------------|---------|
|                           |                    | Stretching exercise group |         | Heat application group |         | Control group |         |
|                           |                    | r                         | p-value | r                      | p-value | r             | p-value |
| Severity of pain          | Pre                | -.362                     | .005    | .244                   | .061    | .243          | .062    |
|                           | second cycle       | -.339                     | .008    | .573                   | .000    | .392          | .002    |
|                           | third cycle        | -.541                     | .000    | .698                   | .000    | .244          | .061    |
| Frequency of dysmenorrhea | Pre                | .317                      | .014    | -.125                  | .341    | -.156         | .233    |
|                           | second cycle       | .332                      | .009    | -.399                  | .002    | -.346         | .007    |
|                           | third cycle        | -.136                     | .301    | -.282                  | .029    | -.351         | .006    |
| Duration of dysmenorrhea  | Pre                | -.092                     | .485    | -.146                  | .265    | -.311         | .016    |
|                           | second cycle       | .005                      | .971    | -.477                  | .000    | -.320         | .013    |
|                           | third cycle        | .187                      | .153    | -.407                  | .001    | -.414         | .001    |

\*\*highly statistically significant differences  $P \leq 0.001$ .



**Table (6): post hoc test for the studied group regarding the severity of pain, frequency and duration of menstruation.**

| Item                      | Time of assessment | r<br>p-value | severity of pain          |                        |               |
|---------------------------|--------------------|--------------|---------------------------|------------------------|---------------|
|                           |                    |              | Stretching exercise group | Heat application group | Control group |
| frequency of dysmenorrhea | Pre                | r            | 0.489                     | -.429                  | -.327         |
|                           |                    | p-value      | .000**                    | .000**                 | .000**        |
|                           | Second cycle       | r            | -.296                     | -.337                  | -.409         |
|                           |                    | p-value      | .000**                    | .000**                 | .000**        |
|                           | Third cycle        | r            | -.051                     | -.115                  | -.160         |
|                           |                    | p-value      | 0.496                     | .124                   | .031*         |
| duration of dysmenorrhea  | Pre                | r            | .302                      | .052                   | -.008         |
|                           |                    | p-value      | .000**                    | .487                   | .920          |
|                           | Second             | r            | .090                      | .107                   | .160          |
|                           |                    | p-value      | .228                      | .152                   | .032*         |
|                           | Third              | r            | -.057                     | .060                   | .147          |
|                           |                    | p-value      | .445                      | .420                   | .049*         |

\* Statistical significant differences  $P \leq 0.05$ , \*\*highly statistically significant differences  $P \leq 0.001$ .

**Table (7): Post hoc test for the absenteeism of the studied groups and frequency & duration of menstruation**

| Item                      | Time of assessment | r<br>p-value | Absenteeism               |                        |               |
|---------------------------|--------------------|--------------|---------------------------|------------------------|---------------|
|                           |                    |              | Stretching exercise group | Heat application group | Control group |
| frequency of dysmenorrhea | Pre                | r            | 0.58                      | 0.42                   | 0.37          |
|                           |                    | p-value      | 0.000**                   | 0.000**                | 0.051         |
|                           | Second cycle       | r            | 0.08                      | 0.11                   | 0.14          |
|                           |                    | p-value      | 0.53                      | 0.21                   | 0.26          |
|                           | Third cycle        | r            | 0.39                      | 0.24                   | 0.55          |
|                           |                    | p-value      | 0.11                      | 0.05*                  | 0.000**       |
| duration of dysmenorrhea  | Pre                | r            | 0.04                      | 0.10                   | 0.32          |
|                           |                    | p-value      | 0.75                      | 0.41                   | 0.01*         |
|                           | Second cycle       | r            | 0.05                      | 0.08                   | 0.32          |
|                           |                    | p-value      | 0.66                      | 0.54                   | 0.01*         |
|                           | Third cycle        | r            | 0.20                      | 0.28                   | 0.49          |
|                           |                    | p-value      | 0.12                      | 0.000**                | 0.000**       |

\* Statistical significant differences  $P \leq 0.05$ , \*\*highly statistically significant differences  $P \leq 0.001$ .

#### IV. Discussion

Dysmenorrhea is the most common gynecologic disorder among young women that affects more than half of women of 18-25 years old, and its major symptom including pain adversely affects daily life and school performance (Armour, 2019)[1]. The treatment approach for primary dysmenorrhea includes pharmacological as well as non-pharmacological. Pharmacological approaches may not be entirely effective and have a side effect for about 15% of women with primary dysmenorrhea. Besides, Egyptian young women/girls are not preferred to use medication for dysmenorrhea as they believe that it may affect fertility or cause some types of dependence (Rizk, 2013) [13].

The current study aimed to study the impact of heat application versus stretching exercises on relieving discomforts of primary dysmenorrhea among university student girls. This aim was achieved through assessing the effect of heat application on relieving discomforts of primary dysmenorrhea, assessing the effect of stretching exercises on relieving discomforts of primary dysmenorrhea, and comparing the effectiveness of heat application and stretching exercises on relieving discomforts of primary dysmenorrhea among university student girls.

Regarding the demographic characteristics of the studied sample for the current study, the mean age of the studied students was (19.96±2.26) (20.45±2.33) (19.66±1.76) in stretching exercise group, hot application group, and routine care group respectively with insignificant difference between them. regarding body mass index, there was an insignificant difference between three groups and more than half of the stretching exercise group and routine care group lived in an urban area while two-third of the hot application group lived in a rural area with a significant difference between them.

These results were in the same line with (Elsayed, et al., 2016) [14] who mentioned that the mean age were 20.61 and 20.65±1.13 years in the study and control group respectively. As far as a residence, 81.3% and 70.7% ±1.04 in the study and control group respectively were living in a rural area. There is no statistically significant

difference between both groups regarding age and body mass index ( $P > 0.05$ ). Also agree with (*Noorbakhsh et al., 2012*)[6] who studied the effect of physical activity on primary dysmenorrhea of female university students and stated that there were no significant differences in the demographic characteristics between subjects of the experimental and control groups. This minimized the effects of group differences that could affect outcome measures. Also (*Mohamed et al. 2015*)[15] who study the effect of using femi-band acupuncture on primary dysmenorrhea and said that, the highest percent of the studied samples with primary dysmenorrhea were living in rural areas.

Concerning the menstrual history of the studied students, the present study clarified that the mean age of menarche in stretching exercise group  $13.43 \pm 1.44$ , in hot application group  $13.11 \pm 2.04$  and routine care group  $13.20 \pm 1.07$  years with a highly significant difference between three groups this mean first occurrence menstrual cycle normal between three groups. Besides more than half in stretching exercise the interval of menstruation less than 28 / day group and two-thirds of hot application and routine care group interval more than 28/day with a significant difference between three groups. Moreover the majority of studied students of three group irregular menstrual cycle and moderate change pad from 2-3 pad/day and natural liquid bleeding and insignificant differences between three groups.

These results similar to (*Nabil, & Khalefa, 2016* ) [16] who study the effect of home-based stretching exercises and menstrual care on primary dysmenorrhea and premenstrual symptoms among Adolescent Girls and said that the age of menarche for the sample was about 13 years old ( $12.55 \pm 2.08$ ) for the control group compared to  $13.22 \pm 1.16$  years old for the study group. Regarding the number of pads, 70% of the study group compared to 52.5% in the control group used about 3 pads per day during the menstruation,

These results also agree with (*Abd EL-Menim, et al., 2018*)[17]. They said that the majority of students done correct hygienic practices during menstruation regarding used sanitary pads before the educational program with a highly significant difference after the program. This is maybe due high availability and increased awareness from television regarding availability and use of the sanitary pad, also supported by (*Ajifi, 2018*)[18] who study the effect of self- feet reflexology on relieving premenstrual syndrome, and mentioned that the mean age of menarche was  $13.28 \pm 1.30$  years. The mean duration of menstruation of them was  $4.77 \pm 1.14$ . Regarding the amount of blood, about two-thirds of students had a moderate amount, and the majority of them had liquid menstruation.

Dysmenorrhea assessment, the result of the current study showed that more than one-third of the three groups start the occurrence of dysmenorrhea 6 months after onset menarche with an insignificant difference between them. In addition more than half in the stretching exercise group and less than half in hot application group and routine care group time of pain occurrence with menstrual beginning and continues for 24 hours with insignificant difference between them. Moreover more than one quarter in the stretching exercise group site of pain lower abdomen and lower back and super pubic pain and more than one-third site of pain lower back in hot application group and lower abdomen in routine care group with insignificant difference between the three groups.

This result supported by (*Hockenberry and Wilson, 2015*)[19] who reported that primary dysmenorrhea usually appears 6 to 12 months after menarche when ovulation is established. Anovulatory bleeding, common in the few months or years after menarche, is painless. Because both estrogen and progesterone are necessary for primary dysmenorrhea to occur, it is experienced only with ovulatory cycles, also similar with (*Shehate ,2015*)[20] who mentioned that the most of studied student location of dysmenorrhea pain in the lower abdomen and lower back and supported by (*Vlachou, et al., 2019*)[21] who study dysmenorrhea prevalence and its impact on the daily functioning of university nursing students in Greece and said that The majority of students (89.2%) reported experiencing pain during menstruation. But disagree with (*Shaban ,2011*)[22] who done a comparative study between three different techniques on relieving dysmenorrhea among students of faculty of nursing at Tanta university and mentioned that, dysmenorrhea started with menarche for almost two-fifth of the students in Faculty of Nursing at Tanta University. This may be due to nutritional and general health status of the studied students

Most females suffer from other dysmenorrhea associated symptoms, nervousness, depression, irritability, and backache, loss of appetite, headache, sleeplessness, dizziness, and fatigue (*Mohamed, 2012*)[23]. Regarding dysmenorrhea associated discomfort symptoms, the result of the current study showed that insignificant differences regarding lower abdominal pain and headache pre-intervention and fatigue during the third cycle while significant differences during different phases of assessment regarding other dysmenorrhea associated discomfort symptoms. This result similar with (*Kanwal, et al., 2017*)[24] who studied the effectiveness of stretching exercises in symptomatic and asymptomatic phase in primary dysmenorrhea who concluded that stretching exercises in symptomatic phase and asymptomatic phase are equally effective to relieve pain and associated symptoms of primary dysmenorrhea, But disagrees with (*Ouda, et al., 2017*)[25]. who mentioned the symptoms associated with dysmenorrhea and found there was a statistically significant

difference regarding headache and diarrhea ( $p = <0.01^{**}$ ), but there was no statistically significant difference regarding other symptoms. This difference may be due to different health status and lifestyles between students.

Several recent studies have confirmed the positive effects of stretching exercises on the intensity of dysmenorrhea in high school and university student girls (*Gamit, et al., 2014*)[26] & (*Noorbakhsh, et al., 2012*)[6]. This result agrees with the current study showed stretching exercise was more effective than hot application and routine care in reducing the severity, frequency and duration of dysmenorrhea and there was an insignificant correlation between the severity of pain and frequency of dysmenorrhea during the third cycle while insignificant correlation during second and third cycle related to the correlation between severity of pain and duration of dysmenorrhea in stretching exercise group. Also supported by (*ouda, et al., 2017*)[25] who done a study of the effect of heat application on relieving dysmenorrheal pain among young females and stated that; stretching and core strengthening exercises was effective in reducing the pain of dysmenorrhea as compared with heat application and statistically significant difference between the two intervention groups.

This finding is similar to (*Saleh et al., 2016*)[2] who study stretching or core strengthening exercises for managing primary dysmenorrhea and mentioned that active stretching or core strengthening exercises seem to be an easy, non-pharmacological method for managing primary dysmenorrhea. It reduces pain intensity and duration of primary dysmenorrhea. So, these can be safely used as a non-pharmacological method for pain relief in primary dysmenorrhea and supported by (*Shahr jerdy, et al., 2012*)[27] who study the effects of stretching exercises on primary dysmenorrhea in adolescent girls and said that stretching exercises reduce pain intensity, duration, and the amount of painkillers being used by vasodilatation, release of endogenous opiates, shutting off blood flow from viscera resulting in less pelvic congestion. They also improve flexibility, restore mobility, relax tense uterine muscles and maintain a good abdominal tone. This may be due to acute stretching suppresses sympathetic nervous activity and increases parasympathetic activity (*Farinatti, et al., 2011*)[28].

Concerning heat application for relieving dysmenorrhea pain the current study revealed that heat application reduces the severity of pain, frequency, and duration than routine care with an insignificant correlation between severity of pain and frequency during the third cycle and insignificant correlation between severity of pain and duration of dysmenorrhea during a different period of assessment. This result similarly to (*Shanmugam et al., 2016*) [29] who study effectiveness of hot application on dysmenorrhea and revealed that there was a significant reduction in level of dysmenorrhea among adolescent girls after giving hot application and congruent with (*Armour et al., 2019*)[30] who study the effectiveness of self-care and lifestyle interventions in primary dysmenorrhea and showed heat application have a moderate reduction in menstrual pain. When compared to analgesic medication control groups only.

From the researchers' point of view, this may be due to heat therapy meets the criteria for an ideal analgesic modality. Heat induced vascular reactions will increase the blood flow to an area, resulting in the dilution of intravascular prostaglandins, bradykinin, and histamine. These molecules are among the most potent pain inducing molecules. Increased blood flow also improves tissue oxygenation. Local heat applied to the upper abdomen increases gastrointestinal motility and has a relaxing effect on the uterus (*Rigi et al., 2012*)[31].

Primary dysmenorrhea has a negative impact on the concentration of learning due to the pain and headaches experienced, and decreases the academic performance of adolescents, due to increased absenteeism (*Bustan et al., 2018*)[32].

Data from few longitudinal studies showed that the absenteeism from college due to primary dysmenorrhea is 34 to 50 percent. (*Osman and El-Houfey, 2016*)[33] this result consistent with a significant association between school absenteeism and severity of dysmenorrhea (*Femi-Agboola, et al., 2017*)[34] additionally (*Joshi et al., 2015*)[35] who studied primary dysmenorrhea and its effect on quality of life in young girls and mentioned that there was highly significant association between dysmenorrhea and school absenteeism, this result congruent with the current study showed there is high significant correlation between absenteeism and frequency of dysmenorrhea pre intervention in three groups and stretching exercise group less absenteeism related to frequency and duration of dysmenorrhea post intervention with insignificant correlation during compare to hot application and routine care group, this may be due to effect of educational program.

The correlation between dysmenorrhea and BMI of the current study revealed that high significant correlation between body mass index in stretching exercise group and severity of pain pre, second and third cycle and frequency of dysmenorrhea during pre and second cycle, This result in the same line with (*Chauhan & Kala, 2012*) [36] Who study the relation between dysmenorrhea and Body Mass Index in adolescents with rural versus urban variation and mentioned that there was a positive correlation between dysmenorrhea in adolescents and BMI. In addition to (*Snehalata et al., 2016*)[37] who study relationship between body mass composition and primary dysmenorrhoea and founded a positive relationship between primary dysmenorrhea and increased BMI and demonstrated that severity of primary dysmenorrhea was increased by gaining weight and increasing BMI in their subjects.

Also the present study revealed an insignificant correlation between body mass index and frequency, duration of menstruation in hot application group pre intervention while insignificant correlation between body

mass index and frequency of menstruation in routine care group pre intervention. This result consistent with (Haidari et al., 2011) [38] who study prevalence and severity of primary dysmenorrhea and its relation to anthropometric parameters and (Shaban, 2011)[39] who done comparative study between three different techniques on relieving dysmenorrhea among students of faculty of nursing at tanta and concluded that there was no significant relationship between the severity of dysmenorrhea and body mass index. also in the same line with (Khodakarami et al., 2015)[40] studied relationship between dysmenorrhea and BMI on 579 high school students and showed that there is no significant relationship between dysmenorrhea and BMI.

## V. Conclusion

Based on the findings of the present study, it can be concluded that, the above mentioned findings proved and reinforced the study hypotheses. The application of heat and stretching exercises was effective in reducing discomforts of primary dysmenorrhea among university student girls and stretching exercises were more effective than heat application in relieving discomforts of primary dysmenorrhea..

## VI. Recommendations

Based on findings of the current study, the following recommendations can be suggested:

- Health education of adolescent girls about the benefits of the use heat application and physical exercises to relieve pain and associated symptoms of dysmenorrhea.
- Stretching exercises should be generalized as a remedy for relief of dysmenorrhea than using analgesics.
- Distribute illustrated booklet with simple explanation and figures about stretching exercises for all adolescent girls with dysmenorrhea.

Further studies:

- Using large sample size for generalization.
- Collaborative efforts from health care providers, program coordinators, and parents should focus on increasing awareness and improving management strategies to treat dysmenorrhea.

## Acknowledgements

The researchers would like to express gratitude and appreciations to all student girls who participated in this study for their effective cooperation and kind appreciation to Dr.Ahmed Mostafa Ali ;the physiotherapist who helped us in implementation of the study.

## References

- [1]. Armour M., Parry K., Manohar N., Holmes K., Ferfolja T., Curry C., (2019). The Prevalence and Academic Impact of Dysmenorrhea in 21,573 Young Women: A Systematic Review and Meta-Analysis. *J Women's Health (Larchmt, Aug;28(8):1161-1171*. <https://doi.org/10.1089/jwh.2018.7615> PMID:31170024.
- [2]. Saleh H., Mowafy H., El Hameid A., (2016) .Stretching or Core Strengthening Exercises for Managing Primary Dysmenorrhea. *J Women's Health Care* 5:1, 295. doi:10.4172/2167-0420.1000295
- [3]. Harada T., (2013). Dysmenorrhea and endometriosis in young women, *Yonago Acta Med.*, 56(4), 81-84.
- [4]. Kazama M ,Maruyama K ,and Nakamura K .(2015), Prevalence of Dysmenorrhea and Its Correlating Lifestyle Factors in Japanese Female Junior High School Students *Tohoku J. Exp. Med.* 113-107 ,(2) 236 .
- [5]. O'Connell K., Davis A., and Westhoff C., (2016). Self-treatment patterns among adolescent girls with dysmenorrhoea. *J Pediatr Adolesc Gynecol*; 19:286-9.
- [6]. Noorbakhsh M., Alijani E., Kohandel M , ,Mehdizadeh Toorzani Z., Mirfaizi M., and Hojat S.,(2012) .(The Effect of Physical Activity on Primary Dysmenorrhea of Female University Students. *World Applied Sciences Journal*, 17(10):1246-52.
- [7]. Khan, K.S., Champaneria, R., and Latthe P., (2012).How effective are nondrug, non-surgical treatments for primary dysmenorrhoea? *BMJ*;344:e3011 doi:10.1136/bmj.e3011
- [8]. Akin M., Price W., Rodriguez, G., Erasala, G., Hurley, G., and Smith ,R.,(2014). Continuous, low-level, topical heat wrap therapy as compared to acetaminophen for primary dysmenorrhea. *J Reprod Med.* ,49(9):739-745. [PubMed] [Google Scholar]
- [9]. Unsal A., Ayranci U., Tozun M., Arslan G., and Calik E.,(2015) .Prevalence of dysmenorrhea and its effect on quality of life among a group of female university students. *Ups J Med Sci.* 2015;115(2):138-145.
- [10]. Kamel, D.M., Tantawy, S.A., and Abdelsamea, G., (2017). Experience of dysmenorrhea among a group of physical therapy students from Cairo University: an exploratory study, *Dove Press Ltd, Volume:10 Pages 1079-1085* <https://www.dovepress.com/experience-of-dysmenorrhea-among-a-group-of-physical-therapy-students--peer-reviewed-full>.
- [11]. Ju H., Jones M., and Mishra G. ,(2014). The prevalence and risk factors of dysmenorrhea. *Epidemiol Rev* 36: 104-113.
- [12]. Sriwatanakul K ,Kelvie, W. Lasagna, L and Calimlim ,F.(1983) , .Studies with Different Types of Visual Analog Scales for Measurement of Pain. *Clinical Pharmacology. University of Rochester School of Medicine and Dentistry*, 5(2) pp. (234-239. (
- [13]. Rizk S .(2013) , .Effect of aromatherapy abdominal massage using peppermint versus ginger oils on primary dysmenorrhea among adolescent girls. *Journal of American Science*, 9(11), 597-605.
- [14]. 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.
- [15]. Mohamed, H ,Salem, S., and Al-Agamy Z .(2015) ,.Effect of using Femi-band acupressure on primary dysmenorrhea : Randomized controlled trial. *Journal of Nursing Education and Practice*, 5(12), 49-57.

- [16]. **Nabil ,R.,and Khalefa T.(2016)** ,,Effect of Home based Stretching Exercises and Menstrual Care on Primary Dysmenorrhea and Premenstrual Symptoms among Adolescent Girls, *IOSR Journal of Nursing and Health Science* , , Volume 5, Issue 2 Ver. IV (Mar. - Apr. 2016), PP 10-17.
- [17]. **Abd EL-Menim S ,,Moursi H ,,and Sarhan ,A.(2018 )** ,,Effect of Educational Program on Vulvitis Prevention among Nursing Students ,*American Journal Of Nursing Science:7267-254:(6)*
- [18]. **Afifi ,O ,,Fahmy M ,,OmranA ,,and Abd Elmoniem ,S .(2018)** ,,Effect of self- feet reflexology on relieving premenstrual syndrome, submitted for partial fulfillment of the doctorate degree in maternal and newborn health nursing , Faculty of Nursing, Benha University.
- [19]. **Hockenberry M ,,and Wilson D .(2015)** ,,Wong’s Nursing Care of Infants and Children (10th ed.). Canada: Mosby, an imprint of Elsevier Inc
- [20]. **Shehate S ,,Mohamed A ,,Ramadan A ,,and Abd Elmoniem,S.(2015)** .Assessment relationship between body mass index and menstrual pattern for female students , Submitted for Partial Fulfillment of Master Degree in Maternal and Newborn Health Nursing , Faculty of Nursing-Benha University
- [21]. **Vlachou E., Owens D.A., Papakonstantinou K., Mouslech Z., Kanakis G., and Tsartsalis A.,(2019)**. Dysmenorrhea prevalence and its impact on daily functioning of university nursing students in Greece, *Endocrine Abstracts* , 63, P:336 . <https://www.endocrine-abstracts.org/ea/0063/ea0063p336>
- [22]. **Shaban R. , (2011)**. Comparative Study between Three Different Techniques on Relieving Dysmenorrhea among Students of Faculty of Nursing at Tanta University. Tanta.
- [23]. **Mohamed E. , (2012)**. Epidemiology of Dysmenorrhea among Adolescent Students in Assiut City, Egypt *Life Science Journal*; 9(1):348-53.
- [24]. **Kanwal R ,,MasoodT ,,AwanW ,,Baig M , ,and Babur N.,(2017)** .(effectiveness of stretching exercises in symptomatic and asymptomatic phase in primary dysmenorrhea, *Pak J Physiol.*10-6:(2)13,
- [25]. **Ouda , K., Latif ,S and Nabil, T., (2017)** .(A study of the effect of heat application on relieving dysmenorrheal pain among young females ,*African Journal of Nursing and Midwifery* ,Vol. 5 (6), pp. 727-735. Available online at [www.internationalscholarsjournals.org](http://www.internationalscholarsjournals.org) © International Scholars Journal
- [26]. **Gamit K ,,Sheth S ,,and Vyas ,J.(2014)** ,.The effect of stretching exercise on primary dysmenorrhea in adult girls .*Int J Med Sci Public Health.*51–549 :3,
- [27]. **Shahr-jerdy R ,.Rahman Sheikh H ,,and Maghsoud E" .(2012)** ,,Effects of stretching exercises on primary dysmenorrhea in adolescent girls." *Biomedical Human Kinetics* 4. 132-127 ,
- [28]. **Farinatti P ,,Brandao ,C ,,and Soares ,P ,,Duarte A.(2011)** ,.Acute effects of stretching exercise on the heart rate variability in subjects with low flexibility levels. *J Strength Cond Res.*25:1579 ,
- [29]. **Shanmugam ,R ,,Susila C ,,and Kalaimathi.A .(2016 )** ,.Effectiveness of hot application on dysmenorrhea, *International Journal of Applied Research* 2016; 2(4): 720-722.
- [30]. **Armour M ,,Smith C., Steel, K., and 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* , Jan 17;19(1):22. doi: 10.1186/s12906-019-2433-8.
- [31]. **RigiS., Navidian A., Safabakhsh L., and Safarzadeh A., (2012)**. Comparing the analgesic effect of heat patch containing iron chip and ibuprofen for primary dysmenorrhea : a randomized controlled trial. *BMC Women’s Health.* <http://doi.org/doi:10.1186/1472-6874-12-25>.
- [32]. **Bustan ,N ,,Seweng ,A ,,and Ernavati. (2018)** ,,Abdominal Stretching Exercise in Decreasing Pain of Dysmenorrhea Among Nursing Students, *Journal of Physics: Conf. Series* 1028 012103 doi:10.1088/1742-6596/1028/1/012103
- [33]. **OsmanA., and El-Houfey A. , (2016)**, prevalence of Dysmenorrhea and its Impact on Quality of Life among Nursing Students at Assuit University, Egypt , *IOSR Journal of Nursing and Health Science (IOSR-JNHS)* Volume 5, Issue 1 Ver. III (Jan. - Feb. 2016), PP 08-16 [www.iosrjournals.org](http://www.iosrjournals.org).
- [34]. **Femi-Agboola ,D ,,SekoniO ,,Olayinka O , . and GoodmanO .(2017)** ,,Dysmenorrhea and its effects on school absenteeism and school activities among adolescents in selected secondary schools in Ibadan, Nigeria ,*Nigerian Medical Journal* :( 4 ) 58 , .148-143
- [35]. **Joshi T., Kural M., Agrawal D., NoorN., and PatilA., (2015)**. Primary dysmenorrhea and its effect on quality of life in young girls. *International Journal of Medical Science and Public Health*, 4(3), 1. <http://doi.org/10.5455/ijmsph.2015.0711201472>
- [36]. **Chauhan M., and Kala J .(2012)** ,,Relation between Dysmenorrhea and Body Mass Index in Adolescents with Rural Versus Urban Variation. *J Obstet Gynaecol India.* Aug; 62(4): 442–445. Published online 2012 Jun.
- [37]. **Snehalata T ,,and MaheshA.(2016 )** ,.Relationship between body mass compositiond primary dysmenorrhoea. *Indian J Physiother Occup Ther*81 –76 :10 ,
- [38]. **Haidari, F., Akrami, A ,,and Mohammad S .(2011)** ,,Prevalence and severity of primary dysmenorrhea and its relation to anthropometric parameters. *Journal of Faculty of Nursing and Midwifery*, 17(1), 70–78.
- [39]. **Shaban R .(2011)** ,,Comparative Study between Three Different Techniques on Relieving Dysmenorrhea among Students of Faculty of Nursing at Tanta University. Tanta.
- [40]. **Khodakarami B., Masoomi S., Faradmal J., Nazari M., Saadati M., and Sharifi F., (2015)**. The severity of dysmenorrhea and its relationship with body mass index among female adolescents in Hamadan, Iran. *Journal of Midwifery and Reproductive Health* 2015; 3: 444-50 .

Somaya Ouda Abd Elmoniem, et. al. “Effect of heat application versus stretching exercises on Relieving Discomforts of Primary Dysmenorrhea Among University Student Girls.” *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, 9(4), 2020, pp. 20-32.