

Effect of Applying Nola Pender's Health Promotion Model on Self-Care Strategies for Managing Dysmenorrhea among Adolescents: A Quasi-Experimental Study

Zeinab Rabea Abd Elmordy Emam¹, Ghada Sobhy Hassan Abd Elrahman²,
Gehad Gamal El-sayed³

¹Assistant Professor of Obstetrics and Gynecology Nursing,
Faculty of Nursing, Benha University, Egypt.

Nursing department, North private college of Nursing,
Arar, North Borders Region, Saudi Arabia.

²Assistant professor of Family and Community Health Nursing,
Faculty of Nursing, Ain Shams University, Egypt.

Nursing department, North private college of Nursing,
Arar, North Borders Region, Saudi Arabia

³lecturer of Obstetrics and Gynecology Nursing,
Faculty of Nursing, Benha University, Egypt

Abstract: Adolescents always complain of dysmenorrhea, which can affect daily activities, academic performance, and overall, well-being. Decreased awareness of effective prevention and self-care strategies always increase the severity of symptoms. **Purpose:** To evaluate the effect of applying Nola Pender's health promotion model on self-care strategies for managing dysmenorrhea among adolescents. **Setting:** Faculty of Nursing, Benha University, Egypt. **Design:** A quasi-experimental study design. The study was carried out at Benha University's Faculty of Nursing in Egypt. **Sampling:** A purposive sample of 223 female students from the first academic year (2025–2026) were included. **Instruments:** Instrument one: A structured self-administered questionnaire: consisted of two parts: General Characteristics and Adolescent's Menstrual history, Instrument two: knowledge of dysmenorrhea and self-care strategies, Instrument three: WaLIDD questionnaire, Instrument four: health promotion lifestyle profile II, and Instrument five: Adolescent dysmenorrhea self-care strategies Scale. **Results:** There were highly statistically significant improvements in students' knowledge, dysmenorrhea self-care strategies and health-promoting lifestyle scores postintervention and follow-up phase compared to the pre-intervention phase. Also, dysmenorrhea severity exhibited a significant and progressive reduction from pre-intervention to post-intervention, with further improvement maintained at follow-up phases ($p < 0.001$). Additionally, there was a highly significant statistical negative correlation between total health-promoting lifestyle score and total self-care strategies and total dysmenorrhea severity domains of the studied students at pre- intervention, post -intervention and follow up phases. **Conclusion:** Applying Nola Pender's Health Promotion Model was associated with positive changes in

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improving knowledge, decreasing level of dysmenorrhea severity, and adopting healthy lifestyle and satisfactory self-care strategies among the students. **Recommendation:** Nola Pender's Health Promotion Model should be integrated into routine nursing care for adolescents to plan, implement, and evaluate effective actions that promote healthy lifestyles and self-care strategies.

Key words: *Adolescents, Dysmenorrhea, Nola Pender's Health Promotion Model, Self-Care Strategies*

INTRODUCTION

World Health Organization (WHO, 2023) defines adolescence as the second decade of life, which includes the age range of 10 to 19. Disease development is influenced by risk factors, dietary habits, and health precautions. Adolescents go through a phase of transition from infancy to adulthood that is marked by physiological, mental, emotional, and social changes, therefore these variables must be supported alongside them. The advent of menstrual cycle presents a new issue for many adolescent females; dysmenorrhea, or unpleasant cramping during menstruation, affects 50% to 90% of adolescent girls, resulting in school absences, diminished participation in physical and other activities, and increased emotional discomfort (Nurhayati et al., 2025).

Dysmenorrhea is defined as intense uterine spasms encountered during menstruation and one of the most prevalent causes of pelvic pain and menstruation disruptions. It is usually marked by lower abdominal pain that starts when menstrual flow starts and lasts for 8 to 72 hours. This normally develops in adolescence, 6 to 24 months following menarche.

According to studies, between 41% and 91.5% of young women experience dysmenorrhea (Sabetsarvestani et al., 2025).

Dysmenorrhea comes in two different forms: primary and secondary. Back pain, pelvic and abdominal pain, headaches, migraines, insomnia, nausea and vomiting, dizziness, fatigue, abdominal cramps, sweating, irritability, emotional liability, and depression are just a few of the many symptoms of primary dysmenorrhea, the most common complaint among teenagers and women of reproductive age. Secondary dysmenorrhea, on the other hand, is brought on by painful organic pelvic diseases like endometriosis or uterine fibroids (Rodrigues, et al., 2026)

In addition to causing physical discomfort, dysmenorrhea can result in absenteeism from university, decreased academic performance, decreased productivity and psychological problems such as fluctuating moods, exhaustion, trouble concentrating, disturbances in dietary habits, and disturbed sleep patterns. These symptoms, which are frequently accompanied by tension and anxiety, can have a major impact on regular

daily living activities, especially for young females. Teenagers in particular are more likely to suffer from severe dysmenorrhea, which worsens their mental and physical health (Kusumawati et al., 2025).

Management of dysmenorrhea involves pharmacological and non-pharmacological methods. Nonpharmacological techniques include regular physical exercise, acupuncture, transcutaneous electrical nerve stimulation and hot baths and sleep that are inexpensive and have no side effects. Dietary supplements as Vitamin E, Omega-3 fatty acids, as well as magnesium may help in pain relief through regulation of prostaglandin synthesis and enhance muscle relaxation and vasodilation (Keerthana et al., 2025). In contrast pharmacological measures include NSAIDs like mefenamic acid and ibuprofen that block prostaglandin formation by inhibiting cyclooxygenase enzymes also; oral contraceptive pills are mainly used (Gindaba et al., 2025).

Although the significant incidence of dysmenorrhea, numerous adolescents possess insufficient understanding of appropriate self-care strategies such as heat therapy, exercise, and nonprescription of analgesics and frequently postpone seeking medical counsel, which can aggravate symptoms and adversely affect quality of life. To overcome knowledge gaps and promote teenage wellbeing, thorough education on menstrual pain management has a significant importance (Li et al., 2024).

Self-care has a significant role in the management of dysmenorrhea and enhances the general wellbeing of adolescents. Adolescent females can improve quality of life; lessen dependency on pharmaceutical therapies, and the severity and frequency of menstrual pain by implementing efficient self-care techniques including eating a balanced diet, exercising frequently, and using relaxation techniques as deep breaths or meditation. Additionally, self-care encourages higher levels of autonomy in handling one's health by enabling adolescent females to identify their own triggers and create useful coping strategies (Sabetsarvestani et al., 2025). Consequently, Health Promotion Model (HPM), developed by Nola Pender in 1982, is an integral viewpoint within nursing theories that emphasize awareness, reinforcement, and promotion of healthy behaviors. This technique, which is frequently applied in social contexts, can direct students toward healthy habits and assists in identifying variables that affect decisions regarding health (Navarro et al., 2023).

Nola Pender's Health Promotion Model is not restricted to illness prevention, in contrast to other behavioral models. Rather, it incorporates interpersonal, motivating, and personal elements that impact the initiation of healthy habits. Its comprehensive viewpoint supports the nursing professional's objective of fostering social, emotional, and physical well-being. Pender's model supports optimal health management through nursing and educational programs by encouraging healthy

nutrition, exercise, motivation and self-confidence (Rojas-Torres et al., 2025). Therefore, nurses play a crucial role in providing appropriate health education and encouragement through this model for relieving dysmenorrhea by improvement of knowledge, and health habits, and then Adolescent females can be encouraged to develop a healthy physical, cognitive, and emotional reaction to dysmenorrhea (Nurhayati, et al., 2025).

Significance of the study

Dysmenorrhea is a common menstrual problem among female adolescents and college students. Menstrual pain affects between half and three quarters of women to varying degrees. This discomfort could be so severe that it can interfere with regular exercise, causing absence from work or school, and prevent social interaction with others (Abbas et al., 2025). Dysmenorrhea affects 20% to 90% of women worldwide, with young females being more likely to experience it which have a detrimental effect on their social connections, academic achievement, and emotional health (Luo et al., 2025).

Globally, primary dysmenorrhea is the most prevalent problem among adolescents with incidence rate among women of reproductive age ranges from 51.1 to 92.3% according to the studies. According to a study conducted in Lebanon, 74.8% of university students with primary dysmenorrhea employed nonpharmacological pain management techniques, whereas 76.4% of students used pharmaceutical ones. Primary dysmenorrhea prevalence ranges from 51.1% to

78.35% in Africa (Gindaba et al., 2025). In Egypt, a study conducted at Technical Institute of Nursing, Mansoura University on 309 adolescent females showed that 91.9% of the studied students complained of dysmenorrhea and 52.1% of them didn't attend the university during menstrual pain days (Moawad et al., 2025).

The application of nursing interventions utilizing the health promotion model has demonstrated statistically significant improvements in health habits and self-care strategies across different age groups. Dysmenorrhea remains highly prevalent among college students and represents a considerable public health concern that should not be overlooked. Moreover, applying this model on self-care strategies for managing dysmenorrhea helps to address an important gap in existing research; hence, this research was conducted to evaluate the effect of applying Nola Pender's health promotion model on self-care strategies for managing dysmenorrhea among adolescents.

Purpose:

This study aimed to evaluate the effect of applying Nola Pender's health promotion model on self-care strategies for managing dysmenorrhea among adolescents

Study hypotheses:

- **H1:** Adolescent students will exhibit higher level of knowledge about dysmenorrhea after receiving the intervention guided by Nola Pender's Health Promotion Model than before.

- **H2:** Adolescent students will report lower level of dysmenorrhea severity after receiving intervention guided by Nola Pender's Health Promotion Model than before.
- **H3:** Adolescent students will exhibit greater engagement in healthy lifestyle after receiving the intervention guided by Nola Pender's Health Promotion Model than before
- **H4:** Adolescent students will demonstrate satisfactory self-care strategies for managing dysmenorrhea after receiving the intervention guided by Nola Pender's Health Promotion Model than before.

Operational definitions:

- **Nola Pender's Health Promotion Model:** refers to a structured educational intervention designed to promote healthy lifestyle among adolescents including sessions to address knowledge, perceived benefits and barriers, self-efficacy, and interpersonal influences related to management of dysmenorrhea.
- **Self-Care Strategies:** are set of behaviors and practices adopted by adolescent students to manage Dysmenorrhea including both pharmacological and non-pharmacological measures such as proper use of analgesics, application of heat, physical activity, dietary modifications, adequate rest, and stress management. It was assessed using adolescent dysmenorrhea self-Care scale.

Methods:

Research design:

A quasi-experimental design (one group, pre/posttest).

Setting:

The study was conducted at Faculty of Nursing, Benha University, in Banha City, Qalyubia Governorate, Egypt. This setting provides an appropriate and naturalistic environment for implementing a Health Promotion Model based intervention and for assessing its impact on adolescent girls' self-care strategies for managing dysmenorrhea.

Sampling

A purposive sampling technique was used to recruit a total of 223 adolescent girls. The total number of students were 767 male and female students who were enrolled in the first academic year 2025-2026 at the Faculty of Nursing, Banha University and the female students were 504. This sample size was considered sufficient based on a power analysis. The analysis was conducted using a significance level (α) of 0.05, a power ($1-\beta$) of 0.80, and an expected moderate effect size ($d = 0.3$), informed by similar published studies on adolescent health behaviors and menstrual self-care interventions (Cohen, 1988). Participants were selected based on predetermined inclusion and exclusion criteria: the study included adolescent female students aged 17–19 years who experienced dysmenorrhea as identified through a pre-study questionnaire assessing menstrual characteristics, had not consumed any

medications, sedatives, mineral or vitamin supplements, or herbal remedies during the previous three menstrual cycles, and were willing to participate in the study. Students were excluded if they had secondary dysmenorrhea, irregular menstrual cycles, gynecological disorders, chronic medical conditions, a history of pelvic surgery, current or past pregnancy, or if they had used mineral or vitamin supplements, herbal products, hormonal medications, or long-term analgesics during the previous three menstrual cycles.

Instruments:

five instruments were used after reviewing the related literature from both local and international sources Almanasef, and Alqarni, (2023) and El-Hosary, (2022).

Instrument one: A structured self-administered questionnaire:

consisted of two parts as the following:

- **Part one: General Characteristics:** This part was designed to gather background information about age, place of residence mother's education and occupation, father's occupation, family income, level of physical activity and BMI.
- **Part two: Adolescent's Menstrual history:** Adolescents' Menstrual History was developed based on Kotian et al., (2025) to collect detailed information about adolescents' menstrual characteristics, including age at menarche, character of menstruation, interval, duration, and amount of menstrual blood flow and number of menstrual pads/ days.

Instrument two: Adolescent' Knowledge regarding dysmenorrhea and self-care strategies.

This instrument was used to assess adolescent's knowledge regarding dysmenorrhea and self-care strategies. It was developed based on extensive review of previous studies regarding dysmenorrhea among adolescents and nursing student populations (Baghianimoghadam et al., 2012; Fetohey, 2011; Mohamed et al., 2020). It contained 9 questions including definition, types, causes, contributing factors, physical symptoms, psychological symptoms, complications, treatment of dysmenorrhea, pharmacological and non-pharmacological methods for relieving dysmenorrhea symptoms as medication, herbal remedies, exercise helps in managing discomfort, and seeking consultation. Additional strategies include applying hot water bottles or heating pad, taking adequate rest and using massage.

Knowledge scoring system:

Each question was scored as 3 for completely correct answer, 2 for incompletely correct answer, and a score 1 for incorrect or "don't know" answer. The total knowledge score ranged from 13 to 39 points. Students' knowledge was considered satisfactory when the total score was equal to or greater than 60% of the maximum score (≥ 23 points), while scores less than 60% (< 23 points) were considered unsatisfactory.

Instrument three: WaLIDD (Working ability, location, intensity, days of pain, dysmenorrhea)

questionnaire is a valid and reliable instrument that was developed by Teheran et al., (2018) and can be utilized to determine the degree of dysmenorrhea severity among university students. It was used to evaluate four dimensions that include; working ability that show the effect of menstrual pain on activities of daily living and school attendance; location of pain that indicate the anatomical sites of pain as lower abdomen, lower back or thighs; intensity of pain, which measure the perceived severity of discomfort; and days of pain that record how many days that menstrual pain persists during each cycle.

Scoring system:

Each dimension was given a score from 0 to 3, with a total score that ranges from 0 to 12. The higher scores reflect more severe degrees of dysmenorrhea. According to the total score, dysmenorrhea can be categorized as mild if the scores were 0–3, moderate 4–7, or severe when the scores were 8–12.

Instrument four: Health Promotion Lifestyle Profile II (HPLP-II)

This instrument was adapted from The Health Promotion Lifestyle Profile II (HPLP-II) based on Nola J. Pender's to assess health-promoting behaviors. It was originally developed by Walker et al., (1987). The instrument contains 52 items distributed across six domains: health responsibility (9 items), physical activity (8 items), nutrition (9 items),

spiritual growth (9 items), interpersonal relations (9 items), and stress management (8 items). In the present study, the HPLP-II was used to evaluate health-promoting lifestyle behaviors among adolescent girls with dysmenorrhea.

Scoring System

Responses to each item were rated on a 4-point Likert scale, a score 1 was given for Never, a score 2 for (sometimes), a score 3 for (often) and a score 4 was given for (Routinely). Subscale scores are calculated by computing the mean score of the items within each domain, with higher scores indicating more frequent engagement in health-promoting behaviors. An overall HPLP-II score was obtained by calculating the mean of all 52 items, providing an estimate of the participant's overall health-promoting lifestyle. The interpretation of HPLP-II scores was based on the calculated mean values. Mean scores between 1.00 and 1.99 were considered indicative of a low level of health-promoting behaviors, values ranging from 2.00 to 2.99 were classified as moderate, while mean scores from 3.00 to 4.00 denoted a high level of engagement in health-promoting lifestyle behaviors.

Instrument five: Adolescent Dysmenorrhea Self-Care Scale (AD-SCS)

The Adolescent Dysmenorrhea Self-Care Scale (AD-SCS) was developed by Hsieh et al., (2004) to assess self-care strategies among adolescent girls with dysmenorrhea. The scale

consisted of 30 items which are divided into 6 domains: Searching for knowledge, Expression of emotions, Seeking assistance, Control over external factors, Resource utilization and Self-control and each domain composed of five items.

Scoring System:

Each item was given a score based on a 6-point Likert scale ranging from 0 for (totally disagree), 1 (disagree), 2 (slightly disagree), 3 (moderately disagree), 4 (slightly agree), 5 (agree) and 6 were given to (totally agree). Each subscale score was computed by calculating the meaning of the items within each subscale, with higher scores indicating more frequent or effective engagement in the corresponding self-care behavior. An overall score was obtained by averaging all 30 items, reflecting the participant's overall level of dysmenorrhea self-care. Scores were interpreted as follows: 0.00–1.66 = low level, 1.67–3.33 = moderate level, and 3.34–5.00 = high level of self-care behaviors.

Pilot Study

A pilot study was conducted on 10% of the target sample (22 adolescent students) to test the clarity, feasibility and time required to complete the data collection instruments. No modifications in the study tool were performed; hence, all the studied sample was included in the total study sample.

Reliability

The reliability of instruments was examined by Cronbach's alpha coefficient test to ensure consistency and stability of tools over time. For (Tool II) Adolescent Knowledge Questionnaire regarding dysmenorrhea and self-care strategies, Cronbach's alpha coefficient was ($r = 0.88$). For

(Tool III) The WaLIDD Questionnaire it was approximately 0.72. The overall Cronbach's alpha of (Tool IV) Health Promotion Lifestyle Profile II was 0.92 and the reliability coefficients of the six subscales ranged from 0.70 to 0.90. Also, (Tool V) Adolescent Dysmenorrhea Self-Care Scale was approximately 0.82 for the total scale.

Validity

The instruments used in this study demonstrated acceptable validity. Their content and construction were reviewed and confirmed by five experts from Obstetrics and Community health nursing, ensuring that the items appropriately measure the intended aspects of dysmenorrhea severity, adolescents' knowledge, self-care behaviors, and health-promoting lifestyle practices. Factor analysis and previous validation studies support the accuracy and relevance of these tools in adolescent populations.

Ethical consideration

The study was conducted in accordance with ethical standards for research involving human participants. Approval was obtained from the Scientific Research Ethical Committee at Faculty of Nursing, Benha University Code (REC-OBSN-P119 4/1/2026). The goal, methods, and advantages of the study were thoroughly explained to teenage girls. Prior to participation, informed consent was assured, and participants were guaranteed. The privacy and anonymity of their answers. Additionally, they were assured of their freedom to leave the study at any moment without facing any repercussions. Every piece of information was safely kept and used only for research.

Procedure

- An official letter was submitted from the researchers to the dean of the

Faculty of Nursing, Benha University including purpose of the study and methods of data collection.

- The researchers visited the study setting three days per week (Sunday, Tuesday, and Thursday), according to student's schedule. At first the researchers interviewed all female students after the end of a theoretical lecture and distributed a self-reported questionnaire about assessment of menstrual characteristics for detection of female students who complain of dysmenorrhea this consumed about 20-30 minutes. After that the researchers analyzed the questionnaire and selected the study participants who met the inclusion and exclusion criteria and accepted to participate in the study to represent the sample size (223 female students). Data collection took place from October 2025 to May 2026, covering eight months. The researchers met adolescent participants in designated activity rooms within the faculty of nursing according to their schedule, introduced themselves, explained the purpose and significance of the study, and obtained informed written consent to participate in the study. Following data collection, an intervention based on evidence-based guidance was developed for dysmenorrhea management on the basis of health-promoting behaviors. The booklet was written in clear Arabic language and included illustrative diagrams to enhance understanding. The intervention was delivered in four sessions (two theoretical and two practical sessions). Participants were divided into 15 small groups. Each group contained 14 -15 adolescents. Discussions encouraged and active participation. The sessions utilized a combination of PowerPoint presentations, videos, group discussions, and the educational booklet to explain dysmenorrhea, self-care strategies, and health-promoting

practices based on Pender's Health Promotion Model. The researchers' guided participants through practical strategies for self-care and encouraged the adoption of behaviors that promote their overall health and well-being.

Assessment phase

Preprogram assessment was conducted to collect baseline data from the participants. Data were gathered using the five study instruments. First, the researchers distributed (instrument one) a structured self-administered questionnaire that was used to assess general characteristics and menstrual history of the study participants then, (instrument two) Adolescents' knowledge regarding dysmenorrhea and self-care strategies was utilized to assess their knowledge base and selfre strategies regarding dysmenorrhea. After that, the severity of dysmenorrhea was assessed using the WaLIDD questionnaire (instrument three). Health-promoting lifestyle behaviors were measured using the Health Promotion Lifestyle Profile II (HPLP-II) (instrument four). Finally, self-care strategies related to dysmenorrhea were assessed using the Adolescent Dysmenorrhea Self-Care Scale (AD-SCS) (instrument five). This phase lasted approximately 30–45 minutes and clear instructions were provided to ensure accurate completion of the tools. The program consisted of two theoretical and two practical sessions according to the following:

1st theoretical Session: - Introduction to Dysmenorrhea and self-care strategies (Duration 40 mins)

This session covered the definitions of menstruation and dysmenorrhea, causes and contributing factors, common physical symptoms such as abdominal cramps, back pain, and nausea, as well as psychological symptoms including

anxiety, irritability, and fatigue. Participants were also informed about possible complications if dysmenorrhea is left unmanaged and guidance on when to seek medical help. The session aligned with the "Health Responsibility domain" of the Health Promotion Lifestyle Profile II emphasizing knowledge acquisition and personal responsibility for health management which assessed behaviors such as following healthcare advice, asking questions about personal health, reading or seeking health information, recognizing signs and symptoms, and discussing health concerns with healthcare professionals.

2nd theoretical Session: - Social, Environmental, and Psychological Factors (Duration 40 min)

This session focused on the impact of dysmenorrhea on daily life, academic attendance, and social interactions. Participants discussed psychological barriers such as stress and anxiety, as well as environmental and cultural factors that may hinder effective self-care. Strategies to overcome these obstacles were introduced to enhance adherence to self-care practices. The session corresponded to the "Interpersonal Relations and Stress Management domains" of the Health Promotion Lifestyle Profile II which reflected through open communication, supportive friendships, emotional sharing with trusted individuals, active listening, providing support to others, and constructive management of interpersonal problem.

1st Practical Session: - Self-Care Techniques and Physical/Relaxation Methods (Duration 60min).

This session provided hands-on training in gentle exercises and stretching techniques to relieve menstrual pain.

Participants practiced relaxation methods, including deep breathing and meditation, and learned the proper application of heat therapy. Besides, participation in regular exercise, avoiding vigorous activities, choosing exercises to strengthen the body, enjoying sports, walking or jogging, allocating time for fitness, performing stretching or flexibility exercises, and maintaining an active lifestyle was done. Also, stress management behaviors were done

2nd practical Session: - Daily Management and self-care Strategies (Duration 60 min)

This session focused on daily management and lifestyle strategies to promote healthy behaviors during menstruation. The session emphasized adequate rest and sleep, balanced nutrition such as eating balanced meals, choosing foods that promote health, avoiding excessive sugar or junk food, planning nutritious meals, limiting high-fat foods, and drinking adequate amounts of water, safe use of herbal remedies, and effective management of daily activities to minimize menstrual discomfort. These components align closely with the "Resource Utilization and Self-Control domains" of the Adolescent Dysmenorrhea Self-Care Scale (AD-SCS), as they support adolescents' ability to effectively use available health resources and regulate physical and emotional responses during dysmenorrhea. Furthermore, the session corresponds to the "Health Responsibility, and Spiritual Growth domains" of the Health-Promoting Lifestyle Profile II, reinforcing holistic self-care practices among adolescents. A variety of instructional methods were employed, including lectures, audiovisual materials, demonstrations, brainstorming, group discussions, and practical exercises, emphasizing skill acquisition, positive attitudes, and

perceived benefits of self-care, in line with Pender's Health Promotion Model.

Evaluation phase

These assessments were conducted four weeks after the completion of the program using the same pretest tools (posttest). Follow up was conducted eight weeks later.

Statistical analysis:

Before being entered into a computer, the data was checked. Using the proper statistical techniques and tests, the gathered data was arranged, coded, computerized, and examined. SPSS version 26.0, the Statistical Package for Social Sciences, was utilized. Means, standard deviations, and frequencies and percentages were examples of descriptive statistics. The research hypotheses were tested using inferential statistics, such as the Chi-square test and ANOVA test. The relationship between the total scores of the study variables was examined using the correlation coefficient. A statistically significant difference was indicated by a $p\text{-value} > 0.05$, a statistically significant difference was indicated by a $p\text{-value} \leq 0.05$, and a highly statistically significant difference was indicated by a $p\text{-value} P \leq 0.001$ for all statistical tests

Results

Table 1 shows that 61.0% of studied students were 18- years old with a mean age of 17.94 ± 0.62 years. In relation to mother's level of education, 67.3% of them had secondary education. Furthermore, 55.2% of them lived in rural areas. Concerning mother's and father's occupation, 69.5% and 96.4% of them were housewives and employed respectively. In addition, 76.7% of them didn't have enough

monthly income and 65.9% had moderate physical activity.

Table 2 shows that 67.7% of the studied students were within normal weight. According to the anthropometric measurements, the mean body mass index of them was $22.67 \pm 3.83 \text{ kg/m}^2$.

Figure 1 illustrates that 67.7% of studied students were within normal weight. In addition, 1.4% of them were obese.

Table 3 clears that 75.8% of students had their menarche at the age group of 12-16 years old and that the duration of menstrual flow for 62.3% of them was from 3-7 days. The amount of blood flow for 44.4% of them was moderate 3-4 pads/day and the interval of the menstrual cycle for 81.6% of them was 21-35 days.

Table 4 indicates that there was a high statistically significant difference among mean scores of studied students' knowledge regarding dysmenorrhea and self-care strategies at pre-intervention, post-intervention and follow up phases with ($p < 0.001$). The total mean score of Knowledge was improved from 4.71 ± 1.60 to 7.14 ± 1.63 then 7.65 ± 1.74 throughout study phases respectively.

Figure 2 displays that 26.9%, 73.1% and 76.2% of studied students had good knowledge regarding dysmenorrhea and self-care strategies at pre, post-intervention and follow up phases respectively.

Table 5 shows that there was a high statistically significant difference among mean scores of students' menstrual characteristics and dysmenorrhea severity at pre-

intervention, post-intervention and follow up phases with (p -value <0.001). The total mean score of dysmenorrhea severity was relieved from 7.48 ± 2.16 to 5.40 ± 1.86 then 4.73 ± 1.72 throughout study phases respectively.

Figure 3 displays that 29.6%, 50.2% and 53.8% of studied students had mild degree of dysmenorrhea severity at pre, post-intervention and follow up phases respectively.

Table 6 shows that there was a high statistically significant difference among mean scores regarding students' health-promoting lifestyle at pre-intervention, post-intervention and follow up phases with (p -value < 0.001). The total mean score of health-promoting lifestyle domains was improved from 137.82 ± 13.28 to 155.38 ± 12.49 then 158.10 ± 13.38 throughout study phases respectively.

Figure 4 displays that 30.1%, 57.4% and 60.1% of studied students had high health promoting behaviors at pre, post-intervention and follow up phases respectively.

Table 7 shows that there was a high statistically significant difference among mean scores regarding students' dysmenorrhea self-care strategies at pre-intervention, post-intervention and follow up phases with (p -value <0.001). The total mean score of students' dysmenorrhea self-care strategies was improved from 94.78 ± 9.57 to 112.02 ± 8.17 then

116.13 ± 9.46 throughout study phases respectively

Figure 5 displays that 26.9%, 53.8% and 58.7% of studied students had high self-care strategies at pre, post-intervention and follow up phases respectively.

Table 8 clarifies that there was a highly statistical significant positive correlation between total knowledge score and total scores of (total health-promoting lifestyle, and total dysmenorrhea self-care strategies) of the studied students at pre-intervention, post -intervention and follow up phases ($P\leq 0.001$). Meanwhile, there was a highly statistical significant negative correlation between total knowledge score and total dysmenorrhea severity domains score of the studied students at pre- intervention, post -intervention and follow up phases ($P\leq 0.001$).

Table 9 clarifies that there was a highly statistical significant negative correlation between total health-promoting lifestyle score and total dysmenorrhea severity domains score of the studied students at pre-intervention, post -intervention and follow up phases ($P\leq 0.001$).

Table 10 clarifies that there was a highly statistical significant negative correlation between total dysmenorrhea self-care strategies score and total dysmenorrhea severity domains score of the studied students at pre-intervention, post -intervention and follow up phases ($P\leq 0.001$).

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Table (1): Distribution of studied students according to their general characteristics (n=223).

General characteristics	No.	%
Age (in years)		
17-	50	22.4
18-	136	61.0
19	37	16.6
Mean $\pm$ SD = 17.94$\pm$0.62		
Mother's level of educational		
Illiterate	4	1.8
Primary education	12	5.4
Secondary education	150	67.3
University education	57	25.1
Residence		
Rural	123	55.2
Urban	100	44.8
Mother's occupation condition		
Housewife	155	69.5
Employed	68	30.5
Father's occupation condition		
Employed	215	96.4
Unemployed	8	3.6
Family monthly income		
Enough	52	23.3
Not enough	171	76.7
Level of physical activity		
Low	43	19.3
Moderate	147	65.9
High	33	14.8

Table (2): Distribution of studied students according to anthropometric measurements (n=223).

Body mass index (BMI) classifications	No.	%
Underweight	40	17.9
Normal weight	151	67.7
Overweight	29	13.0
Obese	3	1.4
Parameters		Mean $\pm$ SD
Weight (in kg)	57.36 $\pm$ 10.36	
Height (in cm)	159.04 $\pm$ 6.14	
BMI	22.67 $\pm$ 3.83	

Figure (1): Distribution of studied students according to their body mass index (n=223).

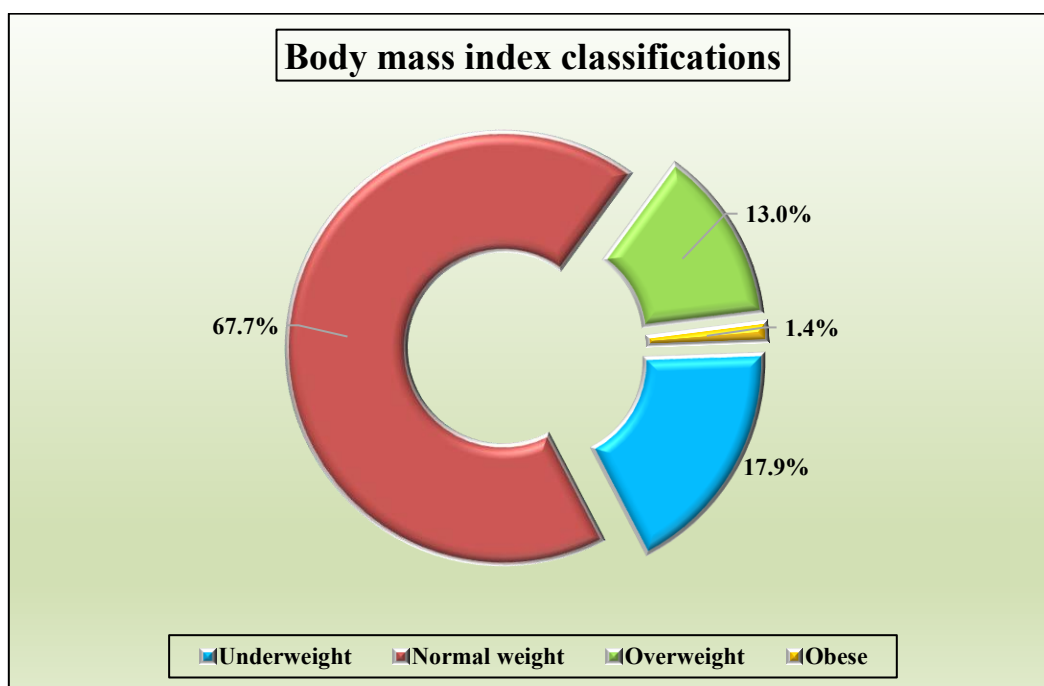


Table (3): Distribution of the studied students according to menstrual history (n=223)

Menstrual history	No.	%
Age at menarche		
< 12 years	44	19.7
12-16 years	169	75.8
> 16 years	10	4.5
Duration of menstrual flow		
< 3 days	52	23.3
3–7 days	139	62.3
>7 days	32	14.4
Amount of blood flow		
Mild (1-2 pad/day)	74	33.2
Moderate (3–4 pads/day)	99	44.4
Severe (≥ 5 pads/day)	50	22.4
Interval of menstrual cycle		
< 21 days	18	8.1
21–35 days	182	81.6
>35 days	23	10.3

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Table (4): Mean Scores of studied students' knowledge about dysmenorrhea and self-care strategies at pre-intervention, post-intervention and follow up phases (n=223).

Knowledge about dysmenorrhea and self-care strategies	No. of questions	Min./Max. score	Mean $\pm$ SD	ANOVA	
				F	P-value
Pre-intervention	9	0/9	4.71 $\pm$ 1.60	198.42	0.000**
Post-intervention			7.14 $\pm$ 1.63		
Follow up			7.65 $\pm$ 1.74		

****A Highly Statistically significant $p \leq 0.001$**

Figure (2): Distribution of studied students according total knowledge score regarding dysmenorrhea and self-care strategies at pre, post-intervention and follow up phases (n=223).

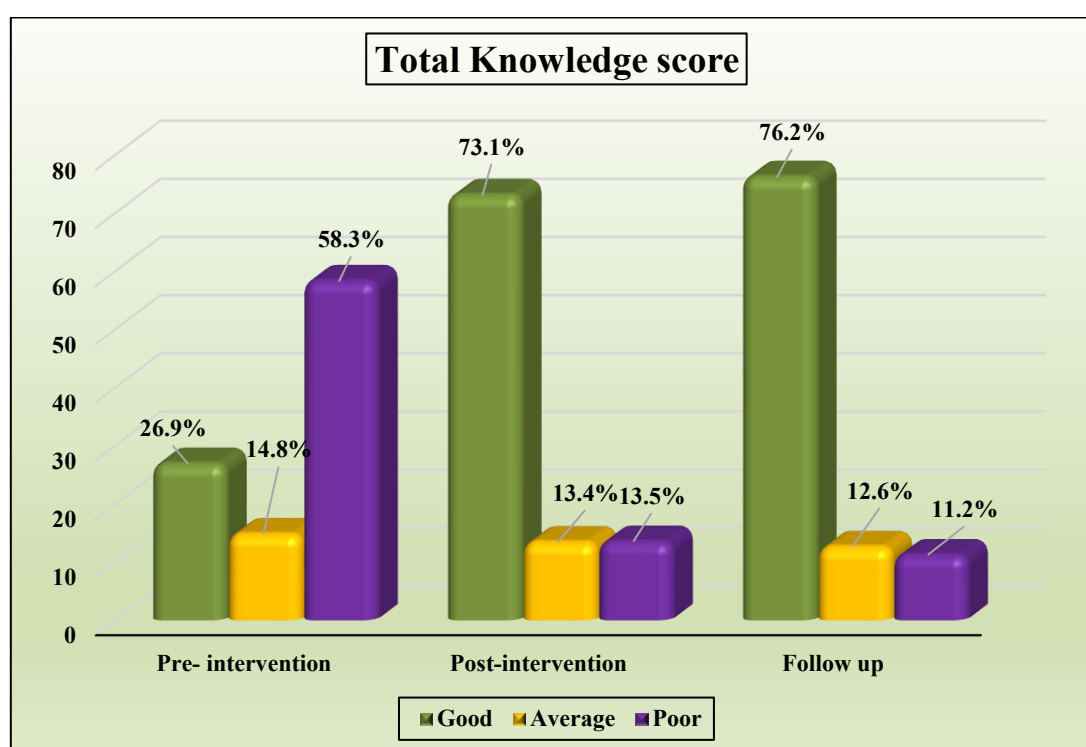


Table (5): Mean Scores of studied students' dysmenorrhea severity dimensions at pre, post-intervention and follow up phases (n=223).

Dysmenorrhea severity dimensions	Min./Max. score	Pre-intervention	Post-intervention	Follow up	ANOVA	
		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	F	P-value
Working Ability	0/3	1.76 $\pm$ 0.88	1.23 $\pm$ 0.87	1.02 $\pm$ 0.94	39.34	0.000**
Location of Pain		1.52 $\pm$ 0.71	1.09 $\pm$ 0.64	0.93 $\pm$ 0.56	51.08	0.000**
Intensity of Pain		2.13 $\pm$ 0.62	1.50 $\pm$ 0.62	1.36 $\pm$ 0.60	98.58	0.000**
Days of Pain		2.07 $\pm$ 0.68	1.59 $\pm$ 0.65	1.42 $\pm$ 0.60	60.06	0.000**
Total score	0/12	7.48$\pm$2.16	5.40$\pm$1.86	4.73$\pm$1.72	123.41	0.000**

****A Highly Statistically significant $p \leq 0.001$**

Effect of Applying Nola Pender's Health Promotion Model on Self-Care Strategies for Managing Dysmenorrhea among Adolescents: A Quasi-Experimental Study

Figure (3): Distribution of studied students regarding total dysmenorrhea severity dimensions score at pre, post -intervention and follow up phases (n=223).

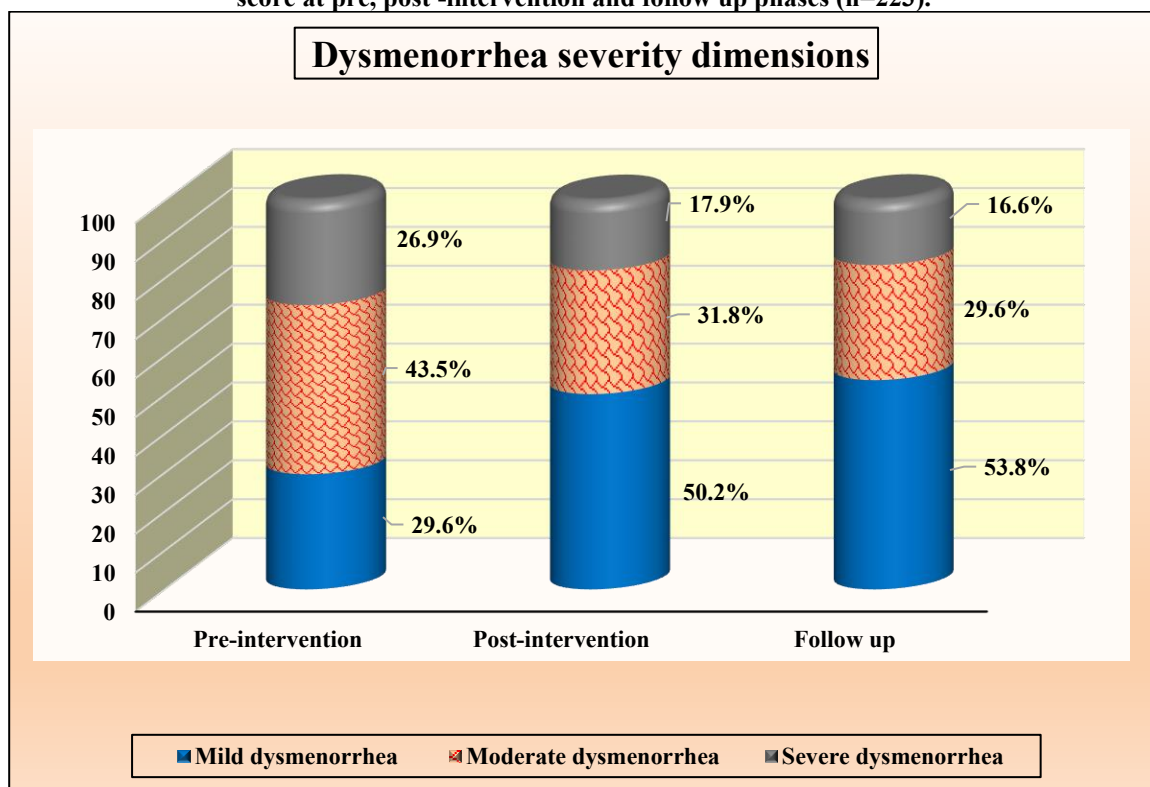


Table (6): Mean Scores of studied students' health-promoting lifestyle at pre, post -intervention and follow up phases (n=223).

Health-Promoting Lifestyle dimensions	Min./Max. score	Pre-intervention	Post-intervention	Follow up	ANOVA	
		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	F	p-value
Health responsibility	9/36	22.43 $\pm$ 5.33	25.89 $\pm$ 5.85	26.12 $\pm$ 7.50	23.98	0.000**
Physical activity	8/32	18.30 $\pm$ 5.74	22.04 $\pm$ 5.96	22.70 $\pm$ 5.91	36.25	0.000**
Nutrition	9/36	18.90 $\pm$ 4.08	23.04 $\pm$ 4.38	23.51 $\pm$ 4.22	80.20	0.000**
Spiritual growth	9/36	27.62 $\pm$ 3.77	29.41 $\pm$ 3.82	29.77 $\pm$ 3.76	20.63	0.000**
Interpersonal relations	9/36	30.00 $\pm$ 2.83	32.03 $\pm$ 2.68	32.49 $\pm$ 2.72	51.71	0.000**
Stress management	8/32	20.57 $\pm$ 3.89	22.97 $\pm$ 4.01	23.53 $\pm$ 4.07	34.48	0.000**
Total score	52/208	137.82 $\pm$ 13.28	155.38 $\pm$ 12.49	158.10 $\pm$ 13.38	158.51	0.000**

**A Highly Statistical significant $p \leq 0.001$

Effect of Applying Nola Pender's Health Promotion Model on Self-Care Strategies for Managing Dysmenorrhea among Adolescents: A Quasi-Experimental Study

Figure (4): Distribution of studied students regarding their total health-promoting lifestyle score at pre, post -intervention and follow up phases (n=223).

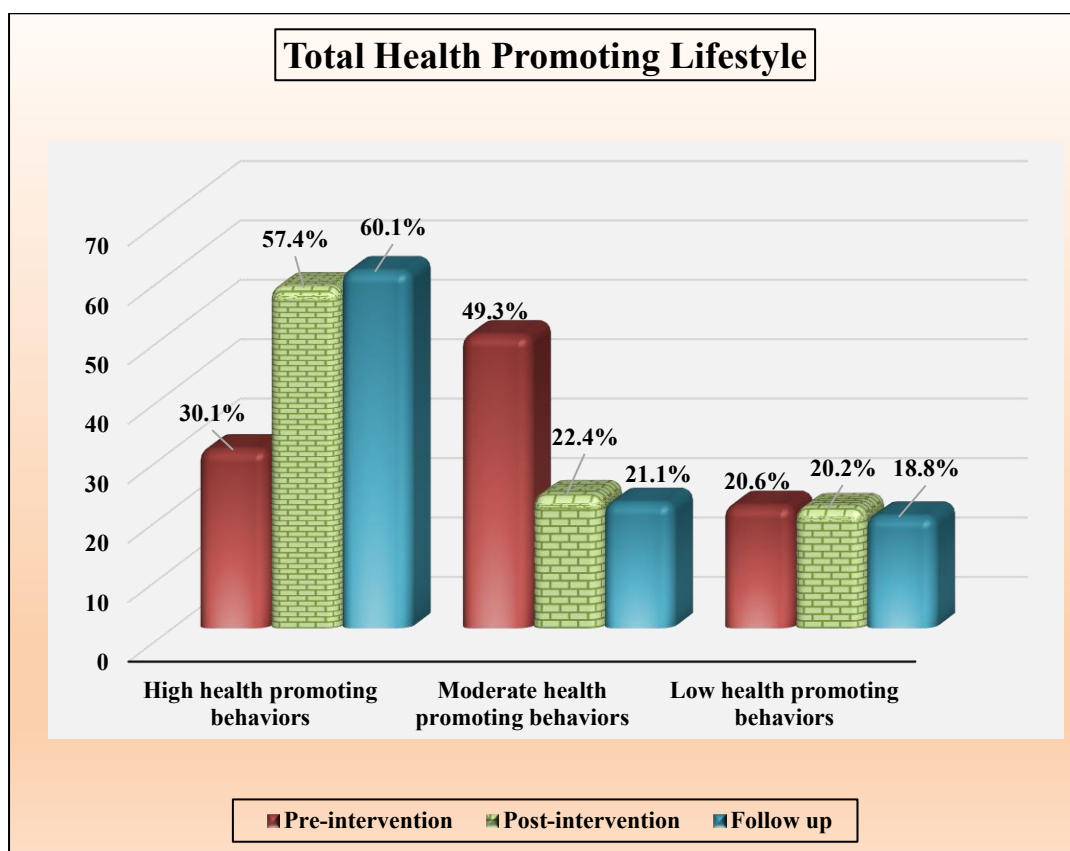


Table (7): Mean Scores of studied students' dysmenorrhea self-care strategies at pre, post -intervention and follow up phases (n=223).

Dysmenorrhea Self-Care strategies	Min./Max. score	Pre-intervention	Post-intervention	Follow up	ANOVA	
		Mean ± SD	Mean ± SD	Mean ± SD	F	p-value
Searching for knowledge	0/25	16.90±3.47	19.62±3.54	20.27±3.92	53.72	0.000**
Expression of emotions	0/25	12.23±3.98	16.06±3.78	16.87±3.39	98.58	0.000**
Seeking assistance	0/25	18.43±4.23	20.13±2.91	20.61±3.41	27.97	0.000**
Control over external factors	0/25	16.37± 3.81	18.87±3.61	19.55±3.93	43.50	0.000**
Resource utilization	0/25	16.14±4.44	19.08±3.61	19.83±4.09	51.24	0.000**
Self-control	0/25	14.71±3.40	18.26±3.50	19.00±3.50	97.20	0.000**
Total score	0/150	94.78±9.57	112.02±8.17	116.13±9.46	346.16	0.000**

*A Statistically significant $p \leq 0.0$

**A Highly Statistically significant $p \leq 0.001$

Effect of Applying Nola Pender's Health Promotion Model on Self-Care Strategies for Managing Dysmenorrhea among Adolescents: A Quasi-Experimental Study

Figure (5): Distribution of studied students regarding total dysmenorrhea self-care strategies scores at pre, post -intervention and follow up phases (n=223).

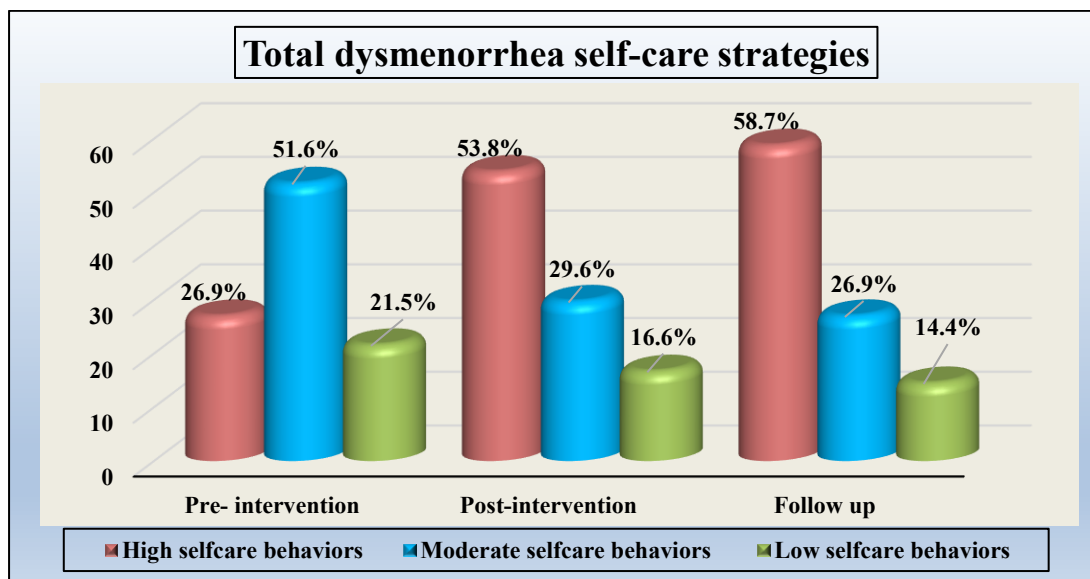


Table (8): Correlation between total knowledge score and total dysmenorrhea severity domains scores, total health-promoting lifestyle scores, and total dysmenorrhea self-care strategies among the studied students at pre, post -intervention and follow up phases (n=223).

Variables	Total knowledge					
	Pre-intervention		Post-intervention		Follow up	
	r	P-value	r	P-value	r	P-value
Total dysmenorrhea severity domains	- 0.462	0.000**	- 0.436	0.000**	- 0.551	0.000**
Total Health-Promoting Lifestyle	0.467	0.000**	0.636	0.000**	0.552	0.000**
Total dysmenorrhea self-care strategies	0.545	0.000**	0.620	0.000**	0.643	0.000**

**A Highly Statistically significant $p \leq 0.001$

Table (9): Correlation between total health-promoting lifestyle score and total dysmenorrhea severity domains score among studied students at pre, post -intervention and follow up phases (n=223).

Variables	Total Health-Promoting Lifestyle					
	Pre-intervention		Post-intervention		Follow up	
	r	P-value	r	P-value	r	P-value
Total dysmenorrhea severity domains	- 0.562	0.000**	- 0.566	0.000**	- 0.657	0.000**

**A Highly Statistically significant $p \leq 0.001$

Table (10): Correlation between total dysmenorrhea self-care strategies score and total dysmenorrhea severity domains score among the studied students at pre, post -intervention and follow up phases (n=223).

Variables	Total dysmenorrhea self-care strategies					
	Pre-intervention		Post-intervention		Follow up	
	r	P-value	r	P-value	r	P-value
Total dysmenorrhea severity domains	- 0.645	0.000**	- 0.721	0.000**	- 0.687	0.000**

****A Highly Statistically significant $p \leq 0.001$**

Discussion

Dysmenorrhea has been recognized as a public health issue due to its high prevalence and status as the most common complaint among adolescents, either physiological or emotional (Kusumawati, et al., 2025). Additionally, Nola Pender's health promotion model (HPM) was used to effectively manage health through nursing and educational interventions, supporting self-care by encouraging physical activity, motivation, healthy eating, and self-esteem, identifying factors that influence health decisions, and guiding students toward positive behaviours (Rojas-Torres et al., 2025). So, this research aimed to evaluate the effect of applying Nola Pender's health promotion model on self-care strategies for managing dysmenorrhea among adolescents. The research results confirmed the aforementioned hypotheses, and this was clarified by discussing the following results. Concerning studied students' knowledge regarding dysmenorrhea and self-care strategies, the results of the present research demonstrated that there was a highly statistically

significant difference in the mean scores of the studied students' knowledge regarding dysmenorrhea and self-care strategies across the pre-intervention, post-intervention, and follow-up phases. The mean score of knowledge improved from 4.71 ± 1.60 to 7.14 ± 1.63 then 7.65 ± 1.74 throughout study phases respectively. This significant change indicated that Nola Pender's model was effective in improving students' knowledge and understanding of dysmenorrhea management.

In addition, slightly more than one-quarter of studied students had good knowledge regarding dysmenorrhea and self-care strategies at the pre-intervention phase. However, after the intervention, a significant improvement was observed, with more than two-thirds of students had good knowledge at post-intervention phase, which was maintained at the follow-up phase. Insufficient knowledge means many young women do not know how to distinguish between normal and abnormal symptoms. This highlights that the educational intervention based

on Pender's model provided structured and relevant information about dysmenorrhea. Also, it helped to correct misconceptions and improve students' understanding, which is reflected in the significant increase in knowledge scores.

This result agreed with Kusumawati, et al., (2025) who stated that prior to the intervention, many students had limited knowledge about menstrual pain, its causes and appropriate management techniques. However, following the educational session, there was a notable improvement in their knowledge, particularly regarding self-care strategies to relieve dysmenorrhea. Also, this result was consistent with Israel and Priscilla, (2023) who revealed the paired t-test analysis revealed a statistically significant improvement in knowledge from the pre-test (10.3 ± 2.87) to at post-test (41.17 ± 8.75) ($p < 0.05$), indicating that the structured teaching program was effective in enhancing knowledge about dysmenorrhea among the adolescent girls in the study.

Regarding dysmenorrhea severity domains, the results of the present research presented that a highly significant reduction in dysmenorrhea severity among the studied students across at post-intervention and follow-up phases than pre intervention indicating that the educational intervention utilizing Nola Pender's Health Promotion Model increased students' perceived benefits of self-care strategies, empowered them to adopt effective methods for managing dysmenorrhea. Additionally, it provided accurate information,

practical guidance, and emotional support which enabled sustained behavior change.

To confirm that, slightly less than one-third of the studied students had mild severity of dysmenorrhea at the pre-intervention phase. After the intervention, this increased to about half of the students at the post-intervention phase, and more than half at the follow-up phase. These results indicate that the comprehensive educational package was effective in reducing dysmenorrhea severity and promoting milder menstrual symptoms among the studied students. This result agreed with El-Hosary, (2022) who stated that the severity of pain and the associated symptoms decreased in study group compared to the control group, with a highly statistically significant difference found between groups. Self-care strategies affected all the menstrual hormone concentrations significantly ($P < 0.001$).

According to Nola Pender's Health Promotion Model (HPM), knowledge acquisition and positive expectations increase the likelihood of engaging in health-promoting behaviors. By providing accurate scientific information, practical strategies, and supportive guidance, the program empowers students to make informed decisions about nutrition, physical activity, hygiene, stress management, and other health-promoting practices (Rivas, 2025).

Pertaining to health-promoting lifestyle, the results demonstrated that there was a highly statistically significant improvement in students' health-promoting lifestyle across the

pre-intervention, post-intervention, and follow-up phases. The total mean score increased at follow-up, indicating that the comprehensive educational package was effective in enhancing students' knowledge, attitudes, and behaviors toward a healthier lifestyle. Slightly less than one-third of the studied students had high health-promoting behaviors at the pre-intervention phase. After the intervention, this increased to more than half at the post-intervention phase and further increased to slightly more than three-fifths at the follow-up phase. These results indicate that the comprehensive educational package was effective in enhancing students' engagement in health-promoting behaviors and encouraging the adoption of a healthier lifestyle.

Also, the sustained improvement at the follow-up phase suggested that students were able to integrate the learned behaviors into daily routines, reflecting long-term adoption of health-promoting lifestyles. These findings confirm that HPM-based educational interventions can effectively enhance adolescents' knowledge, attitudes, and engagement in behaviors that support overall well-being. This result was nearly consistent with Rojas-Torres, (2025) who indicated that nursing interventions based on Pender's model led to statistically significant improvements in multiple dimensions of healthy behavior.

In addition, this result agreed with Ngwazini, (2022) who concluded that Nola Pender's "Clinical Assessment for Health Promotion Plan" allows a participant to understand the variables

that may affect health promotion behaviors and guide counseling. Additionally, according to Santos et al. (2025), the application of Nola Pender's Health Promotion Model in primary care showed that the model offers a useful framework for putting nursing interventions centered on health-promoting behaviors and raising people's involvement in their own medical care into practice.

As regards self-care strategies, the results showed a highly statistically significant improvement in self-care skills across the pre-intervention, post-intervention, and follow-up phases. Slightly more than one-quarter of studied students had high self-care behaviors at the pre-intervention phase. Following the intervention, this proportion increased to more than half of the students at post-intervention phase and further increased at the follow-up phase. These findings indicated that Nola Pender's model was effective in enhancing students' adoption and maintenance of appropriate self-care strategies for managing dysmenorrhea. The results confirm that this approach provides a solid foundation for designing nursing strategies focused on physical, emotional, and social well-being. According to Rojas-Torres et al. (2025), the educational intervention based on Nola Pender's Health Promotion Model was linked to improvements in the participants' adoption of healthy lifestyles.

The results of the present research clarified that there was a highly statistically significant positive correlation between the total

knowledge score and the total scores of health-promoting lifestyle and dysmenorrhea self-care strategies among the studied students, at post-intervention, and follow-up phases ($p \leq 0.001$). This indicates that higher levels of knowledge were associated with better engagement in health-promoting behaviors and more effective self-care strategies. The positive correlation reflects that as students' knowledge improves their ability and motivation to adopt effective health-promoting and self-care strategies also increase across all phases of the study.

The findings indicated a substantial improvement in the participants' understanding of dysmenorrhea and strategies for managing menstrual pain. Knowledgeable students are more likely to implement effective self-care strategies, including the use of appropriate pain relief methods, heat application, regular exercise, and balanced nutrition. These practices contribute directly to reduced uterine contractions and prostaglandin activity, thereby decreasing pain intensity and improving menstrual characteristics such as duration, regularity, and flow. Meanwhile, a highly statistically significant negative correlation was observed between the total knowledge score and the total scores of dysmenorrhea severity domains across all study phases), suggesting that increased knowledge was associated with improved menstrual patterns and reduced severity of dysmenorrhea. Improved knowledge enables students to better understand the physiological nature of menstruation and the factors that may aggravate dysmenorrhea, such

as stress, poor diet, lack of physical activity, and unhealthy habits. With this awareness, students are more likely to avoid triggering factors and adopt preventive measures, which can lead to milder symptoms and more regular, healthier menstrual patterns.

The results of the present research clarified that there was a highly statistically significant negative correlation between the health-promoting lifestyle scores and the total scores of dysmenorrhea severity among studied students across the pre-intervention, post-intervention, and follow-up phases. This finding indicated that higher engagement in health-promoting lifestyle behaviors was associated with improved severity of dysmenorrhea.

This relationship can be explained by the direct physiological and psychological benefits of a healthy lifestyle. Students who adopt health-promoting behaviors such as balanced nutrition, regular physical activity, adequate sleep, and effective stress management tend to experience improved hormonal balance and reduced prostaglandin production, which plays a key role in the development of menstrual pain. As a result, the intensity of dysmenorrhea decreases.

The results of the present research revealed that there was a highly statistically significant negative correlation between the total dysmenorrhea self-care strategies score and the total scores of dysmenorrhea severity domains among the studied students at pre-intervention, post-intervention, and follow-up phases.

This finding indicates that higher levels of engagement in dysmenorrhea self-care strategies, the less severity of dysmenorrhea. This relationship can be explained by the effectiveness of appropriate self-care strategies in managing menstrual pain and improving menstrual health. Students who practised proper self-care strategies such as applying heat therapy, engaging in regular physical activity, maintaining adequate rest, and use of analgesics correctly were more likely to experience reduced uterine muscle tension and decreased prostaglandin levels, which are key contributors to menstrual pain.

Conclusion

Applying Nola Pender's Health Promotion Model was associated with positive changes in improving knowledge, decreased level of dysmenorrhea severity, and adopting healthy lifestyle and satisfactory self-care strategies among the students. Prior to intervention, many students had inadequate knowledge, experienced severe menstrual pain, and engaged in less satisfactory health care behaviors and self-care strategies. However, post-intervention results demonstrated statistically significant improvements across all measured variables. The results of the present research clarified that there was a highly statistically significant negative correlation between total dysmenorrhea self-care score and the total scores of dysmenorrhea severity domains among the studied students across the pre-intervention, post-intervention, and follow-up phases. Therefore, the research hypotheses were supported,

and the research aim was successfully achieved.

Recommendations:

It is recommended that Nola Pender's Health Promotion Model be integrated into routine nursing care for adolescents to guide the planning, implementation, and evaluation of effective interventions aimed at promoting healthy lifestyles and self-care strategies. In addition, individualized care plans focusing on enhancing self-efficacy, perceived benefits, and commitment to self-care behaviors should be developed to support effective management of dysmenorrhea. Continuous health education sessions addressing menstrual health and evidence-based self-care strategies are also essential for adolescents to improve awareness and coping skills. Furthermore, future longitudinal and multicenter studies conducted in diverse settings are recommended to enhance understanding of cultural influences and to evaluate the long-term effectiveness of Nola Pender's Health Promotion Model.

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