▪ ***Basic Research***

Effect of Transcutaneous Electrical Nerve Stimulation Device on Pain Intensity among Female Students during Primary Dysmenorrhea

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Abstract

Background: primary dysmenorrhea is characterized by cramping, dull, and throbbing pain in the lower abdomen. The device of transcutaneous electrical nerve stimulation (TENS) is one of the non-pharmacological approaches to stimulate the nerves for therapeutic purposes. The gate control theory and the release of endogenous morphine are at the core of TENS' effect on primary dysmenorrhea. **Aim:** The study aimed to evaluate the effect of the Transcutaneous Electrical Nerve Stimulation device on pain intensity among female students during primary dysmenorrhea. **Research design:** A quasi-experimental study design was applied. **Research setting:** The study was performed in the medical clinic at Gulf Colleges, Hafr Al Batin Governorate, Saudi Arabia. **Sampling:** A purposive sample comprised of 100 students. They were assigned randomly into two different groups (50) the active TENS group (study group), and (50) for TENS placebo group (control group) **Tools:** three tools to collect data: **Tool (I)**: socio-demographic and menstrual characteristics, **Tool (II)**: dysmenorrheal pain profile, **Tool (III)**: Visual Analogue Scale (VAS). It was used to measure the intensity of pain for both groups. **Results**: There was a statistically significant difference found among students of the study group after the intervention, where (P-value<0.0001). Moreover, another high significant difference was also detected among students of the study group after the first and second months of intervention about their intensity of dysmenorrheal pain where (P-value=0.000). **Conclusion:** TENS is a non-pharmacological method for reducing the severity of pain and symptoms associated with primary dysmenorrhea. **Recommendations:** TENS should be advocated as a non-pharmacological method for the treatment of primary dysmenorrheal pain.

Keywords: Primary dysmenorrhea, Tans-Cutaneous Electrical Nerve Stimulation, non-pharmacological, menstruation.

1. Introduction

Menstruation is generally associated with discomforts and pain. One of them is dysmenorrhea; It's a common gynecologic complaint and one of the most important unresolved issues in adult females **(Kamel, et al,2017)**. The term 'dysmenorrhea' is a word that comes from the Greek meaning painful menstruation. It is characterized by pain, cramping, dullness, throbbing, and lower abdominal discomfort. Dysmenorrheal pain affects 40 percent to 90 percent of adolescents and adult females, depending on their age, residence country, and residence. Pain is defined as "an unpleasant sensory and emotional experience resulting from actual or potential tissue damage" by the International Association for the Study of Pain (IASP). In recent literature, the importance of pain has been emphasized, and it is now recommended as the fifth vital sign **(Cheng, 2014)**.

Dysmenorrhea can be classified into primary and secondary dysmenorrhea. Primary dysmenorrhea (spasmodic) is an excruciating menstrual period marked by lower-abdominal cramping **(Muragod, et al.,2017)**. The earliest appears shortly following menarche (1-2 years) when ovulatory menstrual cycles have been produced and occurs just earlier and/or throughout menstruation. It usually starts in adolescence, occurs in an adult female with typical pelvic anatomy, and lasts for only a few years when 30 years with no macroscopically pelvic pathology, while in secondary dysmenorrhea (congestive) a macroscopically obvious pelvic pathology such as uterine fibroids, endometriosis and Pelvic inflammatory disease (PID) **(López-Liria, et al.,2021) & (Mistry, et al, 2015)**.

Increased production of uterine prostaglandins causes primary dysmenorrhea. In many girls and an adult female with normal gynecological findings, vasoconstriction in small uterine arteries and endometrial ischemia occurs as a result of hormonal changes and vegetative factors at the end of a menstrual cycle, resulting in excessive prostaglandin synthesis in endometrial cells. Prostaglandins have a local effect on the uterus, causing painful uterine contractions during menstruation and can be severe cramps in the pelvic area which are called spasmodic or congestive that accompanied by deep and dull aches. Prostaglandins can produce common symptoms such as loss of appetite, irritability, depression, headache, nausea, vomiting, diarrhea, urinary frequency, and lethargy. The main complaint during dysmenorrhea is pain in the lower abdomen radiating to the hips, lower back, or thighs. The pain generally begins just for the period of their menstrual and after twenty-four hours and then disappears away after two to three days **(Gabyzon &Kalichman, 2020)**.

Pain management in primary dysmenorrhea is one of the major goals of maternity care, as with any other type of care. Two types of management of primary dysmenorrheal pain are medical and

midwifery approaches **(Parsa, &Bashirian, 2013)**. The medical model adopts pharmacologic methods of pain relief, such as Non-steroidal anti-inflammatory drugs (NSAID), and pills for oral contraceptives. The midwifery approach indicates to non-pharmacological model for instance exercises, Heat/cold application, and TENS device. TENS is electromagnetic therapy in which electromagnetic energy is used to diagnose or treat disease. Electrical stimulation is among the most well-known and effective physiotherapy techniques **(Melzac, & Katz, 1994)**.

TENS device has been applied to treat discomfort or pain as in cases of primary dysmenorrhea. The effectiveness of TENS' is established on the gate control theory and the release of endogenous morphine. Skin stimulation led to the antidromic stimulation of sensory nerve fibers by the TENS device resulting in a significant increase in skin blood flow. TENS' effects decrease the uterine muscle ischemia by increasing blood movement to the conforming skin area in primary dysmenorrhea **pain (Armour, et al, 2019) & (Zhao, et al, 2021)**.

The treatment time for the TENS device should be kept short less than thirty minutes the first time for a proper assessment and feel the tingling sensation pass through the skin and monitor any adverse reactions. TENS device can be used for up to one hour at a time after the initial treatment and advised by the professional as a maximum treatment period **(Shaban, 2011)**.

The role of the midwife in dysmenorrheal pain management is like in any other care and it is one of the main objectives of gynecologic care. Midwives have an important responsibility to safeguard adolescent health. They should offer guidelines and interventions that may be used either as a total pain management program or to complement pharmacologic interventions. These include physical or psychological activities to improve the quality of life for adolescent females and coping abilities in their lifestyles. They also increase relaxation and pain threshold by cutting the pain – fear-tension cycle. These methods consist of a wide range of techniques to not only deal with pain's physical manifestations but also avoid suffering by improving its psychological and spiritual aspects. **(Shaban, 2011) & (Muragod, et al.,2017)**.

2. Significant of the study:

Primary dysmenorrhea pain leads to loss of function and activity, as well as a change in social roles, and reduces the quality of life. The TENS device is frequently used by healthcare specialists i.e.: physicians, midwifery, obstetric and gynecologic doctors, nurses, and physiotherapists or pharmacists. Additionally, at the house by adult females and patients themselves. It is applied as an assistant or alternative treatment of pain **(Gabyzon &Kalichman, 2020)**. Researchers who studied TENS devices are so inadequate thus this study was designed to examine the effect of TENS devices on pain intensity in primary

dysmenorrhea to be a starting point to use such data for those who are concerned in carrying out further study in this regard **(Mistry, et al,2015)**.

3. Aim of the Study:

This study aims to evaluate the effect of Transcutaneous Electrical Nerve Stimulation device on pain intensity among female students during primary dysmenorrhea. This aim was accomplished through:
1-Assess the pain level before intervention.
2- Applying active TENS device versus placebo methods for reducing primary dysmenorrhea pain.
3-Evaluate the effect of TENS implementation on primary dysmenorrheal.

4. Research hypothesis

Female students who receive an active Trans-Cutaneous Electrical Nerve Stimulation device (TENS) during primary dysmenorrheal pain exhibit less dysmenorrheal pain intensity than those who receive TENS placebo intervention.

Operational definition:

- The TENS placebo implementation in this study refers to applying the TENS device in off-mode electrodes in both directions of the vertebral column while dysmenorrhea pain is present.

5. Subjects and Methods

5.1.Research design

A quasi-experimental study design was applied to realize the current study aim.

5.2.Research setting

An intervention study was performed in the medical clinic at Gulf Colleges, Hafr Al Batin Governorate, Kingdom of Saudi Arabia (KSA).

5.3.Sampling and Population

- The samples included a purposive sample of 100 students at Gulf Colleges from different stages in college and were selected from 10% of the overall students who had primary dysmenorrhea in the previously mentioned setting.
- The inclusion criteria for the sample were: student female aged from 19-25, regular menstruation, not following a special diet regimen, primary dysmenorrhea, healthy (free from any diseases), not taking any drugs or methods for pain relief, and not using any complementary or alternative therapies. Participants were randomly assigned to two groups: 50 participants in the active TENS group (study group), and 50 participants in the TENS placebo group (control group). We measured

the intensity of dysmenorrheal pain for the two groups three times, once before a menstrual cycle and twice after a TENS treatment, using a visual analogue scale.

As shown below, the sample size was determined by the formula **(Oostendorp & Huijbregts, 2011)**. Wherever: n=sample size, N=population size (133), e=Margin of errors which s±5%.

$$n = \frac{N}{1 + N(e)^2} \qquad n = \frac{133}{1 + 133x0.0025} = 100$$

5.4.Tools of data collection:

This study collected data using three tools:

5.4.1. Tool I: Socio-Demographic and menstrual characteristics Questionnaire

The information collected includes age, weight, BMI, height, telephone number, and what's up number. Detailed information includes the age of menarche, period intervals, menstrual length, patterns, intervals, menstrual flow, and sanitary products used **(Yu, et al, 2021) & (Wang, et al, 2009)**.

5.4.2. Tool II: Dysmenorrheal pain profile: The data in this part include information regarding the onset of dysmenorrheal pain, perception of pain, nature of pain, location of pain, pain symptoms, measures to relieve pain, and pain sites (lower abdomen, lower back, and pain radiating to the lower back and inner thigh (**Shaban, 2011)**.

5.4.3. Tool III: Visual Analogue Scale (VAS): This tool was adopted from (**Melzack & Katz, 1994)**. It is a subjective self-reported device used to assess pain intensity. The scale is ten points with a horizontal straight line of 10 cm between zero and ten. By placing a mark on the line and measuring the intensity of pain in cm, the student evaluates the pain intensity. In two consecutive menstrual cycles, this tool was used twice before and twice after the TENS device application.

Scoring system: There is no pain (0), Mild pain (1–3cm), moderate pain (4–6cm), severe pain (7–9cm), and finally unbearable pain (10cm) are the four levels of pain.

5.5.Field Work:

The current study lasted one year, from January 2020 to 2021. Data were collected from the medical clinic in Gulf colleges for four hours a day. Telephone calls & What's App messaging were used as a direct method of contact with the students. This is to address and follow up on any problem related to the application of TENS. The average time required to achieve the tools for both groups ranged between 2 to 4 hours, depending on the degree of understanding, cooperation, and theresponse of the student. To prevent contamination of the sample, a control group was established and completed before starting the

study group. A handout about TENS devices with an explanation of its (definition, action, advantages, disadvantages, precautions, placing the electrodes on the pain site, and duration of treatment).

5.6.Methods of data collection:

5.6.1. Preparatory phase:

The first author earned an official certificate (knowledge and practice) from The Open Academy of Complementary Medicine after training for 50 hours. Approval for data collection was taken from the director of the Scientific Research Committee Counsel and Gulf Colleges for conducting the study. Once approval was granted, the researchers began collecting data and implementing it in the session. Training sessions were conducted by the researchers and a re-demonstration was carried out by every student under the supervision of the researchers to be sure that the students will perform it safely and accurately for two consecutive menstrual cycles.

5.6.2. Implementation phase:

1. The first session, an overview of TENS implementation and a pretest of female knowledge and practice.

2. In the following session the subjects were provided a booklet about TENS with a clarification of its (definition, action, advantages disadvantages, precautions, positioning of the electrodes on the pain site, and length of treatment).

3. TENS application was done by the female students and observed by the researcher (1st author).

4. The females were personally interviewed to collect the essential data from both groups using a tool I as well as female privacy was considered.

5. Two tools (I&II) were applied three times. Firstly in both groups before using TENS, secondly after two menstrual cycles in a row to confirm that it affects.

6. Participants were equally distributed into two groups (**Group 1**: active TENS Group, 50 females, and **Group 2**: Placebo TENS Group, 50 students.

7. Group I, the active group a TENS device was placed near the students 5 cm apart on the right and left sides of the vertebral column at the level of the tenth thoracic vertebra (T10) to the lumbar vertebra 1 (L1). The lower electrodes were placed between the second and the fourth sacral nerves. The electrical

pulse was begun at a frequency of 100-150 hertz. The electrical current was increased gradually until the student felt a pleasant tingling sensation.

8. Group II, TENS device placebo group, the electrodes were used on the right and left sides of the vertebral column at the level of the tenth thoracic vertebra (T10) to the lumbar vertebra 1 (L1) The lower electrodes were placed between the 2^{nd} and the 4^{th} sacral nerves. The TENS device was turned off (there is no electric current production).

5.6.3. Evaluation phase:

Applying tool III (VAS) for both groups, the intensity of dysmenorrheal pain was assessed three times, once before and twice after TENS implementation over two menstrual periods. Each female was asked to do a mark on the line showing how much pain they thought they were experiencing. During dysmenorrhea, TENS was applied for ten minutes (as the lowest amount) to thirty minutes (as an upper limit) three times per day.

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5.7.Content validity

Tools examine for the relevance of items by an expert panel to assure content and shape validity and then the study pilot was conducted for 13 females that represent 10% of the sample, to estimate the applicability of the collecting data technique .According to the findings of the pilot study, tool items were altered to be clearer for the study sample, as well as consideration points, were organizing the same period & the data collection approach was changed.

5.8.Pilot study

In a pilot study, a 10% sample of the overall sample size was used (13 students) to assess the efficiency and content validity of the tool, to get the possible difficulties and problems that may be faced in data collection, and to test the study process. Females involved in the pilot were excluded from the sample to prevent sample contamination.

5.9.Administrative Design and Ethical Considerations:

An official document was taken from the Department of Hospitals and Health Services Administration Counsels and the Scientific Research Ethical Committee. The approval comprises the title, the study aim, and the TENS training certificate. It was directed to take permission to collect data from the medical clinic in Gulf Colleges. The approval was redirected to the executive principals in the Counsel of scientific research and Gulf Collages to take approval to collect data. The written informed consent was obtained after clarification of the research purpose. Each of those who agree to participate in the study was assured of their confidentiality, privacy, and the right to withdraw at any time.

5.10. Statistical design:

The data was collected, analyzed, and tabulated after being reviewed and prepared for computer entry. The SPSS 22.0 statistical software package and the Microsoft Excel program were used for analysis. For qualitative variables, frequencies and percentages were used as descriptive statistics, while for quantitative variables, means were used. Using chi-square to verify the relationship between qualitative data. Statistical significance difference was assessed.

5.11. Results

Table (1): shows that the mean female student's age was (21.5 ± 8.5& 22.3 ± 9.3) years in the active TENS & TENS placebo group. The majority (70% & 72%) of them were normal weight in both groups respectively.

Table (2): represents that (76%& 78 %) of the active TENS group and TENS placebo groups respectively stated that the period began at 9 - <12 years. The duration of menstruation from (4-6 days) for the active TENS and TENS placebo groups were (60% &64%). (72% and74%) of both groups respectively were menstrual intervals from 25 - 28 days.

Table (3): demonstrates the dysmenorrheal pain profile in the active TENS group & TENS placebo group. It was observed that almost (42% &44%) respectively informed that the pain takes place after six months from the beginning of the 1st menses. (44%& 46%) of both groups reported that the pain starts with the menses and continues for 2-4 days. Two-thirds (64 % & 66%) of both groups respectively had intermittent and sharp spasms. (82 % & 84%) reported lower abdominal pain radiates to the lower back and inner thigh in both groups respectively.

Table (4): shows previous methods used by females to relieve primary dysmenorrheal pain, it was observed that (78% and 80%) were analgesia treatments in the active TENS & placebo groups respectively. While non-pharmacological techniques (92%, and 90%) were hot drinks in both groups respectively.

Table (5): illustrates that, a highly statistically significant difference in the active TENS group & the TENS placebo group regarding their sites of pain before and after the application, where (p-value= 0.000).

Table (6): indicates that the dysmenorrheal pain intensity for both groups before the application had almost similar intensity. After the 1st and the 2nd months of intervention, unbearable pain reduced sharply from 10% to 0% in the active TENS group, while it diminished from 10% to 5% among the placebo

group. Severe pain also decreased sharply from 60% to 0% in the active TENS group, while it slightly decreased from 62% to 58% among the placebo group.

5.12. Tables:

Table (1): Socio-demographic characteristics of the studied sample (n=100).

Socio-demographic characteristics	Active TENS Group		Placebo TENS Group		F / χ^2 (P)
	No (50)	%	No (50)	%	
Age in (years)					1.59 (00.27)
19 - <21	8	16.0	6	12.0	
21 - <23	35	70.0	36	72.0	
23- 25	7	14.0	8	16.0	
Mean ± SD	21.5 ± 8.5		22.3 ± 9.3		
Height (Cm)					3.17 (1.12)
<150	3	12.0	3	12.0	
150- <155	20	40.0	19	38.0	
155-<160	24	48.0	26	52.0	
>160	3	12.0	2	4.0	
Mean ± SD	155.0 ± 12.5		156.6 ± 11.64		
Weight (Kg)					3.08 (0.02) *
<49	2	4.00	1	2.0	
50-59	21	42.0	23	46.0	
60-69	15	30.0	13	26.0	
70-79	8	40.0	9	18.0	
>80	4	8.0	4	8.0	
Mean ± SD	62. 4 ± 5.30		64. 3 ± 4. 59		
Body mass index					1.99 (0.18)
-Underweight = <18.5	2	4.0	1	2.0	
-Normal weight = 18.5–24.9	35	70.0	36	72.0	
-Overweight = 25–29.9	7	14.0	8	16.0	
-Obesity = BMI of 30 or greater	6	12.0	5	10.0	
Mean ± SD	22.4 ± 14.2		23.7 ± 15.8		

χ^2 (P): Chi-Square Test &P for χ^2 Test
F (P): Fisher Exact test &P for F Test
*: Significant at P ≤0.05

Table (2): Menstrual history and characteristics of the studied sample (n=100).

Menstrual history and characteristics.	Active TENS Group		Placebo TENS Group		F / χ2(P)
	No (50)	%	No (50)	%	
Age of menarche (year)					16.75
- 9 - <12	38	76.0	39	78.0	(0 .197)
- 12- < 15	12	24.0	11	22.0	
Mean ± SD	12.9 ± 5.11		13.18 ± 6.5		
Menstrual duration (days)					0.153
2-3	13	26.0	12	24.0	(0.928)
4-6	30	60.0	32	64.0	
7-8	7	14.0	6	12.0	
Mean ± SD	5.15 ± 1.450		4. 3 ± 1.538		
Menstrual interval (days)					
- < 25 day	9	18.0	7	14.0	11.50
- 25 - 28	36	72.0	37	74.0	(0.778)
- >28 day	5	10.0	6	12.0	
Menstrual flow (bleeding amount)					0.060 (0.819)
- **Mild**	8	16.0	7	14.0	
- Moderate	35	70.0	38	76.0	
- Heavy	7	14.0	5	10	
Mean ± SD	34.1 ± 1.547		35. 8 ± 1.657		
Sanitary towels (Number of pads)					
- Mild (2 pads daily)	4	8.0	**6**	**12.0**	4.28
- Moderate (3-4 pads daily)	36	72.0	38	76.0	(0 .122)
- Severe (> 4 pad daily)	10	20.0	6	12.0	

χ^2 (P): Chi-Square Test &P for χ^2 Test
F (P): Fisher Exact test &P for F Test
*: Significant at P ≤0.05

Table (3): Dysmenorrheal pain profile before the intervention of the studied sample (n=100).

Dysmenorrheal pain profile	Active TENS Group		Placebo TENS Group		F / χ^2 (P)
	No (50)	%	No (50)	%	
Beginning of dysmenorrheal pain					
-Beginning with menarche	9	18.0	10	20.0	0.498
-After 1st menses 6 month	21	42.0	22	44.0	(0.923)
-After 1st menses 1year	18	36.0	16	32.0	
-After 1st menses 2year	2	4.0	2	4.0	
Perception of pain					
-Begin from 1 day or nearly before the period	8	16.0	8	16.0	0.159 (0.937)
-Through the starting of the period and continues for 2 days.	20	40.0	19	38.0	
-Begin before the menses and last 2-4 days	22	44.0	23	46.0	
Nature of Pain:					
Colicky	18	36.0	17	34.0	0.268
An intermittent, sharp spasm	32	64.0	33	66.0	(0.618)
# Site of pain:					
-Pain centered in the suprapubic area	35	70.0	36	72.0	0.649
-Lower abdomen and lower back	30	60.0	28	56.0	(0.737)
-Lower abdomen radiates to the lower back and inner thigh.	41	82.0	42	84.0	
# Pain can be accompanied by:					0.537
- Nausea &vomiting	31	62.0	33	66.0	(0.765)
- Fatigue, fever &headache	39	78.0	40	78.0	
- Diarrhea	25	50.0	29	50.0	

#More than one answer

χ^2 (P): Chi-Square Test &P for χ^2 Test
F (P): Fisher Exact test &P for F Test
*: Significant at P ≤0.05

Table (4): Previous methods used to relieve dysmenorrhea of the studied sample (n=100).

Methods of pain relieve	Active TENS Group (No= 50)	%	Placebo TENS Group (No= 50)	%	^{MC}P
# Pharmacological Methods:					
Sedative	20	40.0	22	44.0	**^{MC}P = 0.851**
Analgesics	39	78.0	40	80.0	
NSAIDs (Nonsteroid anti-inflammatory drugs)	15	30.0	17	30.0	
Oral contraceptives	16	32.0	18	32.0	
MEAN ± SD	22.5 ± 8.8		23.5 ± 9.1		
t (P)	**0.001 (0.998)**				
# Non-pharmacological Methods:					
Alternative treatments or Herbal remedy	30	60.0	33	66.0	**^{MC}P = 0.913**
TENS	0	0.0	0	0	
Hot bath	35	70.0	38	76.0	
Hot drinks	46	92.0	45	90.0	
Exercises	10	20.0	8	16.0	
MEAN ± SD	73.3 ± 8.3		74.5 ± 7.8		
t (P)	**0.70 (0.496)**				

^{MC}P: Monte Carlo exact probability

#More than one answer

Table (5): The mean sites of pain relief before and after the intervention of the studied sample (n=100).

# Pain relief	Active TENS Group (No= 50)		Placebo TENS Group (No = 50)		T-test (P) Before intervention	T-test (P) After intervention
	Before intervention	After intervention (1&2 month)	Before intervention	After intervention (1&2 month)		
	Mean ± SD	Mean± SD	Mean ± SD	Mean ± SD		
Pain centered in the suprapubic area	90.56 ± 9.213	70.90 ± 3.174	89.18 ± 8.691	80.08 ± 6.258	**2.453 (0.017) ***	**17.657 (0.000)***
T-test (P)	6.245 (0.000) *		8.924 (0.000) *			
Lower abdomen and lower back	108.75 ± 12.504	120.38 ± 14.310	109.50 ± 11.435	113.00 ± 6.425	**0.094 (0.927)**	**3.598**

						(0.001)*
T-test (P)	4.038 (0.000) *		1.694 (0.095)			
Lower abdomen radiates to the lower back and inner thigh.	22.93± 2.303	16.98± 1.993	20.25 ± 2.658	19.95 ± 2.450	**1.224 (0.226)**	**12.928 (0.000)**
T-test (P)	6.127 (0.000) *		8.207 (0.000) *			

#More than one answer

Table (6): The intensity of dysmenorrheal pain using VAS before and after TENS device application (n=100).

Dysmenorrheal pain intensity by VAS	**Before TENS application**				**After TENS application (1 month)**				**After TENS application (2 months)**			
	Active TENS group(G1)		**Placebo TENS Group (G2)**		**Active TENS group(G1)**		**Placebo TENS Group (G2)**		**Active TENS group(G1)**		**Placebo TENS Group (G2)**	
	No (50)	**%**	**No (50)**	**%**	**No (50)**	**%**	**No (50)**	**%**	**No (50)**	**%**	**No (50)**	**%**
No pain (zero)	0	0.0	0	0.0	18	36.0	0	0.0	30	50.0	0	0.0
Mild pain (1 – 3 cm)	0	0.0	0	0.0	22	44.0	0	0.0	15	46	2	4.0
Moderate pain (4 – 6 cm)	10	20.0	9	18.0	8	16.0	15	30.0	5	4.0	14	28.0
Severe pain (7 – 9 cm)	30	60.0	31	62.0	2	4.0	29	58.0	0	0.0	29	58.0
Unbearable pain (10cm)	10	20.0	10	20.0	0	0.0	6	12.0	0	0.0	5	10.0
F/ χ^2 (P)	0.299 (0.863)				36.351 (<0.0001) *				36.353 (<0.0001) *			
χ^2 (P) before and after (one month) and (two months) for studied groups 41.986 (0.000)*												

Discussion

TENS device has the benefit such as a non-invasive, inexpensive, and easily applicable technique **(Arik, et al.,2022)**. According to the results of the present study, it can be noticed that a sizable percentage of both groups were menstrual duration from four to six days. On asking about the nature of pain, it was noticed that about three-quarters of active TENS and Placebo Groups had cramps, while the vast majority reported lower abdomen pain and the pain starting before the period and lasting 2-4 days. There was a high statistically significant difference was discovered between them after TENS intervention when determining the VAS score for dysmenorrheal pain.

The current result is supported by (**Yu, et al, 2021)** & (**Shaban, 2011)**. They discovered no association between primary dysmenorrhea and the body mass index of students, and most of the students had regular menstruation. Also, they mentioned that dysmenorrheal pain starts with menarche in almost half of them in both groups at the start of their periods and continues for 48 hours with abdomen and back pain. This may be due to dysmenorrhea occurring commonly in the first or second and third cycle after menarche. Moreover, conforms with **(Paley, et al 2021) & (Carroquino, et al,2019)**. Who confirmed that dysmenorrheal pain began in the menarche with pain in the lower back and abdomen in more than half of the study participants. Also, they usually lasted one to three days. Also agree with the result of **(Rodrigues, et al, 2007)**. who discovered that pain in dysmenorrhea began just hours after menstruation began and peaked as flow became the strongest during the early two days of the menstrual cycle.

In recent years, the expansion of knowledge in every aspect of pain has aided in the categorization and treatment of primary dysmenorrhea. According to numerous studies, increasing prostaglandin production and release in teenage girls is what causes primary dysmenorrhea. Before the start of the period, prostaglandins become more concentrated in the uterus, which contains an abundance of smooth muscle stimulators **(Yan, et al.,2017) & (Xie, et al., 2022)**. Prostaglandins are released in the uterus at the end of the monthly cycle, which causes the uterine smooth muscles to contract as the uterine lining begins to separate and shed. These contractions pinch the uterine blood vessels, reducing uterine blood flow and oxygen, and aggravating the pain. The prostaglandin is released into the menstrual flow with the onset of the menstrual flow, which explains why the painful symptoms that go along with it tend to lessen after the first few days of the period **(Tu &Hellman, 2021)**.

The current finding generally agrees with the survey **(Muragod, et al, 2017)**. who discovered a VAS difference that was statistically significant for both groups. Additionally, it is consistent with studies by **(Shah, 2015)**. They concluded that both High and Low-frequency TENS are efficient at managing dysmenorrhea and pain. Additionally, it generally concurs with the research done by **(Heggannavar, et al, 2015)**. who discovered that TENS therapies effectively reduced pain, had analgesic effects, and helped the subjects' functional abilities.

Additionally, the present finding agreed with the report **(Parsa& Bashirian, 2013)**. Who discovered that pain intensity was significantly reduced in the TENS group when compared to the placebo group. In total, another literature review by **(Naka, et al,2013)**. They deal with various painful conditions, and they noticed an analgesic outcome was observed because of the study's design, but the results were inconclusive.

Also, agree with the finding of (**Wang, et al, 2009)**. Who noticed that pain intensity in the active TENS group is significantly reduced than in the placebo group. Moreover, the present finding agrees with those **(Patel, 2016)** who stated after assessing the pain by VAS displayed a significant difference between active TENS and Placebo and recommended that applying a TENS device for 3 days before or during the menstrual cycle is active in reducing pain.

On the contrary, the current result disagrees with the report by (**Santina, et al, 2012)** who stated that one-third of the respondents described having irregular menstrual periods. Also, the current findings not agreed with (**Unsal, et al, 2015)** informed that primary dysmenorrhea was high statistical significance in females with low body mass index. This may be because of a change of lifestyle &dietary habits. The evidence from different findings continues to support the use of the TENS device as a non-pharmacological approach for the treatment of a vast majority of painful conditions. Additionally, the current finding contradicts (**Mistry, et al,2015)** finding that VAS grades were not statistically significant. The two groups experienced similar levels of pain relief. This discrepancy could be the result of TENS device misuse or ineffective technique. Also, because of the inclusion criteria in the existing findings. This discrepancy may be attributable to changes in psychological &nutritional considerations between participants of the studies.

Abbreviations

TENS: Transcutaneous electrical nerve stimulation.
VAS: Visual analogue scale.
NSAID: Non-steroidal anti-inflammatory drugs.

Conclusion: ***The present study findings concluded that:***

- The result supported research hypotheses. The active TENS device is the most effective non-pharmacological approach for reducing pain intensity and symptoms associated with primary dysmenorrhea.
- TENS application during menstruation seems to have a beneficial effect on lowering the intensity of primary dysmenorrheal pain.

Recommendations

1. Counseling program should be developed for students about the treatment of primary dysmenorrhea by TENS.
2. Further research is still required to be examining the consequence of TENS devices on women suffering from common gynecologic problems.

3. TENS should be reinforced as a non-pharmacological approach for treating the pain in primary dysmenorrhea.

Limitations of the study:

- Afraid of the machine although after explanation and re-demonstration such as short circuit, more discomfort.
- Unable to distinguish between pain during menstruation and provide true results about TENS.

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الملخص العربي

تأثير استخدام جهاز التحفيز العصبي الكهربائي (تنس) عبر الجلد على شدة الألم لدى الطالبات أثناء عسر الطمث الاولي.

المقدمة: يتميز عسر الطمث الاولي بالألم والتشنج والخفقان وعدم الراحة أسفل البطن. ويصنف عسر الطمث إلى عسر الطمث الأولي والثانوي. وجهاز التحفيز الكهربائي للأعصاب عبر الجلد هو أحد الأساليب غير الدوائية لتحفيز الأعصاب للأغراض العلاجية في عسر الطمث الأولي.

الهدف من الدراسة: تقييم تأثير استخدام جهاز التحفيز العصبي الكهربائي (تنس) عبر الجلد على شدة الألم لدى الطالبات أثناء عسر الطمث الاولي.

فرضيات البحث: افترضت الدراسة الحالية أن:الطالبات اللائي يتلقين العلاج بالإستخدام النشط لجهاز التحفيز العصبي الكهربائي عبر الجلد (تنس) أثناء ألم عسر الطمث تقل شدة الالم عن أولئك اللاتي يتلقون تنس بالاستخدام الوهمي للعلاج.

تصميم البحث: تم استخدام تصميم شبه تجريبي لتلبية الهدف من هذه الدراسة.

عينه الدراسة: تم تضمين عينة هادفة من 100 طالبة من مستويات دراسية مختلفة بكليات الخليج في العام الدراسي 2020-2021 وتم اختيارهم من 10 ٪ من إجمالي الطالبات التي يعانين من عسر الطمث الأولي في الإعداد المذكور سابقًا.

أدوات الدراسة: استخدم الباحث في هذه الدراسة ثلاثة أدوات لجمع البيانات: آداة (I) : أسئلة عن البيانات الاجتماعية والديموجرافية والدورة الشهرية للطالبات. آداة (II) : تفاصيل عن آلام عسر الطمث. آداة (III) : المقياس التناظري المرئي أو البصري (VAS).

النتائج:أظهرت النتائج أن الطرق السابقة في تخفيف الآلام المختلفة التي تستخدمها الطالبات والأكثر شيوعًا لتخفيف آلام الدورة الشهرية هو المسكنات (78٪ و 80٪) في مجموعة تنس النشط والمجموعة الوهمية على التوالي. في حين أن أكثر الطرق الغير دوائية شيوعًا لتخفيف آلام الدورة الشهرية هي المشروبات الساخنة (92٪ و 90٪) في المجموعتين على التوالي.• أظهرت النتائج أن شدة آلام عسر الطمث لكلا المجموعتين قبل التدخل كان له نفس الشدة تقريبا بعد شهر أو شهرين من التدخل ، لكن انخفضت قوة الألم الحاد الذي لا يطاق من 10٪ إلى 0٪ بين مجموعة تنس النشطة ، بينما انخفض بشكل طفيف من 10٪ إلى 5٪ بين مجموعة الدواء الوهمي. انخفض الألم الشديد أيضًا بشكل حاد من 60٪ إلى 0٪ بين مجموعة تنس النشطة ، بينما في انخفض الالم في المجموعة الوهمية من 62٪ الى 58% بين الطالبات.

الخلاصة: وخلصت نتائج هذه الدراسة المدعومة بفرضية البحث أن جهاز التحفيز العصبي الكهربائي (تنس) عن طريق الجلد هو علاج غير دوائي أكثر فاعلية لتقليل شدة الألم والأعراض المصاحبة لعسر الطمث الاولي واستخدام جهاز تنس الجلد أثناء الحيض له تأثير إيجابي في تقليل شدة آلام عسر الطمث الاولي.

التوصيات:ونتيجة لهذه الدراسة أوصت أن:

1. يجب تطوير برنامج إسترشادي للطالبات حول العلاج الغير دوائي لعسر الطمث الأولي بواسطة تنس.
2. لا تزال هناك حاجة إلى مزيد من الابحاث لتقييم نتائج استخدام جهاز التحفيز العصبي الكهربائي (تنس) عن طريق الجلد على النساء اللائي يعانين من مشاكل أو أعراض لأمراض النساء الشائعة.

الكلمات الدالة: عسر الطمث الأولي ، التحفيز العصبي الكهربائي (تنس) ، طرق غير دوائية ، الطمث.