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EFFECTS OF ABDOMINAL STRENGTHENING EXERCISES WITH AND WITHOUT TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION IN PATIENTS WITH PRIMARY DYSMENORRHEA

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HIGHLIGHTS

- Primary dysmenorrhea is the most common gynecological problem. Many females fail to report in medical interview. In primary dysmenorrhea, pain occur in lower abdomen before or during menstruation.
- In this study, we determined the effect of abdominal strengthening exercises with and without transcutaneous electrical nerve stimulation in patients with primary dysmenorrhea.
- The study is partitioned into two groups, namely, Group A and Group B where each group contained 11 participants.
- A 6 weeks treatment session, with 3 treatment sessions per week were given to each participant.
- Results showed that abdominal strengthening with TENS is more effective than the abdominal strengthening exercises alone.

ABSTRACT

Primary dysmenorrhea is the most common gynecological problem. Many females fail to report in medical interviews, even when their daily activities are restricted. In Primary dysmenorrhea, pain occurs in the lower abdomen before or during menstruation without other underlying diseases like endometriosis, pelvic girdle diseases, etc. **OBJECTIVE:** In this study, we determine the effect of abdominal strengthening exercises with and without transcutaneous electrical nerve stimulation in patients with Primary dysmenorrhea. **MATERIAL AND METHODS:** Twenty-four females aged 20-30 were randomly assigned to group A (abdominal strengthening exercises with TENS) and group B (abdominal strengthening exercises). NPRS, WaLIDD, and ODI were used to measure pain and severity of symptoms. A 6 weeks treatment session, with 3 treatment sessions per week, was given to each participant.

RESULTS: Results showed that both treatment methods, abdominal strengthening exercises with TENS and abdominal strengthening exercises have the effect on pain relief. However, former showed significant improvement in pain and reduce clot formation as compare to later one. **CONCLUSION:** Combining abdominal strengthening exercises with Transcutaneous Electrical Nerve Stimulation (TENS) is more effective in terms of reducing pain intensity measured by numeric pain rating scale (NPRS), improving functional disability measured by Oswestry disability index (ODI), and enhancing the Women's Life Impact Due to Dysmenorrhea (WaLIDD) scale compared to using abdominal strengthening exercises alone.

KEYWORDS: Abdominal Muscle; Dysmenorrhea; NPRS; ODI; Pain; TENS; WaLIDD.
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INTRODUCTION

Primary dysmenorrhea (PD) is defined as pain that occurs before or during menstrual cycle in the lower abdomen, in the absence of other diseases such as endometriosis. PD usually occurs within three years of menarche at teenage age. It is

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however rare for symptoms to begin after menarche within the first six months. Females with PD may experience sharp, irregular spasms of pain that are typically concentrated in the supra-pubic region. Pain can be emitted to lower legs or back. Systematic PD symptoms can include nausea, vomiting, diarrhea, fatigue, fever, headache or lightheadedness. PD symptoms may co-occur with changes to the vasomotor causing pallor, cold sweats and occasional fainting. Rarely maybe associated with syncopation and collapse in grievous cases. Pain usually increases as the discharge becomes stronger during the first day or two of the process within hours of menstruation initiation and peaks. Aboushady and El-saidy study finding showed that the pain level usually lasts for a few hours, may last for 24 hours, but seldom continues after 48 hours. [1]

PD is a leading cause of dysfunction in many teenage females, resulting in emotional liability to focus on study or job, absenteeism from college or university, lack of engagement in educational tasks such as recreational activities. The two categories of dysmenorrhea: 1) PD which occurs when there is no distinctive pelvic pathology and tends to occur within 12 months after menarche: 2) Secondary dysmenorrhea is linked to and gives a clear impression of pelvic disease. Menarche is the beginning of menstrual phase's characteristic for the adolescent girls of a significant point in life. From infancy to adulthood transition period is an adolescence and is characterized by a squirt of physical, endocrine, impetuosity and cognitive development. Recent study has found that the incidence rate of PD in India was 69% in adolescent girls with dysmenorrhea, about 36% of whom had dysmenorrhea in young college students, was 48%. [2]

Pain customarily occurs inside the belly; it takes a few hours after menstrual initiation and rises at its height as the discharge becomes heavier during the first day of the cycle or two. The severity of pain usually curtains with few hours, and may extend to 24 hours but not often persist beyond 48 hours. [3] The majority of teenagers who are unable to focus on their jobs or studies, absenteeism, failure to carry out their school tasks, additional repetitive behaviors such as physical training or sports, are unable to overcome PD and therefore have a major effect in their daily activities. [4,5,6]

Physical exercises were suggested for primary premenstrual dysmorphic disorders to reduce the duration and extent of this disorder. In recent research evidences, young girls who exercise on daily basis had less physical discomfort, mental disorders, mood swings as compared to non-exercising girls. [7] There are several joint studies in which abdominal strengthening exercises and TENS are both used to independently decrease the severe symptoms of PD. [8,9.10,11,12,13,14]

METHODOLOGY

This study was a randomized clinical trial and registered in the Iranian randomized clinical trial *IRCT* 20191218045777*N* 1. The study was completed within 6 months and is conducted in Pakistan. The data was collected from three different centers, namely, 1: The Perfect Physio and Spine Care Center; 2: Asjad Clinic; 3: Minhaj Hospital Muzaffargarh by using convenient sampling technique. The data was collected on NPRS, ODI and WaLIDD and measure the pain, low back pain/symptoms severity and severity of dysmenorrhea, respectively, from each individual in this study. The sample of size 22 was calculated using G-power version 3.1.9.2 software with a study power of 0.80 and an error margin of 5% by taking mean. Considering 10% attrition rate, 11 participants in each group was recruited out of total 24 participants.

SAMPLE SELECTION:

The samples in each group are selected/rejected on the following criteria: Inclusion criteria: the individual in each group must be follow the following criteria for be including in the sample. 1: the individual must be female age between 20 to 30 years; 2: Nulliparous patients with symptoms of severe PD; 3: Pain must be periodic in nature; 4:

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Pelvic colic type of discomfort and pelvic cramps (beginning up to one day before menstruation and lasting for 3 days of bleeding); 5: After 2 to 3 years of menarche pain begins. Exclusion criteria: on the other hand, the following criterion are set to be exclusion the sample in each group. 1: Individuals suffering from pelvic inflammatory diseases such as fibroids and follicular cysts; 2: Chronic abdominal pain; 3: Irritable bowel disease (IBD); 4: Pelvic or abdominal surgery; 5: Patients enrolled into other studies that require drug intake or otherwise prevent compliance with protocol; 6: Individuals taking OCPs and having IUDs.

Randomization and Data Collection Procedure: By taking into consideration of the aforesaid inclusion and exclusion criteria, patients have been recruited in this research through convenient sampling technique and were randomly assigned to each group according to consort guideline 2010. Written informed consent was taken before enrollment into the study. After that patient were allocated either to Group A or Group B by lottery method. Data safety was ensured by assigning specific identify numbers and all consent forms, reading forms were placed in locker to blind assessors.

Study groups: The study is partitioned into two groups, namely, Group A and Group B where each group contained 11 participants and the treatments are carried on each group by follow:

Group A: Patients will receive abdominal strengthening exercises with TENS. Patients were asked to perform core/abdominal strengthening exercises (Pelvic Bridge, Abdominal Crunches, Cat and Camel), for 3 days per week, each session for 20 minutes up to 6 weeks. Each set of exercise was consisted of 10 repetitions and each repetition of exercise/position was held for 20 seconds. Rest interval after each set of exercise activity was of 5 minutes. The subjects will not perform any exercise during the menstrual cycle.

Group B: Patients will receive abdominal strengthening exercises without TENS. Patients were asked to perform core/abdominal strengthening exercises, for 3 days per week, each session for 20 minutes up to 6 weeks. Each set of exercise was consisted of 10 repetitions and each repetition of exercise/position was held for 20 seconds. Rest interval after each set of exercise activity was of 5 minutes. The subjects will not perform any exercise during the menstrual cycle. For details, see Fallah and Mirfeizi[15] and the references cited therein. The data were analyzed using SPSS and p = 0.05 set as the significance value. After assessing the normality by the Shapiro-Wilk test, the data were considered distributed normally. Frequency tables, histograms, and bar charts were used to show both groups' descriptive statistics summary. For between-groups changes: To show the progress of two groups in terms of objectives and subjective measurements, between groups change, and within groups, change was measured. An independent sample t-test was used for between groups, and for within groups changes, paired sample t–test was used to show the progress of the two groups.

CONSORT Flow Diagram

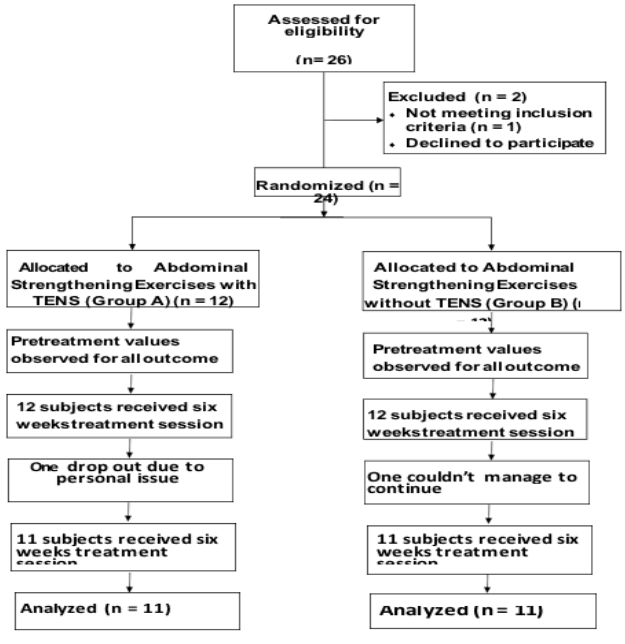

Figure 1: CONSORT Flow Diagram

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RESULTS

A total of twenty-two female participants with PD took part in the study. Out of total, eleven were placed in Group A and they were given treatment of abdominal strengthening exercises with TENS whereas remaining eleven participants were placed in Group B and they were given treatment of abdominal strengthening exercises only. The summary statistics about participants are given as follows:

Table 1: Comparison of socio-demographic variables of both groups

Variable	Group - A	Group - B	*p* value
Age	28.00 ± 1.26	26.64 ± 2.54	0.12
Weight	59.00 ± 4.38	59.73 ± 5.20	0.72
Height	05.34 ± 0.13	05.35 ± 0.15	0.87
BMI	23.09 ± 1.93	22.90 ± 1.38	0.78
Working Hours	06.00 ± 1.00	06.67 ± 1.00	0.17
Sitting Hours	04.11 ± 1.83	04.25 ± 1.67	0.87

p* value significant ≤ 0.05

The mean ± SD of each variable for both groups is given in Table 1. It can be seen that participants in Group A are slightly older than Group B. The rest of the variables are more or less same for both groups in terms of mean.

Table 2: Occupation of participants

Occupation	Frequency	Percentage
Beautician	1	4.50%
News Reporter	1	4.50%
Pharmacist	1	4.50%
Sports Officer	1	4.50%
Student	9	40.9%
Teacher	3	13.6%
Not Working	6	27.3%

Out of total twenty-two female participants one was beautician, one was news reporter, one was pharmacist, one was sports officer, nine were students, three were teachers, and six were not working ladies.

Table 3: Baseline measurement for NPRS, WaLIDD and ODI

	Group A		Group B		
Variable	Mean	SD	Mean	SD	*p* value
NPRS	08.09	0.70	08.27	0.65	0.53
WaLIDD	10.09	0.94	09.82	0.98	0.51
ODI	13.09	0.83	17.73	2.76	0.07

Table 3 summarized the comparison of pre-treatment characteristics between two groups. The scale NPRS mean score before treatment in abdominal strengthening exercises with TENS was 8.09 ± *0.7* in Group B was 8.27 ± 0.65. The mean score of WaLIDD scale before treatment in Group A was 10.09 ± 0.94 and in Group B was 9.82 ± 0.98. The mean score of ODI in Group A was 13.09 ± 0.83 and in Group B was 17.73 ± 2.76. The p value calculated through independent sample t-test (0.53, 0.51, and 0.07) shows the both groups were comparable in base line characteristics.

Table 4: Between-group analysis-comparison of the effectiveness of treatments

Variable	Mean	SD	Mean	SD	*p* value
NPRS	5.45	0.69	1.91	0.54	0.01*
WaLIDD	5.64	1.80	1.82	1.08	0.01*
ODI	9.73	1.01	3.64	1.01	0.01*

The improvement of both groups was compared with paired sample t-test. The p-value indicates

that significant difference is present in the improvement level in both groups. Moreover, improvement in Group A is significantly than Group B as we can clearly see that the mean values in Group A is greater than Group B.

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Table 5: Within group analysis

		Pretreatment		Post-treatment		Improvement		
		Mean		Mean		Mean Diff		*p* value
A	NPRS	08.09	0.70	2.64	0.50	5.45	0.69	0.01*
	WaLIDD	10.09	0.94	4.45	1.37	5.64	1.80	0.01*
	ODI	13.09	0.83	3.36	0.67	9.73	1.01	0.01*
B	NPRS	08.27	0.65	06.36	0.67	1.91	0.54	0.01*
	WaLIDD	09.82	0.98	08.00	1.41	1.82	1.08	0.01*
	ODI	17.73	2.76	14.09	2.30	3.64	1.43	0.01*

For within group analysis paired sample t-test was applied to compare the mean score of scales before and after treatment and p value showed that the treatment in both groups was significant in improving score of NPRS, WaLIDD, and ODI. However, the improvement in means of Group A is slightly greater than Group B. Hence, we can say that abdominal strengthening with TENS is more effective than abdominal Strengthening in patients with PD.

DISCUSSION

Menstruation is a natural sign of female fertility and pain in menstruation happens to every woman. But in early ages, the frequency of PD is high with a variation of symptoms from pain to faintness and syncope. Physical therapy has many modalities and interventions to treat dysmenorrhea and practicing widely. Abdominal muscles have a very important role in controlling dysmenorrhea but lack of awareness about strength training of abdominals leads many women to dysmenorrhea. The use of tens to control pain in physiotherapy is very common and its role is predefined in literature.

A study was conducted by Dawood and Ramos to check the effect of TENS which was compared with the placebo group and concluded that TENS showed significant improvement in pain and reduce clot formation. [3] TENS showed replacement of ibuprofen. So, it was a safe and effective method to control pain in dysmenorrhea. On the lines of Hashemi et al. present study also aimed to check the role of abdominal strengthening exercises alone without tens in one group and second group was given both TENS and abdominal exercises.[9] Paired t-test showed that both groups showed improvement in pain and disability. Result of present study showed that abdominal exercise reduced the symptoms of dysmenorrhea significantly and focuses on the importance of exercises of abdominal muscles. Pathogenesis showed that a huge number of prostaglandins released during menstruation, with this uterus contracted days-rhythmically and pressure is increased, as a whole these problems lead to the reduction of uterine blood flow and increased sensitivity of peripheral nerves that causes dysmenorrhea. Moreover, Azima et al. conducted a study to check the effect of isometric exercises on dysmenorrhea and concluded that exercise plans of isometrics of abdominals and other major groups reduced the symptoms of dysmenorrhea.[7]

Present study focused on role of regular abdominal exercises in dysmenorrhea patients. A same study was conducted by Shavandi et al. to check the effectiveness of exercises among patients of PD and concluded that a plan of eight weeks reduced the intensity of pain and after 4 weeks, duration of pain was decreased, [16] present study results were compatible to these findings. Regular isometric exercise of abdominal and other pelvic muscles causes increased blood flow and enhances the excretion of waste products. In addition, exercises suppress the sympathetic systems which cause spasmodic contractions and pain, improved pelvic control, increased proprioception and muscular balance which reduces back pain in PD. [17] Current study focused on the same mechanisms and applied abdominal exercise alone in group A and the other was given TENS but both groups showed significant improvement in pain and back pain.

PD is highly associated with anxiety which causes disability so the present study measureddisability level. Variation was present in the literature about the effect of exercise and which type is more effective. Multiple approaches were used during the prescription of exercise. Field et al. conducted

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a study to evaluate the effect of yoga and concluded that it was effective in reducing stress and pain in dysmenorrhea.[18] Another study was conducted Broman-Fulks et al. to check the effectiveness of low and high intensity exercises and concluded that both types of exercises were effective in controlling symptoms of dysmenorrhea but high-intensity exercises were found to be more effective. [19] Saleh et al. did a study to check the effect of core stability exercises and stretching exercises on dysmenorrhea and aimed to compare the results. [20]

Present study showed that abdominal exercise and TENS had a great effect in improving on WaLIDD scale so both electrotherapy and exercises had a supreme effect on the signs of dysmenorrhea. We can clearly see in Table 5, the improvement in means of group A is slightly greater than group B. Hence, we can say that abdominal strengthening with TENS is more effective than abdominal strengthening in patients with PD. The results of present study were also the same as previous studies showed the role of exercises and electrotherapy in the management of primary dysmenorrhea. This study concluded that both exercises reduce pain and stress significantly and became an alternative to menstrual pain.

Conclusion

The present study demonstrated that combining abdominal strengthening exercises with TENS is more effective in terms of reducing pain intensity measured by NPRS, improving functional disability measured by ODI, and enhancing the WaLIDD scale compared to using abdominal strengthening exercises alone. The results indicate that the combination of abdominal exercises and TENS had a significant positive effect on the signs of dysmenorrhea, suggesting that both electro-therapy and exercises play a crucial role in alleviating dysmenorrhea symptoms.

DECLARATIONS:

Consent to participate: Written consent had been taken from participants. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

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Author's contributions: All authors read and approved the final manuscript.

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