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Effect Of High Frequency Transcutaneous Electrical Nerve Stimulation On Dermatome And Root Level Among Primary Dysmenorrhea Adolescent Girls

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Abstract: Primary dysmenorrhea (PD) is a painful menstruation due to contractions in the uterus that induce ischemic pain associated with normal pelvic anatomy. The aim of the study is to evaluate the effect of High frequency Transcutaneous Electrical Nerve Stimulation (TENS) application at root level and dermatome level among adolescent girls and to compare the effect of high frequency TENS at dermatome level and root level among adolescent girls with Primary dysmenorrhea. 210 adolescent girls were included with 14-19 years of age and randomly allocated into three groups of High TENS (dermatome level), High TENS (root level) and Control group. The measurement of outcome variables such as lower abdominal pain, referred low back pain, and referred bilateral thigh pain was performed by numerical pain rating scale and measurement of systolic as well as diastolic blood pressure by aneroid sphygmomanometer. The data collection was done before and after the intervention. The within group analysis of outcome variables was performed by Analysis of variance test (ANOVA) in all three groups. The between group comparison of outcome variables was analyzed by Analysis of variance test (ANOVA). Tukey's post hoc pairwise comparison was also applied to identify the statistical pairwise mean difference between all three groups. There were overall highly significant differences within group and between group comparison of all the outcome variables in Group A (p value <0.05). The study concluded that High frequency TENS application at the dermatome level shows significant improvement for managing primary dysmenorrhea.

Keywords: Menstruation, Transcutaneous Electrical Nerve Stimulation, Spasmodic Pain, Adolescence

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1. INTRODUCTION

The period of adolescence starts with the onset of puberty. It is the stage of transformation of adolescent girl to adulthood. The WHO reported this period from 10 to 19 years of age. The most important physiological change during the adolescent period is the onset of menarche which is called the beginning of menstruation [1-2]. Menstruation is a periodic and cyclical endometrium shedding resulting in to genital bleeding, lasting up to 2 to 6 days. The normal interval of menstrual cycle is around 21 to 45 days with about 67 months of menstrual bleeding in a lifetime. It is usually irregular during the initial stages with a wide variation in interval period [3]. There is a lack of awareness about the knowledge of menstruation before menarche among rural adolescent girls of India, which may further lead to menstrual abnormalities due to unhealthy lifestyle, deprivation of physical activity, lack of menstrual hygiene and mental stress[2]. Dysmenorrhea is the most common menstrual abnormality among adolescents and it is reported that around 60 to 90% of adolescent females have undergone this problem in their life. Dysmenorrhea is defined as painful menstrual cramps that usually start a few hours before or with the onset of bleeding and may persist for hours or days[4-5].Dysmenorrhea is further classified into two sub-categories namely Primary and Secondary dysmenorrhea. Primary Dysmenorrhea (PD) often starts at 6 to 12 months after menarche and occurs without any underlying gynecological disease. It is one of the most common diagnosed types among teenagers [6]. Secondary Dysmenorrhea (SD) occurs at any time period between menarche to menopause with accompanying gynecological pathology such as endometriosis, ovarian cysts, pelvic inflammatory disease and intrauterine adhesions [7]. The present study focuses on PD, as it is highly prevalent among adolescent girls of India. PD includes both Pharmacological and Non pharmacological treatment methods. Non Steroidal Anti-inflammatory Drugs (NSAIDs) are the most widely used pharmacological treatment methods. But, there are several side effects to NSAIDs and some females do not wish to use medications [8].According to the guidelines of the U.S. Food and Drug Administration (FDA), NSAIDs can increase the risk of heart attack, stroke, stomach ulcers and bleeding, especially when used over a long time. Oral Contraceptives (OCs) are also used as an alternative pharmacological method. However, OCs may have adverse effects on liver, glucose tolerance and blood pressure [9].Therefore, Non pharmacological treatment method is quite efficient, safe and effective which include Hot pack, Biofeedback, Taping, Spinal manipulation, Stretching exercise, Relaxation techniques, Microwave diathermy, Interferential therapy, Infrared ray filament belt and TENS (Transcutaneous Electrical Nerve Stimulation). TENS is a non invasive, drug free and efficient pain relief device without any significant side effects. It involves the application of electrical stimulation to the skin and produces monophasic or biphasic pulsed current in a repetitive manner. It has been effectively used in controlling postoperative low back pain, labor pain and dysmenorrhea [10-11] The parameters of TENS include pulse width between 50 µs to 300 µs, frequency in the range of 2Hz to 600 Hz and intensity is between 1-60 milliampere (depending upon patient tolerable limit) [12].Mechanism of pain relief through TENS involves the pain gate theory proposed by melzack & wall. TENS blocks the different pain stimulus and this mechanism is based on the effect of high frequency TENS. Application of high TENS causes activation of large diameter fibers in skin & inhibits the small pain carrying fibers input at spinal cord level thereby preventing the pain impulses from transmitting up to brain level. [10,13]. TENS also reduce uterine muscle contractions, ischemia and cause vasodilatation via skin stimulation which may further result as fall in blood pressure level that is usually raised during start of menstruation among dysmenorrhea girls [14].High frequency TENS have its effect both at dermatome level and root level in various studies, however the effect of same parameter of TENS on two different placements (dermatome & root level) have not been compared yet. Moreover, raised blood pressure is also been related as a contributing factor to menstrual pain and menstruation. Thus, it is assumed that application of TENS can also reduce the blood pressure level in dysmenorrhea. Therefore the aim of the study is to evaluate the effect of High TENS application at root level and dermatome level among adolescent girls and compare the effect of high frequency TENS at dermatome level and root level among adolescent girls with Primary dysmenorrhea.

2. MATERIALS AND METHODS

The present study is three arm-randomised controlled designs conducted on 210 adolescent girls between 14-19 years of age at Gurdaspur district of Punjab, India from August 2017 to December 2018. All subjects were selected by means of purposive sampling on the basis of inclusion and exclusion criteria and diagnosis of Primary dysmenorrhea was done by a Gynecologist on the basis of their demographic data, thorough menstrual history and physical examination. The sample size of 210 subjects was estimated by using the formula given by Zhong B [15] with 80% of power at alpha level =0.05, assuming 10% drop out during the intervention period. The subjects were randomly allocated into three groups using sealed opaque envelopes. The data was collected at baseline and immediately post treatment for the measurement of outcome variables such as lower abdominal pain, referred low back pain, and referred bilateral thighs pain by numerical pain rating scale and for the measurement of systolic as well as diastolic blood pressure by aneroid sphygmomanometer[12]. The proposal of the study was approved from the institutional ethical committee (WS/213/45). The procedure was fully explained to the subjects and their parents and they were required to sign the written consent form. The inclusion criteria of the study were adolescent girls between 14 to 19 years of age, having regular menstrual cycle, experiencing self-reported pain for three consecutive menstrual cycles, having moderate to severe primary dysmenorrhea for at least 1 -2 days, without gynecologic pathology and menstrual symptoms must include pain at all three sites (lower abdomen, low back and bilateral thighs). Exclusion criteria were adolescent girls diagnosed with secondary dysmenorrhea, those who use any specific drug or physical method for relief of pain, any cutaneous lesion of anterior abdominal wall, medically diagnosed with any chronic disease and having previous or current psychiatric illness. All the subjects were assessed and treated on the first day of their menstruation. Before beginning the treatment, Subjects were assessed with demographic characteristics, thorough menstrual history and anthropometric measurement. The duration of treatment in each group was 20 minutes. Subjects in group A (Experimental group) received high frequency TENS with a frequency of 100 Hz, pulse duration of 80 micro second and intensity up to the tolerated level. The position of the subject was supine lying. The electrodes were placed at T12-L1 dermatome level. Two electrodes were placed at umbilicus

level and other two electrodes at Anterior superior iliac spine (ASIS) level, both placements were at anterolateral area of pain not higher than umbilicus and lower than ASIS level. Subjects in group B (Experimental group) received high frequency TENS with a frequency of 100 Hz, pulse duration of 80 micro second and intensity up to the tolerated level. The position of the subject was prone lying. The electrodes were placed at T12-L1 root level. Two electrodes were placed at proximal margin of low back area and other two electrodes at proximal margin of gluteal region, both placements at anterolateral area of pain. Subjects in Group C (Control group) were given no clinical intervention and a thin pillow was placed under their lower abdomen to attain comfortable position. The position of the subject was prone lying.After completing the therapeutic treatment session, electrodes were removed and measurement of lower abdominal pain, referred low back pain, referred bilateral thighs pain was re-assessed by using Numerical pain rating scale and blood pressure by aneroid sphygmomanometer immediately after the intervention.

3. STATISTICAL ANALYSIS

The data were analyzed using Statistical Package for the social sciences (SPSS) 22 version software. Paired t-test was applied for within group analysis of outcome variables (lower abdominal pain, referred low back pain, referred bilateral thigh pain by NPRS and systolic as well as diastolic blood pressure by aneroid sphygmomanometer) among all three groups. The between group comparison of outcome variables was analyzed by Analysis of variance test (ANOVA) between different groups. Tukey's post hoc pairwise comparison was also applied followed by ANOVA to identify the statistical pairwise mean difference between all three groups. The results were considered statistically significant if the p value was ≤0.05.

4. RESULTS

Table 1 shows the mean, standard deviation, F-value and p-value of anthropometric variables of subjects in different groups. The mean decimal age was 17.01 ±1.489 (years) in Group A, 17.21 ±1.178 (years) in Group B, 17.50 ±1.327 (years)in Group C with F value 2.332 and p value 0.100. The mean age at menarche was 12.80 ±1.269 (years) in Group A, 12.94 ±1.089 (years) in Group B, 13.19 ±1.081 (years)in Group C with F value 2.014 and p value 0.136. The mean menstrual pain severity was almost similar in three groups. The mean BMI was 21.87 ±1.551 (kg/m^2) in Group A, 21.63 ±1.880 (kg/m^2) in Group B and 22.10 ±1.437 (kg/m^2) in Group C with F value 1.475 and p value 0.231. The mean waist hip ratio was 0.82 ±0.022 in Group A, 0.83 ±0.030 in Group B and 0.83 ±0.030 in Group C with F value 0.831 and p value 0.437. These values show that there was no significant difference between different groups. Table 2 shows Comparison of Pre and Post treatment score of NPRS (lower abdominal pain) between different groups. The Pre-Post treatment mean difference of lower abdominal pain in Group A, B and C was 4.81, 4.17 and 0.04 respectively ($p<0.05$). Table 3 shows Comparison of pairwise mean difference of NPRS (lower abdominal pain) between different groups. The pairwise mean difference of lower abdominal pain in Group A-B before treatment was 0.328 ($p>0.05$) and after treatment was 0.314 ($p>0.05$). The pairwise mean difference of lower abdominal pain in Group B-C before treatment was 0.200 ($p>0.05$) and after treatment was 4.328 ($p<0.05$). The pairwise mean difference of lower abdominal pain in Group A-C before treatment was 0.128 ($p>0.05$) and after treatment was 4.642 ($p<0.05$).Table 4 shows Comparison of Pre and Post treatment score of NPRS (referred lower back pain) between different groups. The Pre-Post treatment mean difference of referred lower back pain in Group A, B and C was 4.51, 4.77 and 0.07 respectively ($p<0.05$). Table 5 shows Comparison of pairwise mean difference of NPRS (referred lower back pain) between different groups. The pairwise mean difference of referred lower back pain in Group A-B before treatment was 0.24 ($p>0.05$) and after treatment was 0.500 ($p>0.05$). The pairwise mean difference of referred lower back pain in Group B-C before treatment was 0.128 ($p>0.05$) and after treatment was 4.571 ($p<0.05$). The pairwise mean difference of referred lower back pain in Group A-C before treatment was 0.371 ($p>0.05$) and after treatment was 4.071 ($p<0.05$).Table 6 shows Comparison of Pre and Post treatment score of NPRS (referred bilateral thigh pain) between different groups. The Pre-Post treatment mean difference of referred bilateral thigh pain in Group A, B and C was 4.41, 3.31 and 0.04 respectively ($p<0.05$). Table 7 shows Comparison of pairwise mean difference of NPRS (referred bilateral thigh pain) between different groups. The pairwise mean difference of referred bilateral thigh pain in Group A-B before treatment was 0.371 ($p>0.05$) and after treatment was 0.728 ($p<0.05$). The pairwise mean difference of referred bilateral thigh pain in Group B-C before treatment was 0.357 ($p>0.05$) and after treatment was 3.628 ($p<0.05$). The pairwise mean difference of referred bilateral thigh pain in Group A-C before treatment was 0.014 ($p>0.05$) and after treatment was 4.357 ($p<0.05$).Table 8 shows Comparison of Pre and Post treatment score of Systolic blood pressure between different groups. The Pre-Post treatment mean difference of Systolic blood pressure in Group A, B and C was 7.46, 6.26 and 0.21 respectively ($p<0.05$). Table 9 shows Comparison of pairwise mean difference of Systolic blood pressure between different groups. The pairwise mean difference of Systolic blood pressure in Group A-B before treatment was 0.071 ($p>0.05$) and after treatment was 1.271 ($p>0.05$). The pairwise mean difference of Systolic blood pressure in Group B-C before treatment was 1.000 ($p>0.05$) and after treatment was 5.042 ($p<0.05$). The pairwise mean difference of Systolic blood pressure in Group A-C before treatment was 0.928 ($p>0.05$) and after treatment was 6.314 ($p<0.05$).Table 10 shows Comparison of Pre and Post treatment score of Diastolic blood pressure between different groups. The Pre-Post treatment mean difference of Diastolic blood pressure in Group A, B and C was 7.40, 5.89 and 0.21 respectively ($p<0.05$). Table 11 shows Comparison of pairwise mean difference of Diastolic blood pressure between different groups. The pairwise mean difference of Diastolic blood pressure in Group A-B before treatment was 0.300 ($p>0.05$) and after treatment was 1.214 ($p>0.05$). The pairwise mean difference of Diastolic blood pressure in Group B-C before treatment was 0.857 ($p>0.05$) and after treatment was 4.814 ($p<0.05$). The pairwise mean difference of Diastolic blood pressure in Group A-C before treatment was 1.157 ($p>0.05$) and after treatment was 6.028 ($p<0.05$).

Table 1. Anthropometric variables of subjects in different groups

Variables	Group A(HF-TENS dermatome level) (mean±SD)	Group B(HF-TENS root level) (mean±SD)	Group C(Control group) (mean±SD)	F value	p-value
Decimal age(years)	17.01 ± 1.489	17.21 ± 1.178	17.50 ± 1.327	2.332	0.100
Age at Menarche (years)	12.80 ± 1.269	12.94 ± 1.089	13.19 ± 1.081	2.014	0.136
Menstrual pain severity	7.67 ± 1.472	7.10 ± 1.661	7.20 ± 1.691	2.513	0.083
Height (cms)	156.93 ± 3.921	156.03 ± 5.631	156.66 ± 4.848	0.634	0.531
Weight (Kgs)	53.86 ± 4.161	52.67 ± 5.263	54.24 ± 4.375	2.195	0.114
BMI (kg/m^2)	21.87 ± 1.551	21.63 ± 1.880	22.10 ± 1.437	1.475	0.231
Waist circumference (cms)	72.44 ± 8.141	74.06 ± 6.685	74.29 ± 7.524	1.265	0.284
Hip circumference (cms)	87.66 ± 8.959	89.06 ± 7.360	89.76 ± 7.866	1.223	0.296
Waist hip ratio	0.82 ± 0.022	0.83 ± 0.030	0.83 ± 0.030	0.831	0.437

p-value ≤0.05 considered as significant

Table 2. Comparison of Pre and Post treatment score of NPRS (lower abdomen pain) between different groups

Values	Group A(HF-TENS dermatome level)(mean±SD)	Group B (HF-TENS root level) (mean±SD)	Group C (Control group) (mean±SD)
Pre-treatment	7.10 ± 1.416	6.77 ± 1.590	6.97 ± 1.702
Post-treatment	2.29 ± 0.705	2.60 ± 0.689	6.93 ± 1.645
t value	33.361	27.904	1.758
p value	<0.001**	<0.001**	0.083
Mean Difference	4.81 ± 1.207	4.17 ± 1.251	0.04 ± 0.204
F value	459.523		
P value	<0.001**		

p value ≤ 0.05 considered as significant; **p value considered as highly significantNPRS – Numerical Pain Rating Scale

Table 3.Comparison of pairwise mean difference of NPRS (lower abdomen pain) between different groups

Values	Group A – Group B		Group B – Group C		Group A – Group C	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Mean ±SD	7.10 ± 1.416-6.77 ± 1.590	2.29 ± 0.705 - 2.60 ± 0.689	6.77 ± 1.590-6.97 ± 1.702	2.60 ± 0.689-6.93 ± 1.645	7.10 ± 1.416 - 6.97± 1.702	2.29 ± 0.705-6.93 ± 1.645
Mean difference ±SD	0.32857 ±0.26599	0.31429 ± 0.18714	0.20000 ± 0.26599	4.32857 ±0.18714	0.12857 ±0.26599	4.64286 ±0.18714
p- value	0.434	0.216	0.733	0.000**	0.879	0.000**

NPRS – Numerical Pain Rating Scale; *p-value ≤ 0.05 considered as significant; **p value considered as highly significant

Table 4. Comparison of Pre and Post treatment score of NPRS (referred lower back pain) between different groups

Values	Group A (mean±SD)	Group B (mean±SD)	Group C (mean±SD)
Pre-treatment	7.10 ± 1.505	6.86 ± 1.747	6.73 ± 1.578
Post-treatment	2.59 ± 0.712	2.09 ± 0.676	6.66 ± 1.483
t value	27.361	26.867	1.927
P value	<0.001**	<0.001**	0.058
Mean Difference	4.51 ± 1.380	4.77 ± 1.486	0.07 ± 0.310
F value	348.319		
P value	<0.001**		

p-value ≤ 0.05 considered as significant; **p value considered as highly significant ; NPRS – Numerical Pain Rating Scale

Table 5.Comparison of pairwise mean difference of NPRS (referred lower back pain) between different groups

Values	Group A – Group B		Group B – Group C		Group A – Group C	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Mean ±SD	7.10 ± 1.505-6.86 ± 1.747	2.59 ± 0.712-2.09 ± 0.676	6.86 ± 1.747-6.73 ± 1.578	2.09 ± 0.676-6.66 ± 1.483	7.10± 1.505-6.73 ± 1.578	2.59 ± 0.712-6.66 ± 1.483
Mean difference ±SD	0.24286 ±0.27268	0.50000 ± 0.17356	0.12857 ± 0.27268	4.57143± 0.17356	0.37143 ±0.27268	4.07143 ±0.17356
p- value	0.647	0.012*	0.885	0.000**	0.363	0.000**

p-value ≤ 0.05 considered as significant; **p value considered as highly significant; NPRS – Numerical Pain Rating Scale

Table 6. Comparison of Pre and Post treatment score of NPRS (referred bilateral thigh pain) between different groups

Values	Group A (mean±SD)	Group B (mean±SD)	Group C (mean±SD)
Pre-treatment	6.43 ± 1.499	6.06 ± 1.710	6.41 ± 1.707
Post-treatment	2.01 ± 0.807	2.74 ± 0.863	6.37 ± 1.670
T value	33.279	24.683	1.758
P value	<0.001**	<0.001**	0.083
Mean Difference	4.41± 1.110	3.31 ± 1.123	0.04 ± 0.204
F value	428.238		
P value	<0.001**		

p-value ≤ 0.05 considered as significant; **p value considered as highly significant; NPRS – Numerical Pain Rating Scale

Table 7. Comparison of pairwise mean difference of NPRS (referred bilateral thigh pain) between different groups

Values	Group A – Group B		Group B – Group C		Group A – Group C	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Mean ±SD	6.43 ± 1.499-6.06 ± 1.710	2.01 ± 0.807-2.74 ± 0.863	6.06 ± 1.710-6.41 ± 1.707	2.74 ± 0.863-6.37 ± 1.670	6.43± 1.499-6.41 ± 1.707	2.01 ± 0.807-6.37 ± 1.670
Mean difference ±SD	0.37143 ±0.27750	0.72857 ± 0.19962	0.35714 ± 0.27750	3.62857± 0.19962	0.01429 ±0.27750	4.35714 ±0.19962
p- value	0.376	0.001**	0.404	0.000**	0.999	0.000**

p-value ≤ 0.05 considered as significant; **p value considered as highly significant; NPRS – Numerical Pain Rating Scale

Table 8. Comparison of Pre and Post treatment score of Systolic blood pressure between different groups

Values	Group A (mean±SD)	Group B (mean±SD)	Group C (mean±SD)
Pre-treatment	125.36 ± 5.472	125.43 ± 4.945	124.43 ± 3.565
Post-treatment	117.90 ± 5.920	119.17 ± 4.749	124.21 ± 3.472
t value	18.217	22.506	1.350
p value	<0.001**	<0.001**	0.182
Mean Difference	7.46± 3.425	6.26 ± 2.326	0.21 ± 1.329
F value	167.38		
P value	<0.001**		

p-value ≤ 0.05 considered as significant; **p value considered as highly significant

Table 9. Comparison of pairwise mean difference of Systolic blood pressure between different groups

Values	Group A – Group B		Group B – Group C		Group A – Group C	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Mean ± SD	125.36±5.472-125.43±4.945	117.90±5.920-119.17± 4.749	125.43±4.945-124.43±3.565	119.17±4.749-124.21± 3.472	125.36±5.472-124.43±3.565	117.90±5.920-124.21± 3.472
Mean difference ± SD	0.07143 ±0.79944	1.27143 ± 0.81447	1.00000 ± 0.79944	5.04286± 0.81447	0.92857 ±0.79944	6.31429 ±0.81447
p- value	0.996	0.265	0.425	0.000**	0.478	0.000**

p-value ≤ 0.05 considered as significant; **p value considered as highly significant

Table 10.Comparison of Pre and Post treatment score of Diastolic blood pressure between different groups			
Values	Group A (mean±SD)	Group B (mean±SD)	Group C (mean±SD)
Pre-treatment	84.59 ± 5.696	84.29 ± 5.198	83.43 ± 3.858
Post-treatment	77.19 ± 5.457	78.40 ± 5.678	83.21 ± 3.714
T value	19.077	22.549	1.758
P value	<0.001**	<0.001**	0.083
Mean Difference	7.40± 3.246	5.89 ± 2.184	0.21 ± 1.020
F value	184.374		
P value	<0.001**		

**p-value ≤ 0.05 considered as significant; **p value considered as highly significant*

Table 11. Comparison of pairwise mean difference of Diastolic blood pressure between different groups						
Values	Group A – Group B		Group B – Group C		Group A – Group C	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Mean ± SD	84.59±5.696-84.29±5.198	77.19 ± 5.457-78.40 ± 5.678	84.29 ± 5.198-83.43 ± 3.858	78.40 ±5.678-83.21 ± 3.714	84.59 ± 5.696-83.43 ± 3.858	77.19 ± 5.457-83.21 ± 3.714
Mean difference ± SD	0.30000 ±0.84151	1.21429 ±0.84973	0.85714 ± 0.84151	4.81429 ±0.84973	1.15714 ±0.84151	6.02857 ±0.84973
p- value	0.932	0.328	0.566	0.000**	0.356	0.000**

**p -value ≤ 0.05 considered as significant; **p value considered as highly significant*

5. DISCUSSION

The aim of the present study was to evaluate the effect of High TENS application at root level and dermatome level among adolescent girls and to compare the effect of high frequency TENS at dermatome level and root level among adolescent girls with Primary dysmenorrhea. The results obtained after the data analysis did not support the null hypothesis as there was a strong effect of high frequency TENS both at dermatome level and root level among adolescent girls with Primary dysmenorrhea.The demographic characteristics of subjects including Decimal age (years), Age at menarche (years), menstrual pain severity, height (cms), weight (kgs), body mass index (BMI) (kg/m^2), waist circumference (cms), hip circumference (cms) and waist hip ratio were all homogenous in nature in three groups (Group A, Group B and Group C) with 70 adolescent girls in each Group (Table 1). The results postulated that there was highly significant difference in within Group comparison of A and B group for all the outcome variables (NPRS (lower abdomen pain), NPRS (referred lower back pain), NPRS (referred bilateral thighs pain), systolic blood pressure and diastolic blood pressure) whereas, there was non- significant difference within Group C in all outcome variables. Also, there was significant difference in between group pre and post treatment mean difference between three groups in all outcome variables (Table 2, Table 4, Table 6, Table 8 and Table 10).The result suggested that overall improvement in NPRS (lower abdomen pain) was more significant in Group A (HF-TENS dermatome level) as compared to Group B (HF-TENS root level) and Group C (control group) (Table 2), overall improvement in NPRS (referred lower back pain) was more significant in Group B (HF-TENS root level) as compared to Group A (HF-TENS dermatome level) and Group C (control group) (Table 4), overall improvement in NPRS (referred bilateral thigh pain) was more significant in Group A (HF-TENS dermatome level) as compared to Group B (HF-TENS root level) and Group C (control group) (Table 6), overall improvement in Systolic blood pressure was more significant in Group A (HF-TENS dermatome level) as compared to Group B (HF-TENS root level) and Group C (control group) (Table 8), overall improvement in Diastolic blood pressure was more significant in Group A (HF-TENS dermatome level) as compared to Group B (HF-TENS root level) and Group C (control group) (Table 10).The findings of present study are also supported by the results of previous studies. Shah Chaitali compared the effect of high frequency TENS at dermatome level and low frequency TENS at root level and found that high TENS at dermatome Level was more effective [10] Patel et al compared the effect of TENS in premenstrual phase and during menstrual cycle. The results found that TENS in the premenstrual phase is more effective for reducing pain than during menstrual cycle [13]. Tugay et al compared the effectiveness of TENS and Interferential current on primary dysmenorrhea. The results suggested that both TENS and Interferential current are efficient in pain reduction among women with primary dysmenorrhea [17]. The present study also demonstrated the effect of high TENS in lowering blood pressure during the start of menstruation in dysmenorrhea. The results of this study are in agreement with the previous study who reported the use of Infrared rays heating element in lowering blood pressure in dysmenorrhea girls [16]. The mechanism of Infrared rays heating element indicates similarity in TENS mechanism as well in pain relief. The application of TENS also leads to vasodilation via skin stimulation; reduce ischemia and uterine muscle contractions that may further result as fall in blood pressure level which is usually raised during start of menstruation among dysmenorrhea girls [14].In primary dysmenorrhea, there is increased endometrial prostaglandin production and maximum prostaglandin get released during first 48 hours of menstruation which leads to increased myometrial muscle tone, uterine contractions and ischemic pain during the initial days of menstruation [6,9].The mechanism of high frequency TENS in reducing menstrual pain is based on Pain gate theory. TENS activates large myelinated A alpha and beta fibres which inhibit small nociceptive fibres at the level of dorsal horn of spinal cord which in turn inhibits pain [10]. Application of TENS stimulates the peripheral nerves

which causes vasodilatation of the vessels around the localized area that results in increased blood flow to the corresponding area and thus reduces uterine muscle ischemia [13].The adolescent girls participating in this study gained a potential benefit that leads to improvement in the loss of their working hours and their overall quality of life. Moreover, treatment through TENS was relatively inexpensive, easily accessible and without any side effects. Thus, the finding of this study indicated that TENS is a safe, effective and best non pharmacological method for managing primary dysmenorrhea. Many studies postulated the effect of HF-TENS dermatome level and HF-TENS root level individually. But there is limited evidence on the comparative effect of the same parameter of TENS at two different levels. Thus, the present study investigated the comparative effect of high frequency TENS at dermatome level and root level among primary dysmenorrhea adolescent girls.

5.1 Future Recommendations

More Experimental studies are needed to explore the comparative effect of high TENS on dermatome level and root level for subjects with primary dysmenorrhea.

Follow up study should be done to evaluate the long term effects of high TENS in the management of primary dysmenorrhea.

6. CONCLUSION

The results of the present study concluded that both HF-TENS at dermatome level and HF-TENS at root level showed significant improvement for the management of Primary dysmenorrhea, however there was overall more significant improvement ($p \leq 0.05$) in HF-TENS dermatome level group (Group A).

7. AUTHORS CONTRIBUTION STATEMENT

Manisha Uttam contributed the concepts, search literature, clinical and experimental studies, data collection, data acquisition and analysis. Manuscript preparation, supervision, manuscript preparation (data analysis, results) and manuscript editing was done by Dr.AnuradhaLehri.

8. CONFLICT OF INTEREST

Conflict of interest declared none.

9. REFERENCES

1. Agarwal AK, Agarwal A. A study of dysmenorrhea during menstruation in adolescent girls. Indian J CommunMed OffPublIndian AssocPrevSocMed. 2010;35(1):159-64. doi: 10.4103/0970-0218.62586, PMID 20606943.
2. Priya SS, Alliratnam A, Shankar R. Menstrual problems and hygiene among rural adolescent girls of Tamil Nadu-A cross sectional study. Ind Jour of Obstet and Gyn Res;2016: 3(2):126-131. doi: 10.5958/2394-2754.2016.00035.7.
3. Dars S, Sayed K, Yousufzai Z.Relationship of menstrual irregularities to BMI and nutritional status in adolescent girls. Pak J Med Sci. 2014;30(1):141-4. doi: 10.12669/pjms.301.3949, PMID 24639848.
4. Grandi G, Ferrari S, Xholli A, Cannoletta M, Palma F, Romani C, Volpe A, Cagnacci A. Prevalence of menstrual pain in young women: what is dysmenorrhea?J Pain Res. 2012;5:169-74. doi: 10.2147/JPR.S30602, PMID 22792003.
5. Uttam M, Lehri A.Potential benefits of transcutaneous electrical Nerve stimulation in Primary dysmenorrhea: areview. IntJ CurrAdvRes. 2018;7(12):16587-90. doi: 10.24327/ijcar.2018.16590.3071.
6. Habibi N, Huang MS, Gan WY, Zulida R, Safavi SM. Prevalence of primarydysmenorrhea and factorsassociated with itsintensityamongundergraduatestudents: Across-sectionalstudy. Pain ManagNurs. 2015;16(6):855-61. doi: 10.1016/j.pmn.2015.07.001, PMID 26328887.
7. De Sanctis V, Soliman A, Bernasconi S, Bianchin L, Bona G, Bozzola M, Buzi F, De Sanctis C, Tonini G, Rigon F, Perissinotto E. Primary dysmenorrhea in adolescents: prevalence, impact and recentknowledge. PediatrEndocrinolRev.2015;13(2):512-20.
8. Dawood MY, Ramos J.Transcutaneous electrical nerve stimulation (TENS) for the treatment of primary dysmenorrhea: a randomized crossover comparison with placebo TENS and ibuprofen. ObstetGynecol. 1990;75(4):656-60. PMID2179780.
9. iacovidesS, AvidonI, BakerFC. What we know about primary dysmenorrhea today: a critical review.Hum Reprod Update. 2015;21(6):762-78.
10. ShahC. To compare the effect of high frequency (conventional) TENS at dermatome level & low frequency (Acupuncture like) TENS at root level in pain management of Dysmenorrhea. IndianJ PhysTher.2014;2(2):34-8. Corpus ID: 71099674.
11. AlYousef S, Abd El-Hay S, Mohamed N, Abo Baker S.Effect of transcutaneouselectricalnervestimulation (TENS) on the relief of dysmenorrheapain among students of Applied Medical Science College at Hafr Al-Batin. J AmSci. 2013;9(11).
12. Uttam M, Lehri A. Effect of high frequency transcutaneous electrical nerve stimulation on dermatomal site menstrual pain among adolescent girls with primary dysmenorrhea. Int J Health SciRes. 2019;9(5).
13. Patel V, Sheth M, Vyas N. Effect of transcutaneous electrical Nerve stimulation on pain in subjects with primary dysmenorrhea. Int Arch Integr Med. 2016;3(6):1-5.
14. Hughes GS, Lichstein PR, Whitlock D, Harker C. Response of plasma beta-endorphins to transcutaneous electrical nerve stimulation in healthy subjects. PhysTher. 1984;64(7):1062-6. doi: 10.1093/ptj/64.7.1062, PMID 6330773.
15. Zhong B. How to calculatesamplesize in randomizedcontrolledtrial?J ThoracDis. 2009;1(1):51-4.
16. Hong YR. Effects of heattherapyusing a farinfraredraysheatingelement for dysmenorrhea in high schoolgirls. J Korean AcadNurs.2011;41(1):141-8. doi: 10.4040/jkan.2011.41.1.141, PMID 21516008.
17. Tugay N, Akbayrak T, Demirtürk F, Karakaya IC, KocaacarO, Tugay U, Karakaya MG, Demirtürk F. Effectiveness of transcutaneous electrical nerve stimulation and interferential current in primary dysmenorrhea. Pain Med. 2007;8(4):295-300. doi: 10.1111/j.1526-4637.2007.00308.x.