RESEARCH PAPER

Impact of Nurse Led Interventions in Relieving Pain and Distress Related to Dysmenorrhea Among Adolescent Girls in Rural areas of Kollam, Kerala: Findings of A Miniature Study Design

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Abstract

Background: Primary dysmenorrhea is one of the most common gynaecological complaints among adolescent girls, significantly affecting their physical, emotional, and academic well-being. In rural settings, inadequate access to information often exacerbates this distress.

Objective: To determine the Impact of a nurse-led non-pharmacological intervention program in alleviating pain and distress associated with primary dysmenorrhea among adolescent girls in rural educational institutions in Kollam, Kerala.

Methods: A quasi-experimental, pre-test, post-test, control group design was employed. A purposive sample of 20 adolescent girls (aged 13 to >15 Yrs.) with primary dysmenorrhea were divided into an experimental group (n=15) and a control group (n=15). The experimental group underwent 12-week nurse-led interventions focusing on health literacy, local heat applications, Pelvic rocking and floor exercises, acupressure and coping & relaxational modules. Tools included the Standardised tool, Numerical Pain Rating Scale (NPRS) and CDDS (Comprehensive Dysmenorrhea Distress Scale), a self-structured rating scale to measure distress related to dysmenorrhea.

Results: The pre-intervention pain and distress levels showed no significant difference between the two groups. Post-intervention, the experimental group exhibited a significant reduction in mean pain levels (from 6.4 ± 1.4 to 4.07 ± 1.71; $t=4.183^*$, df 14, $p < 0.001$) and mean distress levels (from 25 ± 11.24 to 16.4 ± 4.91; $Z= -2.529^*$, $p < 0.05$). The control group showed no significant improvement.

Conclusion: Nurse-led interventions are safe, highly accessible, and effective in reducing dysmenorrhea related pain and distress among Adolescent girls. Integrating these open-access health interventional strategies into rural school health programs is highly recommended.

Keywords: Dysmenorrhea, Adolescent Girls, Menstrual Pain, Distress, Nurse Led Interventions, Impact.

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Introduction

The transition from childhood to adolescence is marked by stark physiological changes, among which menarche, also known as the onset of the menstrual period, stands as the definitive milestone of a female's reproductive maturation. However, for a substantial proportion of young girls, this natural biological transition is complicated by primary dysmenorrhea, i.e., painful menstrual cramps without any underlying pelvic pathology[1,2,3]. The cramping, which typically occurs in the lower abdomen and radiates to the back or thighs, is often accompanied by systemic symptoms like nausea, fatigue, vomiting, and irritability[4]. Primary dysmenorrhea is not merely a transient physical discomfort; it is a major public health issue that deeply disrupts the quality of life, academic performance, and social engagement of adolescents[5]. In rural areas of India, cultural taboos, lack of open discussions regarding reproductive health, and limited access to medical care cause many young girls to suffer in silence, accepting severe pain as an inescapable burden of womanhood[6]. Nurses, acting as primary health educators in community and school settings, hold the unique potential to bridge this gap. Structured, nurse-led interventions focusing on non-pharmacological management, self-care practices, and psychosocial support can empower young women to manage their symptoms actively[7]. This study investigates the impact of such a comprehensive intervention crafted specifically for adolescent girls in rural educational institutions in Kollam, Kerala.

Objective(s)

1. To assess the pre-test and post-test Menstrual Pain and Distress levels among Experimental and Control groups.
2. To compare the pre-test and post-test Menstrual Pain and Distress levels among Experimental and Control groups.
3. To evaluate the Impact of Nurse led interventions in reducing Menstrual Pain and Distress levels in Experimental group.
4. To determine the relationship between post-test Pain levels among Experimental group with selected Demographic and Clinical variables

5. To determine the relationship between post-test Menstrual Distress levels among Experimental group with selected Demographic and Clinical variables

Review of Literature (ROL)

Prevalence and Burden of Dysmenorrhea

The prevalence of primary dysmenorrhea among adolescent girls is alarmingly high. Global data indicates that it affects 50% to 90% of young women[8]. In the Indian context, cross-sectional studies reveal a similar burden. Agarwal and Agarwal (2010) reported a prevalence of over 70% among adolescents in Indian educational institutions, noting that it is the leading cause of recurrent short-term absenteeism[9]. Furthermore, Omidvar et al. (2016) highlighted that severe dysmenorrhea significantly impairs daily activities and is closely tied to the age of menarche (AOM) and familial history[10].

Impact on Academic and Psychosocial Well-being

The repercussions of dysmenorrhea extend far beyond physical pain. Yesuf et al. (2018) demonstrated that severe menstrual pain restricts academic participation and lowers concentration levels, leading to a significant drop in scholastic performance[11]. Additionally, the psychological toll is immense. Hailemeskel et al. (2016) found that young girls with severe dysmenorrhea often experience heightened anxiety and social withdrawal, underscoring the need for interventions that go beyond basic pain relief to address overall menstrual distress[12].

Non-Pharmacological and Nurse-Led Interventions

While Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are the conventional first-line treatment, long-term reliance is often hindered by side effects and access issues in rural settings[13]. Consequently, non-pharmacological therapies have emerged as vital, evidence-based alternatives. A robust meta-analysis by Jo and Lee (2018) confirmed that localized heat therapy effectively neutralizes prostaglandin-induced uterine ischemia, offering pain relief comparable to over-the-counter analgesics[14]. Similarly, Armour et al. (2019) validated the efficacy of self-care strategies, including stretching and progressive relaxation[15]. Despite these findings, there is a gap in literature regarding the holistic implementation of thesetechniques by nursing professionals in Indian rural schools. By incorporating psychosocial elements such as fostering a healthy Interpersonal Relationship with peers and building resilience, nurses can realistically alter how adolescents experience and manage menstrual distress[15,16].

2. Methodology

Research Approach and Design

A quantitative research approach was utilized. A quasi-experimental, pre-test and post-test control group design was applied to assess the intervention's impact while preserving the natural school environment setting[17].

Setting of the Study

The study was conducted across two selected rural educational institutions in Kollam, Kerala. The locations were chosen due to their representation of rural demographics.

Population, Sample, and Sampling Technique

The target population comprised adolescent girls aged 13 to >15 years. Purposive sampling was used to enrol 30 students who reported to have primary dysmenorrhea (scoring 04 and above on the Numerical Pain Rating Scale). The sample was divided into an experimental group (n=15) and a control group (n=15) Girls with other obstetrical complications or chronic illnesses were excluded.

Variables

- Independent Variable: Nurse-led Interventions.
- Dependent Variable(s): Menstrual Pain and Distress Levels.

Tools and Technique(s)

1. **Tool A:** Demographic Proforma and Clinical Variables: Used to collect data on age, class enrolled, religion, type of family, parental education and occupation, monthly income, information source, age of menarche (AOM), periods regularity, maternal history of dysmenorrhea, duration of flow, amount of blood flow, BMI, dietary habits, physical activity, junk food consumption, sleep quality and general stress[18].
2. **Tool B:** Numerical Pain Rating Scale (NPRS): A validated 0–10 point numerical scale assessing pain severity.
3. **Tool C:** A Structured Rating scale, CDDS: Comprehensive Dysmenorrhea Distress rating scale, a Self-Structured rating scale with a very good internal consistency of 0.81 (Cronbach's Alpha) and high-test reliability (0.831) was used to evaluate somatic pain, systemic and autonomic symptoms, psychological and emotional symptoms and functional impairment. The tool had an overall 24 items and scoring ranged from a minimum score of 0 and a maximum of 96.

Technique: The Nurse led Intervention(s)

The experimental group received a comprehensive 12-week nurse-led interventions (spanning approximately three menstrual cycles), which included:

1. **Health Literacy:** Interactive health education on reproductive anatomy and the physiological etiology of menstrual cramps using appropriate AV Aids. (10 min)
2. **Pain Management Techniques**: (25 min)
   - Practical demonstrations of local heat application (using hot water bags safely)
   - Acupressure to manage pain[19].
   - specific pelvic strengthening exercises (including pelvic rocking and Kegel's pelvic floor exercises)[20].
3. **Stress management Interventions:** (10 min): Dedicated modules on Coping with Stress during painful days and relaxational techniques such as deep breathing and muscle relaxation to combat stress and anxiety, navigating the emotional fluctuations of the luteal phase, and strategies for Effective Communication with parents and teachers regarding their health needs. Guidance on maintaining a healthy Interpersonal Relationship with peers to avoid social isolation during menstruation.

Data Collection Procedure

The data was collected for a period of 12 weeks from April 1, 2025 to June 30th, 2025. All formal permissions and ethical clearance were obtained prior to the study and full confidentiality was ensured. Following the pretests in both groups, the experimental group received the intervention. The control group continued with standard school routines and received an informational booklet at the study's conclusion. Furthermore, a post test was done to evaluate both groups at the end of the study.

3. Data Analysis and Results

Data were tabulated using Excel 365 and analysed in SPSS V 27. Descriptive statistics summarized baseline demographics. Inferential statistics (Shapiro Wilks for Normality assessment and paired and independent t-tests, Mann-Whitney U test, Wilcoxon Signed rank test, Freeman Halton Exact tests) were used to test significance at $p < 0.05$.

Section I: Description of Sample Characteristics

Table 1: Baseline Demographic and Clinical Characteristics of Samples (N = 30)

Variable	Category	Experimental (n = 15)	Control (n = 15)
Demographic Variables		f (%)	f (%)
Age	13-14 years	3 (20.0%)	3 (20.0%)
	>14-15 years	8 (53.3%)	6 (40.0%)
	>15 years	4 (26.7%)	6 (40.0%)
Class Enrolled	8th	2 (13.3%)	3 (20.0%)
	9th	4 (26.7%)	4 (26.7%)
	10th	9 (60.0%)	8 (53.3%)
Religion	Hindu	7 (46.7%)	8 (53.3%)
	Muslim	5 (33.3%)	4 (26.7%)
	Christian	3 (20.0%)	3 (20.0%)
Type of Family	Nuclear	11 (73.3%)	11 (73.3%)
	Joint	4 (26.7%)	4 (26.7%)
Father's Education	High School	4 (26.7%)	4 (26.7%)
	Higher Secondary & Above	11 (73.3%)	11 (73.3%)
Mother's Education	High School	6 (40.0%)	4 (26.7%)
	Higher Secondary & Above	9 (60.0%)	11 (73.3%)
Father's Occupation	Govt. Employment	3 (20.0%)	3 (20.0%)
	Pvt. Employment	6 (40.0%)	10 (66.7%)
	Self Employed	6 (40.0%)	2 (13.3%)
Mother's Occupation	Govt. Employment	3 (20.0%)	3 (20.0%)
	Pvt. Employment	4 (26.7%)	4 (26.7%)
	Self Employed	2 (13.3%)	1 (6.7%)
	Homemaker	6 (40.0%)	7 (46.7%)
Monthly Income	< 10,000 Rs.	2 (13.3%)	1 (6.7%)
	10,001 - 20,000 Rs.	6 (40.0%)	4 (26.7%)
	20,001 - 30,000 Rs.	2 (13.3%)	4 (26.7%)
	> 30,000 Rs.	5 (33.3%)	6 (40.0%)
Clinical Factors	Category	f (%)	f (%)
Age of Menarche	< 10 years	2 (13.3%)	4 (26.7%)
	10-11 years	8 (53.3%)	9 (60.0%)
	12-13 years	1 (6.7%)	2 (13.3%)
	> 13 years	4 (26.7%)	0 (0.0%)
Periods Regularity	Regular	8 (53.3%)	10 (66.7%)
	Irregular	7 (46.7%)	5 (33.3%)
Duration of Flow	< 3 days	2 (13.3%)	3 (20.0%)
	3-7 days	8 (53.3%)	9 (60.0%)

	> 7 days	5 (33.3%)	3 (20.0%)
Amount of Flow	Scanty	2 (13.3%)	1 (6.7%)
	Moderate	8 (53.3%)	11 (73.3%)
	Heavy	5 (33.3%)	3 (20.0%)
Family History of Dysmenorrhea	Yes	9 (60.0%)	10 (66.7%)
	No	6 (40.0%)	5 (33.3%)
Body Mass Index (BMI)	Underweight	6 (40.0%)	7 (46.7%)
	Normal	3 (20.0%)	4 (26.7%)
	Overweight	6 (40.0%)	4 (26.7%)
Junk Food Consumption	Occasional	7 (46.7%)	9 (60.0%)
	Frequent	8 (53.3%)	6 (40.0%)
Physical Activity Level	Sedentary	13 (86.7%)	9 (60.0%)
	Regular Exercise	2 (13.3%)	6 (40.0%)
Sleep Quality	Normal	6 (40.0%)	7 (46.7%)
	Disturbed Sleep	6 (40.0%)	5 (33.3%)
	Increased Daytime Sleep	3 (20.0%)	3 (20.0%)
Associated Symptoms (Nausea, etc.)	Yes	3 (20.0%)	5 (33.3%)
	No	12 (80.0%)	10 (66.7%)
General Stress/Anxiety Levels	Normal	5 (33.3%)	2 (13.3%)
	Mild to Moderate	10 (66.7%)	13 (86.7%)

Inference: A total of 30 samples were included in the study, evenly divided between the Experimental (n = 15) and Control (n = 15) groups. A majority of the samples in the experimental group were between 14 to 15 years (53.3%), whereas the control group had an equal distribution of samples between 14-15 years (40.0%) and >15 years (40.0%). The predominant religion across both groups was Hinduism (46.7% in the experimental group and 53.3% in the control group), and the vast majority of samples hailed from nuclear families (73.3% in both groups). Parental education levels were generally high, with most fathers and mothers having attained a higher secondary education or above. Regarding sources of menstrual health information, most samples relied on their mothers and family members (66.7% experimental vs. 60.0% control). Clinically, the most common age of menarche was between 10 to 11 years for both the experimental (53.3%) and control (60.0%) groups. Over half of the samples in both groups reported regular menstrual periods and moderate blood flow. A significant proportion of the study samples reported a family history of severe dysmenorrhea (60.0% experimental vs. 66.7% control). Clinical variables indicated that a substantial majority led a sedentary physical activity level, especially in the experimental group (86.7%), and experienced mild to moderate general stress or anxiety levels (66.7% experimental vs. 86.7% control). The use of painkillers was relatively low in both groups (13.3% experimental vs. 26.7% control).

Section II: Menstrual Pain and Distress levels (Descriptive Statistics)

Table 2: Categorization of Menstrual Pain Levels (Pre-Test vs. Post-Test) (N=30)

Group	Pain Category	Pre-Test (f)	Pre-Test (%)	Post-Test (f)	Post-Test (%)
Experimental (n=15)	Mild (1-3)	1	6.7%	6	40.0%
	Moderate (4-6)	7	46.7%	8	53.3%
	Severe (7-10)	7	46.7%	1	6.7%
Control (n=15)	Mild (0-3)	0	0.0%	0	0.0%
	Moderate (4-6)	12	80.0%	13	86.7%
	Severe (7-10)	3	20.0%	2	13.3%

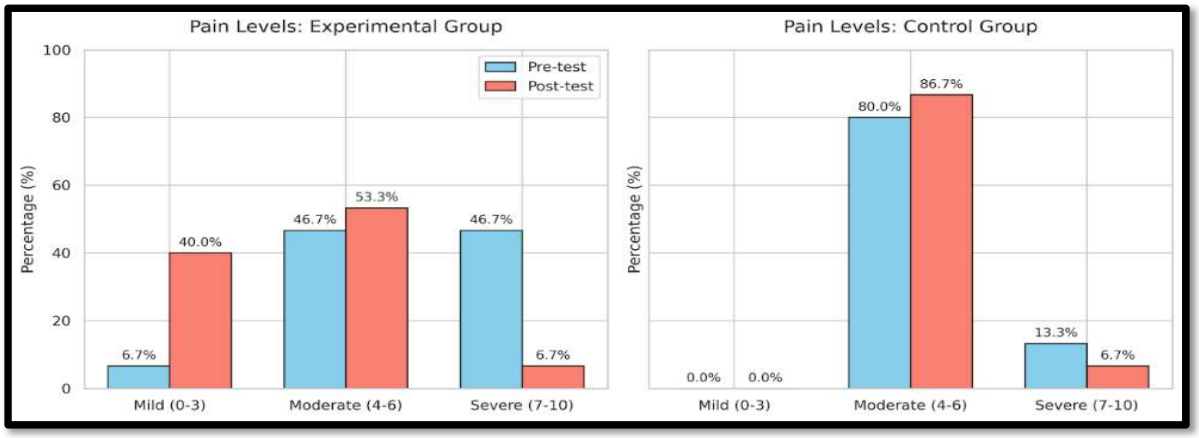

Figure 1: Menstrual Pain levels among Experimental and Control groups

Inference: Majority of samples (46.7%) in experiment group shows severe level of pain, which reduced to 6.7% following intervention. Whereas, majority samples (80%) in the control group presents with moderate level of pain, which increased to 86.7%.

Table 3: Categorization of Menstrual Distress Levels (Pre-Test vs. Post-Test) (N=30)

Group	Distress Category	Pre-Test (N)	Pre-Test (%)	Post-Test (N)	Post-Test (%)
Experimental (n=15)	Subclinical (0-16)	0	0.0%	10	66.7%
	Mild (17-40)	13	86.7%	5	33.3%
	Moderate (41-68)	2	13.3%	0	0.0%
	Severe (69-96)	0	0.0%	0	0.0%
Control (n=15)	Subclinical (0-16)	0	0.0%	1	6.7%
	Mild (17-40)	14	93.3%	13	86.7%
	Moderate (41-68)	1	6.7%	1	6.7%
	Severe (69-96)	0	0.0%	0	0.0%

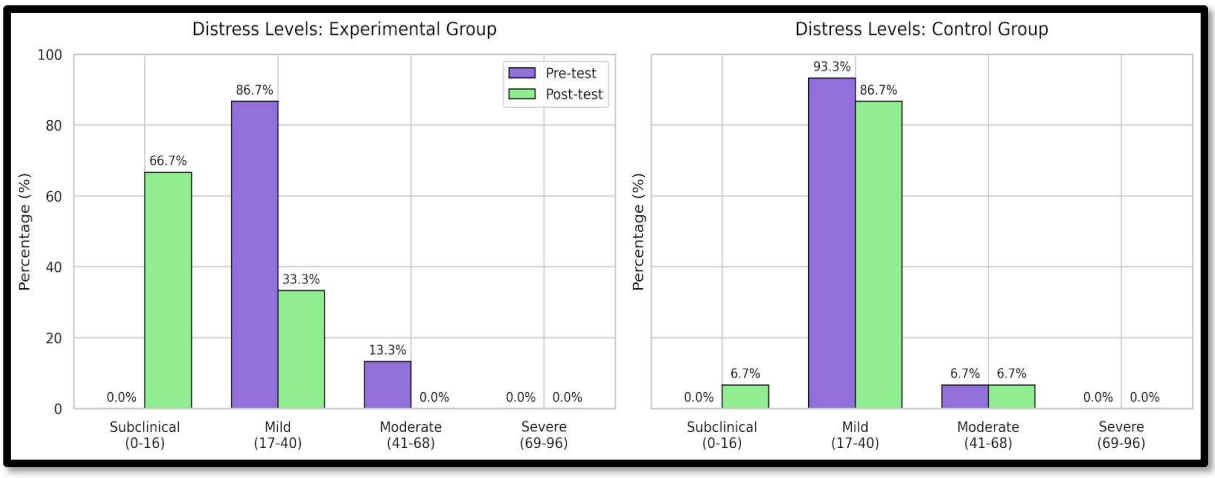

Figure 2: Menstrual Distress levels among Experimental and Control groups

Inference: Majority (86.7%) in Experimental group had Mild Distress levels, following the intervention which reduced to 33.3%. In the control group majority (93.3%) presents with Mild distress with a slight reduce to 86.7% following post-test.

Table 4: Mean, SD and Median of Menstrual Pain levels among Experimental and Control groups

Variable	Group	n	Mean	SD	Median
Pre-Test Pain level	Experimental	15	6.40	1.40	6.00
	Control	15	5.87	1.73	6.00
Post-Test Pain level	Experimental	15	4.07	1.71	4.00
	Control	15	5.60	1.76	5.00

Table 5: Mean, SD and Median of Menstrual Distress levels among Experimental and Control groups

Group & Stage	Minimum	Maximum	Mean	Median	(SD)
Experimental Pre-Test	17.00	56.00	25.00	20.00	11.24
Experimental Post-Test	12.00	29.00	16.40	14.00	4.91
Control Pre-Test	17.00	49.00	25.60	25.00	8.15
Control Post-Test	15.00	51.00	26.87	28.00	8.81

Inference: The pretest Mean Menstrual Distress level in the experimental group was 25.00 ± 11.24 SD. Following the intervention, the distress level dropped considerably to a mean of 16.40 ±4.91. The mean Menstrual Distress level in Control group was 25.60 ± 8.15 which is very similar to the experimental group's starting point. At the post-test stage, the mean distress level slightly increased to 26.87 ± 8.81 SD, this suggests that without the intervention, the participants in the control group experienced no relief from menstrual distress over the same time period.

Section II: Normality Assessment

Table 6: Shapiro-Wilk Test Results for Normality Assessment among Experimental and Control group Pre and Post-test Pain levels

Group	(n)	Test Statistic (W)	p-value	Normality Assessment
Experimental Pre-Test Pain	15	0.8904	0.0680	Normal (p > 0.05)
Experimental Post-Test Pain	15	0.9622	0.7307	Normal (p > 0.05)
Control Pre-Test Pain	15	0.7939*	0.0031	Not Normal (p<0.05)
Control Post-Test Pain	15	0.7552*	0.0010	Not Normal (p<0.05)

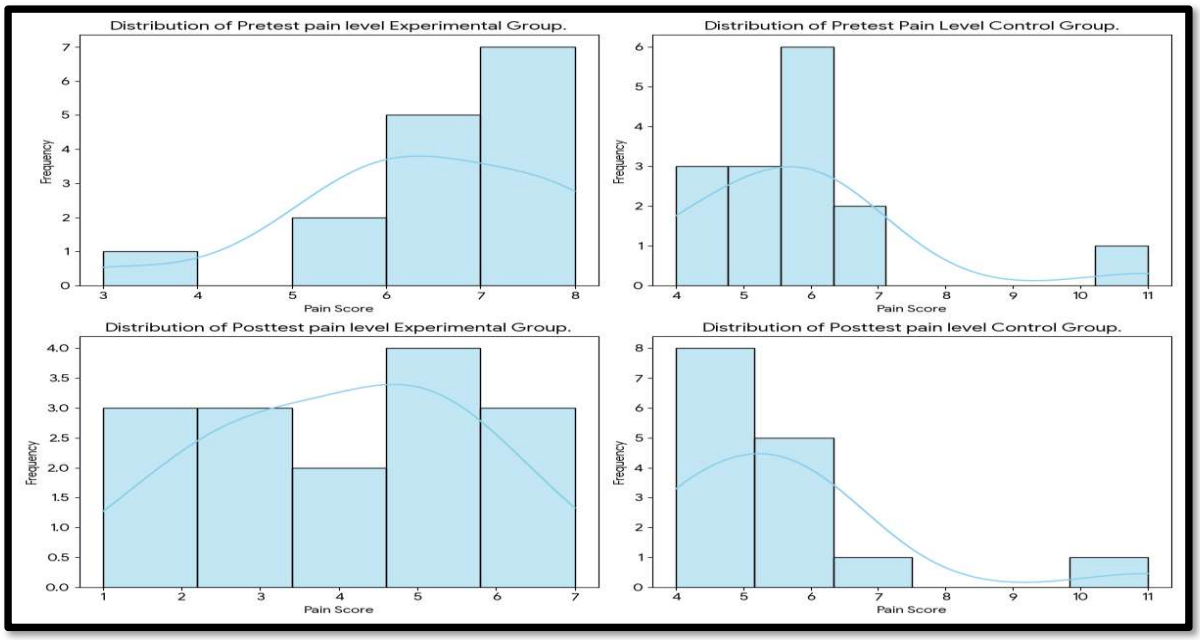

Figure 3: Histogram Plot representing the Distribution of Data

Inference: In the Experimental Group, the pain scores for both the pre-test and post-test follow a normal distribution and in the Control Group, the pain scores in both the pre-test and post-test do not follow a normal distribution (they are significantly non-normal).

Table 7: Shapiro-Wilk Test Results: Menstrual Distress Levels; Normality Assessment

Group & Timepoint	Sample Size (n)	Test Statistic (W)	p-value	Normality Assessment
Experimental Pre-Test	15	0.7269	0.0005*	Not Normal (p<0.05)
Experimental Post-Test	15	0.7592	0.0012*	Not Normal (p<0.05)
Control Pre-Test	15	0.8431	0.0139*	Not Normal (p<0.05)
Control Post-Test	15	0.8932	0.0750	Normal (p > 0.05)

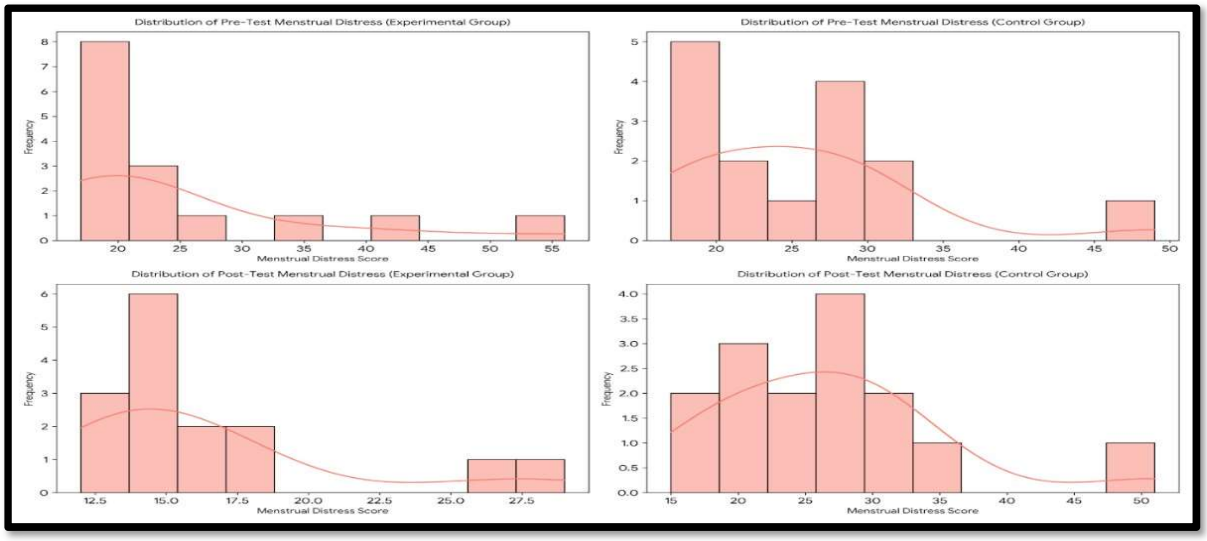

Figure 4: Histogram plot representing the Distribution of Data

Inference: Three out of the four variables (both Experimental groups and the Control pre-test) violate the assumption of normality by having a p-value well below 0.05, the data as a whole should be treated as non-normally distributed.

Section III: Comparison of Menstrual pain and Distress levels among Experimental and Control Groups

Table 8: Mann-Whitney U test statistic comparing the Menstrual Pain levels among Experimental and Control groups (N=30)

Variable	Group	n	Mean Rank	Sum of Ranks	U test	Welch's test	Significance
Pre-Test Pain level	Experimental	15	17.93	269.00	149.00 (p-value 0.123)	t = 0.928 (p-value 0.362)	Not Significant (p > 0.05)
	Control	15	13.07	196.00			
Post test Pain level	Experimental	15	12.17	182.50	62.50 (p-value 0.036)	t = -2.417* (p-value 0.022)	Significant (p < 0.05)
	Control	15	18.83	282.50			

Inference: A Mann-Whitney U test was conducted to determine the differences in Menstrual pain levels between the Experimental and Control groups. The results indicate that there is no statistically significant difference (U = 62.50, p = 0.036) in initial pain levels. The post-test pain levels comparison between the Experimental and Control groups reveals a statistically significant difference between the groups. The Experimental group reported significantly lower pain scores than the Control group.

Table 9: Mann-Whitney U test statistic comparing the Menstrual Distress levels among Experimental and Control groups (N=30)

Variable	Group	n	Mean Rank	Sum of Ranks	U test	Welch's test	Significance
Pre-Test Pain level	Experimental	15	13.93	209.00	89.00 (p-value 0.338)	t = -0.167 (df 25.53, p-value 0.868)	Not Significant (p > 0.05)
	Control	15	17.07	256.00			
Post test Pain level	Experimental	15	9.53	143.00	23.00 (p-value 0.0002)	t = -4.018 (df 21.93, p-value 0.0006)	Highly Significant (p < 0.001)
	Control	15	21.47	322.00			

Inference: A Mann-Whitney U test conducted revealed that the (pre-test) Menstrual Distress scores were not significantly different between the Experimental group (Mean Rank = 13.93) and the Control group (Mean Rank

= 17.07), U = 89.00, p = 0.338. Whereas, comparison of post-test Menstrual Distress scores between the Experimental and Control groups showed a highly significant difference between the Experimental group (Mean Rank = 9.53) and

the Control group (Mean Rank = 21.47), U = 23.00, p = 0.0002. Hence, the experimental group had significantly lower menstrual distress levels than the control group after the intervention.

Section IV: Effectiveness of Nurse led Interventions in Reducing Pain & Distress Levels.

1. Analysis of the Experimental Group (Parametric)

Table 10: 'Paired t test' Statistics comparing the before and after Intervention, Pain levels among the Experiment group. (N=30)

Stage	Mean	Mean Diff	SD	Std. Error Mean	t	df	p
Pre-Test Pain (Exp)	6.40	2.33	2.16	0.56	4.183*	14	0.0009
Post-Test Pain (Exp)	4.07						

Inference: The Paired Samples t-test, conducted to evaluate the effectiveness of the Nurse led intervention on Menstrual pain levels in the experimental group shows a statistically significant decrease in pain scores from the Pre-test (M = 6.40, SD = 1.40) to the Post-test (M = 4.07, SD = 1.71), t (14) = 4.18, p < 0.001. Hence, the Nurse led Interventions are highly effective at reducing pain.

2. Analysis of the Control Group (Non-Parametric)

Table 11: Wilcoxon Signed Rank test Statistics for Comparison of Pre and Post test Control group Pain levels. (N=15)

Variable	Group	n	Pre-Test Mean ± SD	Post-Test Mean ± SD	Z	p	Significance
Menstrual Pain Levels	Control	15	5.87 ± 1.73	5.60 ± 1.76	-1.242	.214	Not Significant
Count	Negative Ranks (Post < Pre)				04		
	Positive Ranks (Post > Pre)				01		
	Ties (Post = Pre)				10		

Inference: The Wilcoxon Signed-Rank test revealed that there was no statistically significant difference in the pre-test and post-test pain levels in control group, Z = -1.24, p = 0.214. A majority of the participants (10 out of 15) experienced zero change in their pain levels (Ties = 10). Hence it is Concluded that the pain levels in the control group did not change significantly over the duration of the study. The results clearly show that the intervention was successful.

Table 12: Wilcoxon Signed Rank test Statistics Comparing the Menstrual Distress levels before and after Intervention among the Experimental and Control Groups (N=30)

Variable	Group	n	Pre-Test Mean ± SD	Post-Test Mean ± SD	Z	p	Significance
Menstrual Distress Levels	Experimental	15	25.00 ± 11.24	16.40 ± 4.91	-2.529*	.011	Significant
	Control	15	25.60 ± 8.15	26.87 ± 8.81	-1.929	0.54	Not Significant

Inference: "A Wilcoxon Signed-Rank Test was conducted to evaluate the within-group changes in Menstrual Distress levels before and after the intervention. The experimental group demonstrated a statistically significant reduction in Menstrual Distress (Z = -2.53, p = .011) from pre-test to post-test. Conversely, participants in the control group, showed no statistically significant changes in Menstrual Distress (Z = -1.93, p = .054) levels over the same period. These findings indicate that the experimental intervention was highly effective in mitigating Menstrual Distress."

Section V: Association between Menstrual Pain and Distress Levels in Experimental Group and Demographic, Clinical Variables

Table 13: Freeman-Halton Exact Association of Post-Test Menstrual Pain with Demographic and Clinical Variables (Experimental Group) (N = 15)

Demographic Variable	Category	Pain: Mild	Pain: Mod	Pain: Severe	P value	Distress Subclinical	Distress Mild	P value
Age	13-14	0	2	1	0.231	2	1	0.291
	>14-15	3	5	0		4	4	
	>15 years	3	1	0		4	0	
Class Enrolled	8th	0	1	1	0.379	1	1	1.000
	9th	2	2	0		3	1	
	10th	4	5	0		6	3	
Religion	Hindu	2	4	1	0.158	4	3	0.790
	Muslim	4	1	0		4	1	
	Christian	0	3	0		2	1	
Type of Family	Nuclear	5	5	1	0.692	7	4	1.000
	Joint	1	3	0		3	1	
Father's Education	High School	4	0	0	0.011*	4	0	0.231
	Higher Sec. & Above	2	8	1		6	5	
Mother's Education	High School	4	2	0	0.287	6	0	0.044*
	Higher Sec. & Above	2	6	1		4	5	
Father's Occupation	Govt Employment	1	2	0	0.840	1	2	0.336
	Pvt. Employment	3	2	1		4	2	
	Self Employed	2	4	0		5	1	
Mother's Occupation	Homemaker	3	3	0	0.691	4	2	1.000
	Pvt. Employment	2	1	1		3	1	
	Govt Employment	1	2	0		2	1	
	Self Employed	0	2	0		1	1	
Monthly Income	< 10000/- Rs.	1	1	0	0.355	1	1	0.700
	Rs 10001-20000/-	3	3	0		5	1	
	>30000 Rs.	1	4	0		3	2	
Info Source	Mother & Family	5	4	1	0.552	6	4	0.760
	Internet/Media	0	3	0		2	1	
	Teachers/Friends	1	1	0		2	0	

*** Significant at p < 0.05.**

Inference: Fathers' education has a significant association with Menstrual Pain (p<0.05).

Table 14: Freeman-Halton Exact Association of Post-Test Menstrual Distress with Demographic and Clinical Variables (Experimental Group) (N=15)

Clinical Variable	Category	Pain: Mild	Pain: Mod	Pain: Severe	P value	Distress Subclinical	Distress Mild	P value
Age of Menarche	<10 years	0	2	0	0.781	0	2	0.09a
	10-11 years	3	4	1		5	3	
	12-13 years	1	0	0		1	0	
	>13 years	2	2	0		4	0	
Period Regularity	Irregular	3	4	0	1.000	5	2	1.000
	Regular	3	4	1		5	3	
Duration of Flow	Less than 3 days	1	1	0	1.000	2	0	0.053a
	3-7 days	3	4	1		3	5	
	More than 7 days	2	3	0		5	0	
Amount of Blood	Scanty	1	1	0	0.876	2	0	0.053a
	Moderate	2	5	1		3	5	
	Heavy	3	2	0		5	0	
Family History	No	2	3	1	0.566	3	3	0.329
	Yes	4	5	0		7	2	

BMI	Underweight	2	4	0	0.213	4	2	1.000
	Normal	2	0	1		2	1	
	Overweight	2	4	0		4	2	
Junk Food	Occasional	4	2	1	0.184	4	3	0.608
	Frequent	2	6	0		6	2	
Physical Activity	Sedentary	4	8	1	0.276	8	5	0.524
	Regular Exercise	2	0	0		2	0	
Sleep Quality	Normal	3	2	1	0.840	3	3	0.775
	Disturbed	2	4	0		5	1	
	Increased Daytime	1	2	0		2	1	
Pain Killers	No	5	7	1	1.000	8	5	0.524
	Yes	1	1	0		2	0	
Associated Symptoms	No	4	7	1	0.631	8	4	1.000
	Yes	2	1	0		2	1	
Stress/Anxiety Levels	Normal	2	2	1	0.534	2	3	0.251
	Mild to Moderate	4	6	0		8	2	

a Marginal Association.

Inference: No significant association (p>0.05). Only Duration of flow, amount of blood and Age of Menarche showed a marginal association with post-test Distress levels in the Experimental group.

4. Discussion

This study provides robust quantitative evidence that a structured, nurse-led intervention is highly effective in mitigating both the Menstrual pain and distress levels associated with primary dysmenorrhea among rural adolescent girls. The core objective of this study was to evaluate the impact of nurse led interventions designed to alleviate Menstrual pain and distress levels among adolescent girls. The findings demonstrate a highly effective interventional impact. Post-intervention, the experimental group exhibited a shift in pain severity, with the proportion of adolescents reporting "Mild" pain (1–3) surging from 6.7% to 40.0%, while "Severe" pain (7–10) dropped from 46.7% to 6.7%. Similarly, the "Subclinical" distress (0–16) rose from 0.0% at pretest to 66.7% post-test. Conversely, the control group remained unchanged in the "Moderate" to "Severe" pain and "Mild Distress" across both testing phases. These results strongly align with recent studies, such as the work by Cherenack EM et al., which emphasizes that culturally tailored, educational, and behavioural interventions are critical to helping adolescent girls overcome physiological barriers and manage dysmenorrhea effectively[21]. Left unaddressed, dysmenorrhea causes severe disruptions to daily functioning, concentration, and emotional stability; thus, the dramatic symptom reduction observed in this study validates the necessity of structured school-based health interventions[21, 22]. The findings are further in accordance with the study conducted by Armour et al. (2019) and Jo and Lee (2018), who emphasized that thermotherapy and physical exercises actively reduce uterine contractility and ischemia[13,14]. Furthermore, the significant drop in the distress levels highlights the psychological benefits of the intervention. As noted by Hailemeskel et al. (2016), dysmenorrhea is not just a somatic event but a deeply emotional one[12]. The inclusion of modules on Effective Communication and Coping with Stress helped cope with the pain, reducing the associated anxiety and helplessness. When girls learned to articulate their discomfort without stigma, their overall psychological burden got reduced. A novel and highly significant finding of this study is that research variables were associated more with demographic predictors than the clinical factors. Specifically, the Freeman-Halton Exact analysis revealed a significant inverse relationship between parental education and Menstrual Pain, Distress. Post-intervention, 100% of adolescents whose fathers possessed only a "High School" education successfully normalized to the "Mild" pain category (p = 0.011). Similarly, 100% of adolescents whose mothers possessed a High School education achieved total "Subclinical" distress (p = 0.044). In stark contrast, daughters of highly educated parents ("Higher Secondary and Above") exhibited moderate/severe pain and distress (post-test). This finding is in contradiction with existing open-access literature, such as the study by Rehman et al., which establishes that maternal education is a strong positive determinant of baseline menstrual hygiene and dysmenorrhea awareness[23]. We hypothesize that adolescents from households with lower educational backgrounds previously lacked basic menstrual health literacy; therefore, the introduction of a structured intervention filled a massive educational gap, yielding a dramatic and immediate therapeutic effect. Conversely, adolescents from highly educated households may face greater academic or social expectations, potentially triggering psychosomatic distress, harder to alleviate through short-term interventions alone. The results further revealed a marginal association (not statistically significant) regarding the biological onset of puberty, amount of blood flow and duration with research variables (p=0.094, p=0.053, p=0.053). The samples who experienced early menarche (<10 years) exclusively reported "Mild Distress" post-intervention, whereas 100% of the late-onset group (>13 years) achieved total "Subclinical" normalization (p= 0.094). Also, the modern trend in decrease in the age of menarche (AOM) is prevalent across the world and not limited to rapidly developing third world nations as well as the Indian cultural context[1].

Furthermore, Velez et al. demonstrated that girls who experience menarche at a younger age, endure significantly higher risks for primary dysmenorrhea, shorter cycles, and elevated psychological distress[24]. Anikwe et al. similarly noted that early menarche exacerbates severe menstrual pain and the accompanying socio-emotional withdrawal[25]. Clinical variables, including Body Mass Index (BMI), junk food consumption, physical activity etc, had no association with the research variables. ($p > 0.05$). While previous literature confirms that poor diet, sedentary behavior, and heavy blood flow are established risk factors for developing severe dysmenorrhea[23,25,26].

Nursing Implications

The implications for rural reproductive health education are substantial among adolescent girls. Since dysmenorrhea is a primary leading cause of school based absenteeism[8,10]. Integrating the nurse-led non-pharmacological measures into standard school health curriculums can directly improve attendance percentage and hence ensure more academic engagement.

Limitations

The self-reporting nature of the NPRS and CDDS tools presents with potential subjective bias. Furthermore, the study was confined to a single geographical district in Kerala, suggesting that wider, multi-centered randomized controlled trials are needed to validate these findings across culturally diverse Indian population.

Ethical Considerations

Approval was granted by the Institutional Ethics Committee, Vinayaka Mission's Kirupananda Variyar Medical College & Hospitals, Salem, Tamilnadu. Written informed consent from parents and verbal assent from the participants were obtained. Complete data confidentiality was maintained.

5. Conclusion

Primary dysmenorrhea heavily burdens the lives of adolescent girls, yet it remains under-managed in rural settings. This study concludes that nurse-led interventions combining health literacy, local heat therapy, Pelvic exercises, and psychosocial support is a highly effective, culturally safe, and accessible method for reducing menstrual pain and distress.

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