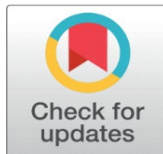
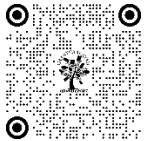


EFFECT OF VITAMIN C AND COMBINATION OF VITAMIN C WITH PHYSICAL EXERCISE ON THE PAIN OF DYSMENORRHEA

Satabdi Mondal ¹, Dr. Badshah Ghosh ²

¹State Aided Contractual Teacher-I, Panskura Banamali College (Autonomous), Panskura, Purba Medinipur

²Principal, G.C.P.E.W, Dinhata, Cooch Behar



Corresponding Author

Satabdi Mondal,
satabdimondal16@gmail.com

DOI

[10.29121/shodhkosh.v5.i6.2024.2876](https://doi.org/10.29121/shodhkosh.v5.i6.2024.2876)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Copyright: © 2024 The Author(s). This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

With the license CC-BY, authors retain the copyright, allowing anyone to download, reuse, re-print, modify, distribute, and/or copy their contribution. The work must be properly attributed to its author.



ABSTRACT

Dysmenorrhea is a common problem in adolescent girls and women; with moderate to severe pain, often refrain from their daily activity and also affect their profession and quality of life. In this study effect of vitamin C and vitamin C in combination with exercise on the pain of dysmenorrhea was examined on twenty girl students of age range 18-22 years suffering from the symptoms of mild to moderate primary dysmenorrhea. Pain was measured as Pain Rating Index (PRI) using McGill pain Questionnaire. Duration of the intervention was for consecutive 8 weeks and pain score was measured three times; before intervention, after 1st menstrual cycle and after second menstrual cycle. Results showed that pain score decreased after both the treatments. It was also observed that vitamin C in combination with exercise showed a better effect than vitamin C alone ($P < 0.05$).

Keywords: Primary Dysmenorrhea, Vitamin C, Exercise

1. INTRODUCTION

Dysmenorrhea is a common issue for women of reproductive age. Dysmenorrhea, also known as painful menstruation in women with normal pelvic anatomy, typically begins during adolescence [1]. Dysmenorrhea begins when young girls first experience ovulatory cycles, and its prevalence rises during adolescence (14-17 years), reaches its peak in 20-24 years, and gradually declines thereafter. Dysmenorrhea is characterized by pain that begins a few hours before or after menstruation and lasts 24-48 hours [2]. Dysmenorrheal pains originate in the lower abdomen and may spread to the inner thighs. In a large number of cases, girls may experience systematic symptoms such as backache, nausea, vomiting, diarrhea, fatigue, and headache. With severe pain, the patient may be absent from their daily activity schedule for one or two days, which could have a negative impact on their career.

The pain is caused by natural chemicals known as prostaglandins, which are produced in the uterine lining by contracting the muscles and blood vessels [3]. On the first day of a period, the level of prostaglandin is high; as bleeding

continues and the uterine lining sheds, the level falls, and pain decreases. Non-steroidal anti-inflammatory drugs (NSAIDs), which lower the level of prostaglandins produced by the body and reduce their effects, are frequently prescribed to treat menstrual cramps and pain [4]. Women with bleeding disorders, asthma, aspirin allergy, liver damage, stomach disorders, or ulcers should avoid taking NSAIDs such as ibuprofen, aspirin, and naproxen. Long-term use of NSAIDs increases the risk of side effects. Frequent use of NSAIDs can lead to gastrointestinal, cardiovascular, and renal complications [5]. Many studies have been conducted to find alternative treatments for dysmenorrhea besides medications. This includes exercising, practicing yoga, taking vitamins and micronutrients, and so on. This may lead to a decrease in the use of drugs with adverse side effects.

Physical activity is widely believed to alleviate the discomfort associated with dysmenorrhea. Several studies have found that exercise therapy and physical activity help dysmenorrheal patients. Exercise and physical activity increase premenstrual pelvic blood flow, which can speed up the removal of waste and prostaglandins from the uterus. Regular exercise, on the other hand, aids in stress reduction, improves blood circulation, and increases endorphins and nerve transducers [6].

A group of researchers investigated the impact of exercise on the severity and duration of primary dysmenorrhea in students with mild to moderate dysmenorrhea [7]. The results showed that the mean dysmenorrhea severity and duration after the intervention was significantly lower than in the control group. Another study compared the effects of aerobic and stretching exercises on the severity of primary dysmenorrhea in 105 female students [8]. There was a significant difference between the aerobic and stretching groups prior to and following the interventions. Another group of researchers conducted a randomized controlled trial on women with severe primary dysmenorrhea to assess the efficacy of a treadmill-based aerobic exercise intervention on pain and associated symptoms [9]. The results showed that exercise has a significant impact on primary dysmenorrhea-related pain. In two additional studies, they claimed that exercise can reduce the intensity and duration of pain [10, 11]. According to the literature, in addition to exercise, yoga and physiotherapy may help to relieve the pain associated with primary dysmenorrhea [12–16].

According to various studies, nutrition can influence the prevalence and severity of dysmenorrhea. Dietary supplements are used to treat period pain. In a study, the effect of vitamin E on the treatment of primary dysmenorrhea was investigated, and the findings revealed that vitamin E relieves pain and reduces blood loss [17]. Another study compared the effects of vitamin B1 and ibuprofen on the treatment of primary dysmenorrhea, and the results were similar [18]. The effectiveness of fish oil and vitamin B1 against primary dysmenorrhea has also been discovered in the literature [19]. Another group of researchers concluded from their study that in adolescent girls with primary dysmenorrhea, vitamin E taken for 5 days around the time of menstruation significantly reduced the severity and duration of menstrual pain and blood loss compared to placebo [20].

Vitamin C is a well-established cofactor for the synthesis of catecholamine neurotransmitters, and thus plays a role in neuromodulation [21]. Vitamin C functions as a cofactor for the enzyme dopamine β -hydroxylase, which converts dopamine to norepinephrine [22, 23]. Vitamin C may also help with dopamine synthesis by recycling the cofactor tetrahydrobiopterin, which is required for the rate-limiting enzyme tyrosine hydroxylase to function optimally. Vitamin C regulates the level of hemoglobin in the bloodstream. Vitamin C deficiency has been shown to contribute to nutritional anaemia by causing scurvy anaemia and menorrhagia (abnormally heavy bleeding during menstruation), either by impairing the health of the endometrial blood vessels or by affecting menstrual function in an unexplained way, most likely associated with the formation of the hormone progesterone [24]. There is little evidence in the literature that vitamin C has a direct effect on dysmenorrhea. However, given vitamin C's biological functions, it is reasonable to expect a significant effect on dysmenorrhea.

The literature indicates that exercise may have a positive impact on the pain associated with primary dysmenorrhea, though studies on the use of vitamins for the same are limited. The literature also lacks studies on the combined effect of exercise and vitamins on dysmenorrhea. More research into these two aspects, namely the effect of vitamins and the combination of vitamins and exercise on dysmenorrhea, is required. These may open up and establish an alternative route for treating dysmenorrhea, eliminating the need for analgesics and other medications.

2. METHOD

2.1. SELECTION OF SUBJECTS

The study included sedentary girls who had been experiencing primary dysmenorrheal pain for the previous three months and had no sexual experience. Twenty subjects (20) were selected from a population of fifty female students at Panskura Banamali College (Autonomous), Panskura, Purba Medinipur, West Bengal, based on their responses to a questionnaire that asked about their demographics (name, father's name, income, address, age, height-weight to calculate BMI, and menstrual history (age at which menstruation began, period of menstruation, history of painful menses, type of drugs taken, medical condition, active or sedentary lifestyle, etc.). All participating students were asked to provide written consent regarding their willingness to participate.

2.2. CRITERIA MEASURES

The McGill Pain Questionnaire was used in this study to measure pain quality using the Pain Rating Index (PRI). The methods for defining the characteristics of pain were created by Melzack and Torgerson (1971). The questionnaire, now called the McGill Pain Questionnaire, was published in 1975 after some revisions [25]. Since then, it has gained popularity as a clinical and research tool. Twenty subgroups in all, grouped under four main categories—sensory, 1–10; affective, 11–15; evaluative, 16; and miscellaneous, 17–20—make up the questionnaire. The subject must select the word that best describes the state of the pain from the list of words under each subgroup. Each descriptor word's rank value is determined by where it falls in the word set. All 20 subgroups must go through the same process, and the pain rating index (PRI) is calculated by adding the rank values. More pain is indicated by a higher PRI value.

2.3. EXPERIMENTAL DESIGN

The subjects were randomly assigned to two experimental groups: the first group (N=10) received vitamin C, and the second group (N=10) received both vitamin C and physical exercise. The study was designed to cover two consecutive menstrual cycles. During this time, all students (both groups) were allowed to take 400mg of vitamin C daily. The second group (vitamin C with exercise) received a structured 8-week (3-day-per-week) aerobic training program that included 10-minute warm-up exercises, treadmill running, and 10-minute cooling down. The duration of treadmill running was gradually increased from 10 to 25 minutes. The intensity of exercise was gradually increased from 40% to 65%. Days of menstruation were excluded from the exercise program. The Pain Rating Index (PRI) values were assessed using Mc. Gill's Pain questionnaires [25]. PRI values for each subject were collected three times: before the intervention, after the first menstrual cycle, and after the second menstrual cycle. Subjects were advised to record the PRI values within 24 hours of the onset of pain.

2.4. DATA ANALYSIS

SPSS version 25.0 was used to calculate all statistical analyses. The threshold for statistical significance was set at $P < 0.05$. Initially, descriptive statistics (mean and SD) were computed in order to present the data in a more meaningful manner and facilitate interpretation. The Shapiro-Wilk test was performed under the assumption of normality. Levene's Test was used to determine the homogeneity of the groups' single categorical variables. To determine differences between groups in terms of time series, a two-way repeated measures ANOVA was used.

3. RESULTS

Table 1: Descriptive statistics of pain score (PRI):

Group		Pre-test	1 st MC	2 nd MC
Vitamin C	Mean	43.3000	42.4000	41.3000
	Std. Deviation	4.64399	4.40202	5.45792
Vitamin C with exercise	Mean	41.7000	40.6000	39.4000
	Std. Deviation	5.43752	5.08156	5.60159

The descriptive statistics indicate pain score decreased after the intervention in both groups. Mean PRI values also decreased with time; in each case mean score after 2nd menstrual cycle were less compared to 1st menstrual cycle.

Table 2: The interaction effect between treatment and time on the PRI values, including the mean, standard error, and 95% confidence interval for each condition

Treatment	Time	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Vitamin C	Pre-test	43.300	1.469	39.978	46.622
	1MC	42.400	1.392	39.251	45.549
	2MC	41.300	1.726	37.396	45.204
Vitamin C with exercise	Pre-test	41.700	1.719	37.810	45.590
	1MC	40.600	1.607	36.965	44.235
	2MC	39.400	1.771	35.393	43.407

The mean pain score (PRI) for the group treated with vitamin C decreases from 43.30 (SE = 1.47) to 42.40 (SE = 1.39) after first menstrual cycle, it further decreases to 41.30 (SE = 1.73) after second menstrual cycle suggesting the effectiveness of the treatment. There also a steady decrease in the mean pain score for the group treated with vitamin C with exercise by time; from 41.70 (SE = 1.72) (pre-test) to 40.60 (SE = 1.61) after 1st menstrual cycle to 39.40 (SE = 1.77) after completion of the intervention. Overall, these results indicate both treatments showed a progressive decline in the mean pain scores across the menstrual cycles.

Table 3: Estimate for the two treatments on the PRI values, including the mean, standard error, and 95% confidence interval

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Vitamin C	42.333	1.514	38.909	45.758
Vitamin C with exercise	40.567	1.681	36.765	44.369

The estimates for the two treatments provide information about the central tendency and precision of the mean scores, as well as the 95% confidence intervals for each treatment condition. The mean score for treatment with vitamin C alone is 42.333. In contrast, vitamin C supplementation combined with exercise has a lower mean score of 40.567, which may indicate that it is more effective than vitamin C supplementation alone.

4. DISCUSSIONS

The current study was conducted to investigate the effect of vitamin C and vitamin C combined with treadmill-based aerobic training on the pain of primary dysmenorrhea. Pain was measured as a Pain Rating Index (PRI) using the McGill pain questionnaire for two consecutive menstrual cycles. The results showed that for both cases (vitamin C and vitamin C with exercise), the pain score (PRI) gradually decreased from the pre-test value to menstrual cycles later. The current study's findings are consistent with previous studies by other groups of researchers who found that other vitamins, such as vitamin E and vitamin B1, had a positive effect on primary dysmenorrhea [17-20]. S. Ziaei et al. demonstrated that vitamin E reduced the severity and duration of pain associated with primary dysmenorrhea, as well as the amount of menstrual blood loss [17].

The literature clearly shows that nutrition plays an important role in the treatment of primary dysmenorrhea. Antioxidants such as vitamin C and E may inhibit oxidative stress and prostaglandin synthesis, thereby reducing pain [26]. Antioxidant levels such as superoxide dismutase, vitamin E, and vitamin C were found to be lower in women suffering from primary dysmenorrhea [26]. The decreased antioxidant level could be attributed to increased antioxidant consumption to detoxify the increased oxidants or free radicals in primary dysmenorrhea. As a result, consuming antioxidants such as vitamin C may compensate for the deficiency, thereby improving primary dysmenorrhea symptoms.

The current study also found that aerobic exercise was effective in relieving the pain of primary dysmenorrhea, supporting the existing literature that exercise and physical activity have a positive effect on primary dysmenorrhea. There are numerous articles that investigate the effects of exercise, yoga, and physiotherapy on primary dysmenorrhea [7-16]. In each case, exercise and physical activity were found to help alleviate pain.

Aerobic exercise is thought to improve blood flow, relax abdominal muscles, reduce pelvic pain, and relieve pressure on nerve centers, pelvic organs, and the alimentary canal [13]. Exercise increases the release of several neurotransmitters, including natural endorphins, estrogen, dopamine, and endogenous opiate peptides, as well as altering hormone secretion reproduction, suppressing prostaglandin release, and increasing the estrone-estradiol ratio, which reduces endometrial proliferation and redirects blood flow away from the uterus.

Another finding of our study was that vitamin C supplementation combined with treadmill-based exercise reduced the pain of primary dysmenorrhea. The experimental group received 400 mg of vitamin C daily and followed an 8-week structured training schedule, resulting in a lower pain score than the group that only received vitamin C supplements. It is possible that the increased antioxidant levels, combined with the benefits of regular exercise, help to alleviate the symptoms of primary dysmenorrhea. Though the combined effect of vitamin and exercise on primary dysmenorrhea is uncommon in the literature, it is possible that combining exercise with vitamins will result in a more effective pain reduction. However, rigorous research in this area is required.

5. CONCLUSION

The study found that vitamin C can effectively treat the pain of primary dysmenorrhea. It also reveals that vitamin C combined with exercise can reduce pain more effectively, making it a better alternative.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

REFERENCES

1. Dysmenorrhea, Linda French, American Family Physician, 2005, Volume 71, Number 2, 285-291.
2. Primary dysmenorrhea and menstrual symptoms in Indian female students: prevalence, impact and management, Shabnam Omidvar, Fatemeh Bakouei, Fatemeh Nasiri Amiri, Khyrunnisa Begum, Global Journal of Health Science; 2016, Vol. 8, No. 8.
3. Dysmenorrhea and prostaglandine: pharmacological and therapeutic consideration, Dawood M Y, Drugs. 1981, 22(1),42-56.
4. Nonsteroidal anti-inflammatory drugs and changing attitudes toward dysmenorrhea, Dawood M Y, Am J Med, 1988 20;84(5A), 23-9.
5. Adverse Effects of Nonsteroidal Antiinflammatory Drugs: An Update of Gastrointestinal, Cardiovascular and Renal Complications, Sam Harirforoosh, Waheed Asghar, and Fakhreddin Jamali, J Pharm Pharm Sci, 2013, 16(5) 821 - 847.
6. Levine M. Ascorbic acid specifically enhances dopamine beta-monooxygenase activity in resting and stimulated chromaffin cells. J Biol Chem. 1986;261(16):7347-7356.
7. The Effect of Exercise Plan Based on FITT Protocol on Primary Dysmenorrhea in Medical Students: A Clinical Trial Study, Heidari Moghadam R, Abdolmaleki E, Kazemi F, Masoumi SZ, Khodakarami B, Mohammadi Y., J Res Health Sci. 2019; 19(3): e00456.
8. Comparing the Effects of Aerobic and Stretching Exercises on the Intensity of Primary Dysmenorrhea in the Students of Universities of Bushehr, Farideh Vaziri; Azam Hoseini; Azam Hoseini; Farahnaz Kamali; Khadijeh Abdali; Mohamad javad Hadianfard; Mehrab Sayadi, Journal of Family and Reproductive Health, March 2015 Vol. 9, No. 1.

9. Effectiveness of a treadmill-based aerobic exercise intervention on pain, daily functioning, and quality of life in women with primary dysmenorrhea: A randomized controlled trial, Priya Kannana, Cathy M. Chapplea , Dawn Millerb , Leica Claydon-Muellerc , G. David Baxter; Contemporary Clinical Trials, 81 (2019) 80–86.
10. Stretching or Core Strengthening Exercises for Managing Primary Dysmenorrhea, Saleh HS, Mowafy HE, El Hameid AA (2016), Journal of Women's Health Care 5: 295.
11. The Effect of Exercise on Primary Dysmenorrhea, Abbaspour Z., Rostami M., Najjar Sh., Journal of Research in Health Sciences, 2006 Vol 6, No 1, pp. 26-31.
12. Effect of Yoga on the Menstrual Pain, Physical Fitness, and Quality of Life of Young Women With Primary Dysmenorrhea, Ponlapat Yonglitthipagon, Somruthai Muansiangsai, Wilanee Wongkhumngern, Wanida Donpunha, Raoyrin Chanavirut, Wantana Siritaratiwat, Lukana Mato, Wichai Eungpinichpong, Taweesak Janyacharoen, Journal of Bodywork & Movement Therapies 21 (2017) 840-846.
13. Effect of aerobic exercises on primary dysmenorrhoea in college students, Anuradha Sutar, Sayli Paldhikar, Nigar Shikalgar, Snehal Ghodey, Journal of Nursing and Health Science (IOSR-JNHS) volume 5, Issue 5 (2016), PP 20-24.
14. Effect of cognitive behavioral interventions (Yoga) on premenstrual syndrome among adolescents, Karpagavalli, Raj Rani, National Journal of Advanced Research, Volume 6; Issue 2; 2020; Page No. 33-39.
15. Comparison of the Effect of Massage Therapy and Isometric Exercises on Primary Dysmenorrhea: A Randomized Controlled Clinical Trial, Sara Azima, Hajar Rajaei Bakhshayesh, Maasumeh Kaviani, Keramatallah Abbasnia MSc, Mehrab Sayadi, J Pediatr Adolesc Gynecol 28 (2015) 486-491.
16. Effect of a physiotherapy program in women with primary dysmenorrhea, Mario I. Ortiz, Sandra Kristal Corte's-Ma'rquez, Luis C. Romero-Quezada, Gabriela Murgui'a-Ca'novas, Alfonso P. Jaramillo-Di'az, European Journal of Obstetrics & Gynecology and Reproductive Biology, 194 (2015) 24–29.
17. A randomised controlled trial of vitamin E in the treatment of primary dysmenorrhoea, S. Ziaei, M. Zakeri, A. Kazemnejad, BJOG: an International Journal of Obstetrics and Gynaecology April 2005, Vol. 112, pp. 466 –469.
18. Comparing the effect of vitamin B1 (vit. B1) and ibuprofen on the treatment of primary dysmenorrhea, Mandana Zafari, Aghamohammady A. and Tofighi M., African Journal of Pharmacy and Pharmacology July 2011 Vol. 5(7), pp. 874-878.
19. The Effects of Fish Oil Capsules and Vitamin B1 Tablets on Duration and Severity of Dysmenorrhea in Students of High School in Urmia-Iran, A. Hosseini, V. Alinejad, M. Alinejad and N. Aghakhani, Global Journal of Health Science; Vol. 6, No. 7; 2014, 124-129.
20. Vitamin E greatly reduced the severity and duration of menstrual pain in girls with primary dysmenorrhea, Ziaei S, Zakeri M, Kazemnejad A, Evidence-based Obstetrics and Gynecology (2006) 8, 22-23.
21. Harrison FE, May JM. Vitamin C function in the brain: vital role of the ascorbate transporter SVCT2. Free Radic Biol Med. 2009;46(6):719–730. doi: 10.1016/j.freeradbiomed.2008.12.018. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
22. Levine M. Ascorbic acid specifically enhances dopamine beta-monooxygenase activity in resting and stimulated chromaffin cells. J Biol Chem. 1986;261(16):7347–7356. [PubMed] [Google Scholar]
23. May JM, Qu ZC, Nazarewicz R, Dikalov S. Ascorbic acid efficiently enhances neuronal synthesis of norepinephrine from dopamine. Brain Res Bull. 2013; 90:35–42. doi: 10.1016/j.brainresbull.2012.09.009. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
24. Deeny, J. and Geary, R. C. (1940). Ulster med. J. 9:117
25. Melzack R: The McGill Pain Questionnaire: major properties and scoring methods. Pain 1975; 1:277–99.
26. Oxidative Stress and Antioxidant Status in Primary Dysmenorrhea, S.Venkata Ra , Ra i i an.V.S, M.Vijayasree, Journal of Clinical and Diagnostic Research. 2011 June, Vol-5(3): 509-511 509