

Original Paper


Effect Of a Gym Ball Exercise Program on Dysmenorrhea in Nursing Students of a Selected College in Mangaluru, India: A Quasi-experimental Study



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Citation Azabu A, Fernandes P, Thomas T. Effect Of a Gym Ball Exercise Program on Dysmenorrhea in Nursing Students of a Selected College in Mangaluru, India: A Quasi-experimental Study. *J Holist Nurs Midwifery*. 2024; 34(1):29-34. <https://doi.org/10.32598/jhnm.34.1.2553>

Running Title Effect of Gym Ball Exercise on Dysmenorrhoea

doi <https://doi.org/10.32598/jhnm.34.1.2553>



Article info:
Received: 08/11/2022
Accepted: 21/11/2023
Available Online: 01/01/2024

Keywords:
Dysmenorrhea, Exercise therapy, Gym ball exercise

ABSTRACT

Introduction: Dysmenorrhoea is one of the leading causes of school absenteeism among adolescent girls. Many women have menstrual cramps before and during their menstrual periods. For some women, the discomfort is merely annoying. Methods used to relieve dysmenorrhea include; exercise, a healthy diet, and yoga.

Objective: This study aims to evaluate the effect of a gym ball exercise program on dysmenorrhea in nursing students from a selected college in Mangaluru, India.

Materials and Methods: This is a quasi-experimental study on 52 eligible nursing students (26 in the exercise group and 26 in the control group). A pre-test assessment was done in both groups to assess the level of dysmenorrhea by using the numerical pain rating scale. The gym ball exercise was performed in the exercise group for 3 weeks prior to their predicted menstrual date, three times a week, each for 45 minutes. The post-test assessment was done on the first day of their menstruation and followed up one month later to assess the sustainability of the effect of the exercise. To analyze the data, inferential statistics, including chi-square test, Fisher's exact test, Wilcoxon signed rank test, and Mann-Whitney U test were used.

Results: The participants had moderate to severe pain. They had regular menstrual cycles lasting for 28-30 days, with a menstrual duration of 3-6 days, and moderate bleeding. The level of dysmenorrhea in the exercise group was lower (2.69±1.15) than in the control group (4.77±1.75) in the post-test phase. The mean level of dysmenorrhoea in the follow-up phase was 3.08±1.74 and 4.35±1.79 in the exercise and control groups, respectively. A significant difference was found between pre-test and follow-up pain scores (P=0.001) and between post-test and follow-up pain scores (P=0.001). Mann-Whitney U test results showed a significant difference between the two groups in the post-test (P=0.001) and follow-up phases (P=0.001).

Conclusion: The four-week gym ball exercise program is effective in reducing the intensity of dysmenorrhea in nursing students.

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Highlights

- Gym ball exercise enhances blood circulation in the lower limbs and abdomen.
- Gym ball exercise is effective for reducing lower abdominal pain.
- Gym ball exercise is a non-medical strategy for managing dysmenorrhea intensity.

Plain Language Summary

In this study, we investigated the effect of a gym ball exercise program on dysmenorrhea, a condition involving menstrual pain. The gym ball exercise may affect by controlling the activation of the sympathetic nervous system and positively affecting the body's hormonal system. This exercise can also improve blood circulation in the lower limbs and make blood vessels more elastic, which can help reduce lower abdominal pain during menstruation. Our findings showed that the gym ball exercise had a positive impact. The participants experienced less pain in their lower abdomen after engaging in these exercises. This suggests that gym ball exercise can be a useful program to reduce dysmenorrhea and improve overall well-being. This is an important finding for those experiencing this discomfort.

Introduction

Dysmenorrhea, which refers to painful menstrual cramps, is a prevalent issue among women of reproductive age. Experiencing psychosomatic discomfort increases the possibility of resorting to self-medication to alleviate menstrual issues and discomfort, which can have direct consequences on both personal and academic aspects of life [1]. Dysmenorrhea can negatively affect academic performance and is associated with diminished concentration and related symptoms, leading to higher rates of absence from work during menstruation [2]. Dysmenorrhea has physiological and psychological mechanisms, and individuals' reaction to this pain depends on factors such as personality, emotional state, level of comprehension, cultural background, family upbringing, and prior experiences. [3]. Women experience different physical and emotional symptoms before and during menstruation, including acne, breast soreness, bloating, tiredness, irritability, mood swings [4], abdominal cramps, headaches, nausea, vomiting, or diarrhea [5]. Dysmenorrhea, known as "painful menstruation" [6], affects many teenage girls, ranging from 60% to 93%, and up to 42% of them experience severe symptoms [7]. Dysmenorrhea has primary and secondary types. Primary dysmenorrhea often appears within 6-12 months after first menstrual cycle [8]. Although primary dysmenorrhea may not be life-threatening, it can substantially reduce the quality of life and, in severe cases, result in disability and an inability to carry out daily activities [9].

The gym ball exercises for menstruation pain are done for 50 minutes each day, consisting of a 10-minute warm-up session, followed by three exercises for 10 minutes, including the knee tuck exercise (tucking the knees toward the chest, rolling the ball forward, and then back to the starting position), the leg curls exercise (bending the knees and moving the heels toward the buttocks while the rest of the body stays still) and the back extension exercise (facing the floor with the thighs on the gym ball, allowing the spine to extend upward) [10]. There is also a 10-minute cooling-down session. This gym ball exercise program is performed three weeks before menstruation, every other day (Mondays, Wednesdays, and Fridays) for four weeks [11]. Gym ball exercise can alleviate dysmenorrhea [12] and our research can help have more comprehension of the link between exercise and dysmenorrhea, offering valuable insights into women's health and overall well-being [12]. We investigate the effective use of gym ball exercise to help women in the reproductive age to have better productivity and quality of life.

Materials and Methods

This is a quasi-experimental study that was carried out from April 26 to May 28, 2021 at the [Mangalura University Campus](#) in India. Sampling was chosen using a purposive method. Sample size calculation was done using the formula and by considering a 95% confidence level, an 80% test power, a population variance (σ^2) of approximately 2.31, and a margin of error (d) of about 1.48. In his regard, the estimated sample size was 24 per group. Considering a 10% dropout rate, it increased to

26. Therefore, the overall sample size was 52, with 26 in the exercise group and 26 in the control group. The samples were 52 nursing students, who were selected based on the inclusion criteria: Being a nursing students residing at the university campus, age 18-22 years, and suffering from moderate to severe dysmenorrhea based on the numerical pain rating scale. In this study, the study participants were not allocated randomly. Participants in the study were allocated based on specific criteria, including having a menstrual cycle lasting 28-30 days, a menstruation duration of 3-6 days, experiencing a moderate amount of menstrual flow, and having a history of moderate to severe dysmenorrhea occurring at least three times in the past six months [13].

The data collection tool was the numerical pain rating scale. Each of the participants were asked to rate their level of dysmenorrhea on a scale from 0 to 10, where 0 indicates no pain, 1-3 indicates mild pain, 4-7 indicates moderate pain, and 8-10 indicates severe pain. The data were collected after obtaining the informed consent from the participants.

The gym ball exercise program was carried out 3 weeks prior to the predicted menstruation date of the samples and was done every other day (Monday, Wednesday, Friday) three times a week for 4 weeks. The exercise was carried out by the author after obtaining the certificate from a professional instructor. The exercise was done under the supervision of a qualified instructor. The participants in the exercise group were divided into two groups; group A, consisting of 13 students who performed gym ball exercises from 5 PM to 6 PM and group B, consisting of 13 students who performed the exercises from 6 PM to 7 PM and an attendance register was maintained for the participants. Post-test of menstrual pain level was done on the first day of menstruation after the gym ball exercise and a follow-up test one month later on the first day of menstruation.

Data were analyzed using descriptive and inferential statistics. The normality test using Shapiro-Wilk showed that the data distribution was not normal. Therefore, Mann-Whitney U test and Wilcoxon signed rank test were used to examine the effectiveness of the gym ball exercise program. Chi-square test and Fisher's exact test were also used.

Results

Most of the students belong to the age group of 20-22 (57.8%) in both exercise and control groups. Their mean height ranged from 151 to 160 cm (57.7% in exercise group

and 46.2% in control group). Majority of the students had a weight of 31-50 kg (61.5%) in the exercise group and 51-70 kg (53.8%) in the control group. None of them had any medical illness. Most of the students had a mixed diet (73.1% in exercise group and 26.9% in control group) and drank fluids 1000-2000 mL daily (69.2% in exercise group and 61.5% in control group). The majority of the students had a regular bowel pattern (100% in exercise group and 92.3% in control group) and most of them slept for 6-8 hours (73.1% in exercise group and 76.9% in control group) in both the groups. Most of the students in both the groups attained menarche at 13-15 years (42.3% in exercise group and 61.55% in control group). The students had a regular cycle of 25-28 days in the exercise group, and 29-32 days (61.5%) in the control group. The students had a menstrual duration of 4 days (30.8%) in the exercise group and 5 days (30.8%) in the control group. All students had painful menstruation, and majority of them had 3 episodes of dysmenorrhea (38.5%) in the exercise group and 6 episodes of dysmenorrhea (57.7%) in the control group in the last 6 months. Most of them had pain in the first day (76.9% in exercise group and 73.1% in control group) and the pain lasted for 0-8 hours (61.5% in exercise group and 88.5% in control group) in the lower abdomen region (80% in exercise group and 88.5% in control group). Most of students had intermittent pain (96.2%) in the exercise group and continuous pain (53.8%) in the control group. Results showed that the homogeneity of the groups in terms of these variables was established except for educational level and types of pain (Table 1). The pre-test mean level of dysmenorrhea was 6.04 ± 1.53 in the exercise group and 5.31 ± 1.37 in the control group. The mean level of dysmenorrhea in the post-test phase was 2.69 ± 1.15 in the exercise group and 4.77 ± 1.75 in the control group, while the mean level of dysmenorrhea in the follow-up phase was 3.08 ± 1.74 and 4.35 ± 1.79 in the exercise and control groups respectively.

The results in Table 2 revealed that there was no significant difference between the pre-test median and post-test median based on Wilcoxon signed rank test results, whereas there was a significant difference between pre-test pain score and follow-up pain score and between post-test pain score and follow-up pain score ($P=0.001$ and $P=0.001$, respectively). The results of Mann-Whitney-U test showed (Table 3) a significant difference between the exercise and control group for post-test and follow-up pain scores ($P=0.001$, $P=0.001$ respectively). Hence, it indicates that the gym ball exercise was effective in reducing the menstrual pain. Results showed no significant difference in the pre-test level of dysmenorrhea in terms of the selected variables except for age and leave taken due to absent from class due to dysmenorrhea.

Table 1. Baseline characteristics of participants (n=52)

Variables		No. (%)		P*
		Exercise (n=26)	Control (n=26)	
Sleep pattern (h)	<6	5(19.2)	6(23.1)	0.23
	6-8	19(73.1)	20(76.9)	
	>8	2(7.7)	0	
Age at menarche (y)	10-12	15(57.7)	10(38.5)	0.16
	13-15	11(42.3)	16(61.5)	
Menstrual cycle (d)	25-28	15(57.7)	10(38.5)	0.40
	29-32	11(42.3)	16(61.5)	
Menstrual duration (d)	2-4	10(38.5)	9(34.6)	0.97
	5-7	16(61.5)	17(65.4)	
Frequency of dysmenorrhea in the past 6 months	3-4	13(50)	10(38.3)	0.69
	5-6	13(50)	16(61.5)	
Leave taken due to dysmenorrhea due to dysmenorrhea	No	16(61.5)	15(57.7)	0.77
	Yes	10(38.5)	11(42.3)	
Onset of menstrual pain	One day prior	5(19.2)	5(19.2)	0.83
	1 st day	20(76.9)	19(73.1)	
	2 nd day	1(3.8)	2(7.7)	
Duration pain (h)	0-8	16(61.5)	17(65.4)	0.49
	9-16	8(30.8)	5(19.2)	
	17-24	12(7.7)	4(15.4)	
Location of pain	Lower abdomen	21(80.8)	23(88.5)	0.68
	Lower back	4(15.4)	2(7.7)	
	Thighs	1(3.8)	1(3.8)	
Types of pain	Continuous	1 (3.8)	14 (53.8)	0.001
	Intermittent	25 (96.2)	12 (46.2)	

*Chi-square test.

Discussion

The main purpose of this study was to evaluate the effectiveness of gym ball exercise in reducing dysmenorrhoea, was reported by Lopez-Liria R, et al in their study on efficacy of physiotherapy treatment in pri-

mary dysmenorrhoea. The main techniques were isometric exercises, massage therapy, yoga, stretching, progressive relaxation exercises and aerobic dance. Meta-analysis shows benefits of physiotherapy treatment for pain relief compared with no intervention. The current low-quality evidence suggests that physiotherapy may provide a clinically significant reduction in

Table 2. Test of within-subject effect for the exercise group (n=26)

Source	Median (IQR)	P*
Pre-test to post-test	4(2-5)	0.08
	5(4-7)	
Pre-test to follow-up	4(3-5)	0.001
	5(4-7)	
Post-test to follow-up	4(2-5)	0.001
	5(3-5)	

*Wilcoxon signed rank test. IQR: Interquartile range.

Table 3. Test of between-subject effect in the post-test and follow-up phases in exercise (n=26) and control (n=26) groups

Effect of Gym Ball Exercise on Level of Dysmenorrhoea Within the Experimental Group		Median (IQR)	P*
Post-test	Exercise	2.50 (2-3.25)	0.001
	Control	4.50 (4-5.25)	
Follow-up	Exercise	3 (2-4.25)	0.001
	Control	2 (4-5)	

*Mann-Whitney U test. IQR: Interquartile range.

menstrual pain intensity. Given the overall health benefits of physiotherapy and the low risk of side effects reported, women may consider using it, either alone or in conjunction with other therapeutic modalities [14]. Another study aimed to delve into the reasons behind “presenteeism,” where college students attend classes despite experiencing dysmenorrhea-related discomfort. The findings revealed that dysmenorrhea had a notable impact on academic achievement of nursing students. In conclusion, the authors highlighted the need for increasing awareness and support for students experiencing dysmenorrhea, especially for those in nursing courses where attendance in the classroom is crucial. Universities and educational institutions should consider implementing policies that provide flexibility and support for female students dealing with chronic conditions, such as dysmenorrhea, to ensure their well-being and academic success [15]. Dalia et al. also suggested a correlation between the intensity of dysmenorrhea and students’ inability to concentrate [16].

Moreover, consistent with the findings of Dehnavi et al. [17], the exercise group in our study showed a significant reduction in pain level compared to the control group. Goda in a study aimed to assess the effectiveness of stretching exercises in alleviating primary dysmenorrhea symptoms among secondary school female students in Assiut City. They found a statistically significant difference in the severity of dysmenorrhea among students who actively engaged in stretching exercises. They recommended incorporating educational courses on the benefits of such exercises into school curricula to increase students’ awareness [18]. In the present study, a significant difference in baseline dysmenorrhea level was reported based on age and leave taken due to dysmenorrhea, which is consistent with the findings of Al-Matouq et al. [19].

In conclusion, the gym ball exercise program is effective in reducing dysmenorrhea, presenting a practical and accessible therapeutic method for adolescent girls. It can enhance their quality of life and productivity during menstruation. However, there were some limitations in this study. The sampling technique used in this study was purposive

rather than random. This non-random selection method may cause bias, potentially leading to results that may not accurately represent the broader population of nursing students. Furthermore, the lack of randomization may hinder the ability to control the effect of confounding variables. Moreover, the absence of blinding during allocation can introduce bias. If those involved in data collection were aware of the group assignments (exercise vs control), there is a possibility of unintentional influence on data recording and measurements, potentially skewing the results. In addition, caution is advised when attempting to generalize the findings of this study to all nursing students or individuals experiencing dysmenorrhea. Other limitations were the short duration of the intervention, the lack of long-term follow-up, and the possibility of the lack of compliance with the exercise program. Further studies with random sampling, blinding of allocation, and a longer intervention period can provide more robust evidence and enhance the generalizability of the findings.

Ethical Considerations

Compliance with ethical guidelines

The Central Ethics Committee of [Nitte \[Deemed to be University\]](#), approved this study (Code: NUINS/CON/NU/IEC/2020-21/830). Informed consent was obtained from all participants, and they were free to withdraw from the study. Moreover, they were informed about the study aims, methods, and data confidentiality.

Funding

This study was funded by [Nitte \[Deemed to be University\]](#) (No.: N (DU)/RD/Grant/NUINS/2020-21/03-2).

Authors’ contributions

Conceptualization, protocol development, data collection, writing, review and editing the manuscript: All authors; Data analysis and supervision: Azabu Azabu and Philomena Fernandes; Sampling and writing the initial draft: Philomena Fernandes and Timi Thomas; Review and final approval: All authors.

Conflict of interest

The authors certify that they have no affiliation with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials dismissed in this manuscript.

Acknowledgments

The authors would like to thank the students participated in this study for their cooperation.

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