European Journal of Applied Sciences 13 (1): 22-27, 2021
ISSN 2079-2077

DOI: 10.5829/idosi.ejas.2021.22.27

Effect of Core Muscles Strengthening on Primary Dysmenorrhea Associated with Malposture: a Randomized Controlled Trial

[1]Mona O. Helal, [2]Doaa A. Osman, [3]Hossam El-Din H. Kamel and [2]Marwa E. Hasanin

[1]Department of Physiotherapy, Al-Shohdaa Central Hospital, El Minufia, Egypt
[2]Department of Physical Therapy for Woman's Health,
Faculty of Physical Therapy, Cairo University, Giza, Egypt
[3]Department of Gynecology and Obstetrics, Faculty of Medicine, AL-Azhar University, Cairo, Egypt

Abstract: *Aim*: To determine the effect ofcore muscles strengthening on primary dysmenorrhea associated with malposture. *Methods*: A total of 40 adult females with primary dysmenorrhea and lumber hyperlordosis participated in this study. They were randomized into 2 equal groups. Group (A) received lifestyle interventions for 3 consecutive menstrual cycles (n=20), while group (B) received the same lifestyle interventions in addition to core muscles strengthening for 3 consecutive menstrual cycles (n=20). The dysmenorrhea severity was evaluated by WaLIDD scalepre- and post-treatment. *Results*: There were significant reductions in total WaLIDD score within both groups ($p<0.05$). Comparing both groups pre- and post-treatment revealed non-significant differences in total WaLIDD score ($p>0.05$). However, the percentages of improvement post-treatment in total WaLIDD score was 37.22% in group (A), while it was 47.24%in group (B). *Conclusions*: Core muscles strengthening plus lifestyle interventions yield more improvement percentage in dysmenorrhea severity than lifestyle interventions alone in females having primary dysmenorrhea associated with malposture.

Key words: Core Muscles Strengthening · Lifestyle Interventions · Primary Dysmenorrhea · Malposture · Walidd Scale

INTRODUCTION

Primary dysmenorrhea, a painful menstruation, is one of the most common gynecological conditions among reproductive-aged females, ranging between 54.5% and 88% [1]. It happens when the pelvic anatomy and ovarian function are normal and no organic cause for menstrual discomfort can be detected [2].

In females with malposture, the improper restriction of movement of the lumbosacral vertebrae is hypothesized to cause an increase in bodily fluid in the pelvis as well as uterine contractions, which intensifies menstruation pain [3]. Furthermore, the aberrant state of the pelvis caused by misaligned spinal alignment causes an imbalance in the levels of oxytocin and prostaglandin, causing worsening of menstrual discomfort. As a result, when the spinal alignment of females suffering from severe menstrual pain was restored, the discomfort was relieved [4].

Strengthening exercises are the most effective among the many forms of exercise treatments for increasing functional results [5, 6]. Core strengthening is a type of muscle control that maintains functional stability around the lumbar spine [7]. It improves the performance of small intrinsic musculatures surrounding the lumbar spine by conditioning them; this type of training not only allows for isolation but also raises the core muscles strength. Such musculatures become more efficient in handling typical biomechanical pressures every day, especially during menstrual cycle stress, as they become stronger [8].

Although prior research had suggested that strengthening core muscles could help with primary dysmenorrhea [7, 9, 10], none of them had investigated the effect of core muscles strengthening on primary dysmenorrhea associated with malposture. Therefore, this study was the first one aiming to investigate the effect ofcore muscles strengthening on primary dysmenorrhea associated with malposture.

MATERIALS AND METHODS

Study Design: The study was designed as a prospective, randomized, pre-post test, controlled trial. Ethical approval was obtained from the institutional review board at

Corresponding Author: Mona O. Helal, Department of Physiotherapy, Al-Shohdaa Central Hospital, El-Minufia, Egypt.

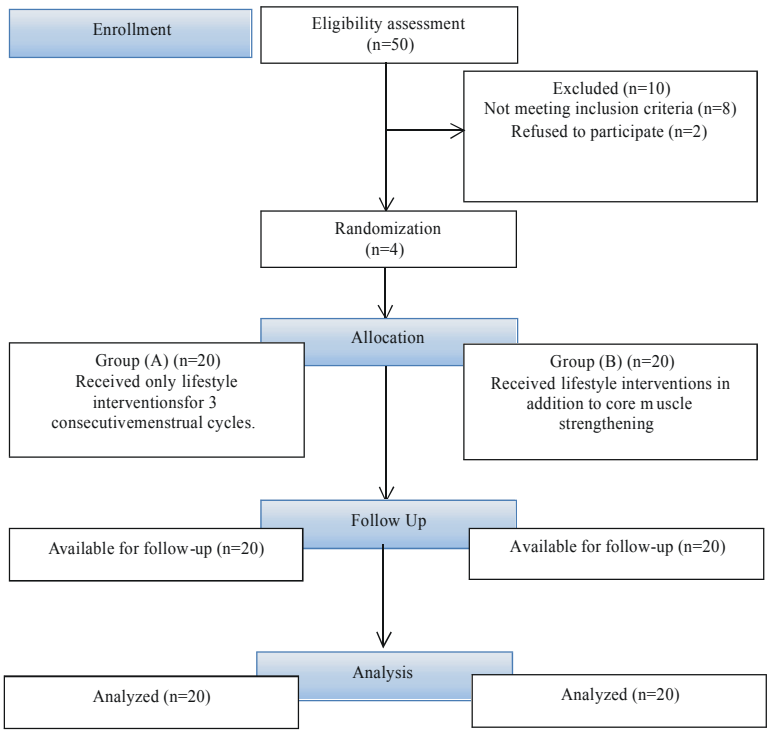

Fig. 1: Flow chart demonstrates the experimental design of the study

Faculty of Physical Therapy, Cairo University (No: P.T.REC/012/002929). The study followed the Guidelines of Declaration of Helsinki on the conduct of human research.It was conducted between October 2020 and July 2021.

Participants: A sample of 40 females was recruited from the Gynecological Outpatient Clinic, AL-Azhar University Hospital in Cairo, Egypt. To be included in the study, the participants were chosen adult females having moderate to severe primary dysmenorrhea (as determined by WaLIDD Scale = 5). All females were virginal and non-smokers. Their age ranged from 18 to 25 years and their body mass index (BMI) ranged from 20 to 25 kg/m^2. Theyhad regular menstrual cycles with menstrual cycle length of 28-30 days and they had lumber hyperlordosis. The participants were excluded if they had a history of pelvic pathology, any gynecological disease or any stressful event (e.g. parental separation or death of a first-degree relative in the last 6 months). Also, they didn't use analgesics, non-steroidal anti-inflammatory drugs and oral contraceptives during the study period.

Randomization: Each female was informed about the study nature, purpose and benefits, the right to refuse or withdraw at any time and the confidentiality of any obtained data. The females were randomly assigned into 2 equal groups (group A and group B) with the use of a computer based randomization program. No dropping out of subjects from the study was reported after randomization, Figure (1).

Interventions: Group (A) included 20 females who received lifestyle interventions for 3 consecutive menstrual cycles, while group (B) included 20 females who received the same lifestyle interventions as in group (A) in addition to core muscles strengthening for 3 consecutive menstrual cycles.

Lifestyle Interventions: All females in both groups (A & B) receivedlifestyle interventions for three consecutive menstrual cycles. These interventions included education on maintaining good posture throughout the daywhile standing, sitting, lying, lifting, pushing and bending in order to shift their bad habitual positions [11]. Also, they included taking pain-relieving position, hot packs, hot drinks, nutritional modification and brisk walking. Concerning the pain-relieving position, females were instructed to perform the knee-to-chest position 20 seconds of hold with 10 repeats from the first to the third day of the first menstrual cycle and then 30 seconds of hold with 20 repetitions in the subsequent two menstrual

cycle [9].Concerning hot packs, they were applied on the lower abdomen for 20–30 minutes, once daily, for the first two days of menstruation [12]. Concerning hot drinks such as cinnamon, gingerandmint, females were asked to increase their intake during the days of menstrual pain.Concerning the nutritional modification, each female was instructed to maintain adequate fluid intake, limit caffeine intake, keep breakfast, modify diet through increasing the intake of fruit and vegetables (good sources of vitamins, minerals and fibers), consuming fish 1-2 times/week (good source of omega-3 and calcium) and increasing the intake of nuts, as well as avoiding cold, spicy, greasy and sugary foods [13, 14]. Finally, each female was asked to perform brisk walking for 30 minutes a day during the first three days of menstruation [15].

Core Muscles Strengthening: Each female in group (B) performed core muscles strengthening, 4 days per week, for three consecutive menstrual cycles(days of menstrual pain were excluded).They included pelvic bridging, plank, cat and camel, curl up, single leg abdominal press and double leg abdominal press [16]. For performance of pelvic bridging, participants were asked to lie supine with knee flexed and then raise the pelvis upward then hold that position for 5 seconds with 5 times repetitions then increase range gradually till reaching 10 seconds with 10 times repetitions. For performance of plank, participants were asked to lie prone and then by putting the weight on elbows and toes lift the body upward, hold this position for 3 seconds with 3 times repetition then increase range gradually till reaching 6 seconds with 10 times repetitions. For performance of Cat and Camel, participants were asked to prone kneel and then take a deep breath fromnose while making hump in the back (cat) and breathe out from mouth while curvingthe spine (camel) 5 times with gradual increase to 10 times. For performance of curl up, participants were asked to lie supine with mild knee flexion and clasp both hands behind the head and move the body towards the knee5 times with gradual increase to 10 times. For performance of single leg abdominal press, participants were asked for supine lying and then flex both knees and raise left leg off the floor (till hip and knee were bent at 90 degrees angle) then return to starting position and repeat the same for right leg for 5 to 10 times. For performance of double leg abdominal press exercises, participants were asked to lie supine as well as bendboth knees towards chest and both hands opposite toward the feet and maintain isometric contraction. This exercise was repeated for 5 timesthen was increased till 10 times [7, 17].

Outcome Measures

WaLIDD Scale: It was assessed before and after treatment program for all females in both groups (A and B). It has high sensitivity and high specificity [18]. It has been developed with the goal of measuring the severity of dysmenorrhea and predicting the resultant activity limitation that measures integrated features of dysmenorrhea such as: 1- number of anatomical pain locations (no part of the body, lower abdomen, lumbar region, lower limbs, inguinal region), 2- pain intensity (does not hurt, hurts a little, hurts a little more, hurts even more, hurts a lot, hurts a lot more), 3- number of days of pain during menstruation (0, 1–2, 3–4, = 5) and 4- frequency of disabling pain to perform their activities (never, almost never, almost always, always). Each tool's variable provided a specific score between 0 and 3 and the final score ranged from 0 to 12 points. The total score of 0 indicated without dysmenorrhea; 1–4 indicated mild dysmenorrhea, 5–7 indicated moderate dysmenorrhea and 8–12 indicated severe dysmenorrhea [19].

Statistical Analysis: Statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS) computer program for windows, version 23 (SPSS, Inc., Chicago, IL). The p-value of ≤ 0.05 was considered significant. Results were expressed as mean ± standard deviation. Prior to final analysis, data were screened for normality assumption, homogeneity of variance and presence of extreme scores. Paired sample t-test was used to compare the difference between before treatment and after treatment results of total WaLIDD score in each group while unpaired sample t-test was used to compare the before and after treatment results between the study groups for totalWaLIDD score. The alpha level was set at 0.05.

RESULTS

There were no significant differences ($p>0.05$) in the mean values of age, body mass, height, BMI, menarche and menstrual cycle length between the two groups (Table 1).

The total WaLIDD score showed a statistically significant reduction at post-treatment in comparison to pre-treatment within both groups ($p<0.05$). The post-treatment comparison of both groups revealed a statistically non-significant difference ($P>0.05$). However, there was a greater percentage of improvement in group (B) (47.24%) than in group (A) (37.22%) (Table 2).

Table 1: Baseline characteristics of participants in both groups

	Group (A) (n = 20)	Group (B) (n = 20)	p value
Age (yrs.)	19.05±1.23	20.05±1.89	0.057 ^{NS}
Body mass (Kg)	59.63±5.28	62.67±6.47	0.112 ^{NS}
Height (m)	1.61±0.04	1.62±0.05	0.575 ^{NS}
BMI (Kg/m^2)	22.86±1.86	23.62±1.72	0.187 ^{NS}
Menarche (years)	13.85±0.98	13.1±1.29	0.051 ^{NS}
Menstrual cycle length (days)	28.75±0.85	28.60±0.82	0.574 ^{NS}

^{NS} P > 0.05 = non-significant, P = Probability.

Table 2: TotalWaLIDD score for both groups

		Group (A) (n = 20)	Group (B) (n = 20)	P value*
Total WaLIDD score	Pre-treatment	6.85±1.22	7.26 ±1.22	0.326 ^{NS}
	Post-treatment	4.3±1.12	3.83±1.12	0.269 ^{NS}
	Improvement %	37.22 %	47.24 %	
	P value**	0.0001 ^{S}	0.0001 ^{S}	

Data were expressed as mean ± standard deviation.

* Inter-group comparison; ** intra-group comparison of the results pre- and post-treatment.

^{NS} p>0.05 = non-significant, ^{S} p<0.05 = significant, p = probability.

DISCUSSION

Studies revealed an association between lumbo-pelvic malalignment and dysmenorrhea [4, 20]. Lumber instability can lead to injury and pain specifically during stressful times of the female body and one of these repetitive stressful times is dysmenorrhea. Therefore, the current study aimed to investigate the effect of core strengthening on primary dysmenorrhea with malposture.

The results of the current study revealed significant reductions in total WaLIDD score within both groups, with a non-significant difference between the two groups post-treatment. However, there was a greater percentage of improvement in group (B) than in group (A).

These results indicated that the addition of core muscles strengthening to lifestyle interventions produced a greater improvement percentage in dysmenorrhea severity, in females having primary dysmenorrhea associated with malposture, than lifestyle interventions alone.

The positive effects of lifestyle interventions on reducing severity of dysmenorrhea associated with malposture cannot be limited to one intervention; however, they are related to the synergistic effect of whole lifestyle interventions. Firstly, good posture maintenance was effective in reducing musculoskeletal pain in university students through correcting posture, improving balance and relaxing the whole body [21]. Secondly, the knee-to-chest position produced pain-relieving effect in dysmenorrheic females through stimulating blood flow, operating on the uterine lining and raising the level of circulating endorphins, with a subsequent pain threshold increase [9]. Thirdly, heat therapy has been proposed as beneficial in pain reduction in cases of primary dysmenorrhea [22]. It may act through increasing blood flow in the abdominal area as well as the pain-inhibition gate control idea [23]. Fourthly, herbs such as ginger and cinnamon provide pain intensity reduction equal to mefenamic acid [24]. This analgesic effect could be related to their impact on inhibiting prostaglandin synthesis [25, 26]. Additionally, mint relieves menstrual pain through its relaxing effect on the smooth muscles [27]. Fifthly, since there is a significant relationship between dysmenorrhea and nutrition type, a recent study found that diet therapy for 3 months resulted in pain lessening in females with primary dysmenorrhea [13]. Finally, previous studies demonstrated the effectiveness of brisk walking for 30 minutes a day during the first three days of menstruation in reducing primary dysmenorrhea severity [15, 28]. Walking can increase blood flow, relax abdominal muscles, reduce pain of the pelvis and relieve nerve centers pressure and pelvic organs [29].

The greater improvement percentage in group (B) than in group (A) reflected the valuable effect of core muscles strengthening on improvingWaLIDD score variables, which might reach the level of significance if its application continued more than 3 consecutive menstrual cycles.

Core strengthening exercises are easy and non-pharmacological methods for managing primary dysmenorrhea. Previous studies revealed the effectiveness of different core strengthening exercises in

reducingseverity of dysmenorrhea and its associated symptoms [7, 9, 30, 31]. During menstruation weak core musculature leads to improper biomechanical function of structures adjacent to the lumbar spine and inability to handle forces required for normal movement and function. Therefore, it results in pain throughout the abdomen, low back and thighs [32]. Core strengthening exercises thus allow the small intrinsic muscles around the lumbar spine to be strengthened and conditioned for greater performance enabling them to handle daily forces of normal biomechanics, even when the body is undergoing the stress of the menstrual cycle [10]. Additionally, previous research revealed that isometric exercises for the abdominal, hip and pelvic muscles had a positive effect on lowering menstrual pain intensity and duration through strengthening pelvic muscles, increasing blood flow and augmenting excretion of prostaglandins outside the uterus, increasing in-depth sensation, controlling pelvic movements by increasing the muscular balance and reducing the activity of sympathetic system which causes contraction and pain in uterine muscles [33].

CONCLUSION

Core muscles strengthening represents an effective, safe and successful therapy adjunct to lifestyle interventions in reducing severity of dysmenorrhea associated with malposture.

ACKNOWLEDGMENTS

The authors would like to thank all females who participated in the study.

REFERENCES

1. Unsal, A., U. Ayranci, M. Tozun, G. Arslan and E. Calik, 2010. Prevalence of dysmenorrhea and its effect on quality of life among a group of female university students. Ups J. Med. Sci., 115(2): 138-145.
2. Nizy, J. and S. Rajitha, 2019. Effectiveness of pelvic rocking exercise on Dysmenorrhoea among adolescent girls. International Journal of Medical and Health Research, 5(11): 61-71.
3. Proctor, M., W. Hing, T. Johnson and P. Murphy, 2006. Spinal manipulation for primary and secondary dysmenorrhoea. Cochrane Database Syst Rev., (3): CD002119.
4. Kim, M.J., I.H. Baek and B.O. Goo, 2016. The relationship between pelvic alignment and dysmenorrhea. J. Phys. Ther. Sci., 28(3): 757-760.
5. Coyle, P.C., T. Velasco, J.M. Sions and G.E. Hicks, 2017. Lumbar mobility and performance-based function: an investigation in older adults with and without chronic low back pain. Pain Med., 18(1): 161-168.
6. Rudy, T.E., D.K. Weiner, S.J. Lieber, J. Slaboda and J.R. Boston, 2007. The impact of chronic low back pain on older adults: a comparative study of patients and controls. Pain, 131(3): 293-301.
7. Saleh, H., H. Mowafy and A. El-Hameid, 2016. Stretching or Core Strengthening Exercises for Managing Primary Dysmenorrhea. J. Women's Health Care, 5(1): 295.
8. Bill, S. and R. Halvorson, 2010. Core Stability for Enhanced Daily Function. IDEA Fitness Journal, 7: 25-58.
9. Patel, D., A. Sutar and S. Ghodey, 2019. Effect of Knee-to-Chest Position on Primary Dysmenorrhea in School Going Girls. JMSCR, 7(3): 540-544.
10. Kaur, S., P. Kaur, S. Shanmugam and M. Kang, 2014. To compare the effect of stretching and core strengthening exercises on primary dysmenorrhea in young females. IOSR Journal of Dental and Medical Sciences, 13(6): 22-32.
11. Geldhof, E., G. Cardon, I. De Bourdeaudhuij and D. De Clercq, 2007. Back posture education in elementary schoolchildren: stability of two-year intervention effects. Eura Medicophys, 43(3): 369-379.
12. Potur, D.C. and N. Kömürcü, 2014. The effects of local low-dose heat application on dysmenorrhea. J. Pediatr. Adolesc. Gynecol., 27(4): 216-222.
13. Kartal, Y.A. and E.Y. Akyuz, 2018. The effect of diet on primary dysmenorrhea in university students: A randomized controlled clinical trial. Pak J. Med. Sci., 34(6): 1478-1482.
14. Chen, H.M., H.H. Wang, M.H. Chiu and H.M. Hu, 2015. Effects of acupressure on menstrual distress and low back pain in dysmenorrheic young adult women: An experimental study. Pain Manag Nurs., 16(3): 188-197.
15. Ezbarami, S., B. Mirzaei and F. Esfarjani, 2014. Comparison the prevalence and severity of dysmenorrhea among athletes and non-athletes and its relation with body composition. Arak Medical University Journal, 16(11): 80-88.

16. Rajalaxmi, V., G. Kumar, V. Kirthika and K. Ramalakshmi, 2016. A Study to Analyze the Effectiveness of Core Strengthening Exercises and Stretching Program for Young Female Physiotherapy Students with Primary Dysmenorrhea. International Journal of Physiotherapy, 2(1): 27-32.
17. Mahmoud, S., A. Yousef, H.E.D. El-Shenoufy and M. Hasanin, 2020. Effect of core muscles strengthening exercises on pelvic pain caused by copper intrauterine device. Egyptian Journal of Physical Therapy, 3(1): 9-15.
18. Fakari, F., M. Simbar, G. Tahmasebi, A. Ebadi, F. Fakari, M. Nasiri and M. Ghazanfarpour, 2021. Efficacy of Working Ability, Location, Intensity, Days of Pain, Dysmenorrhea (WaLIDD) and Verbal Rating Scale (Pain and Drug) in Diagnosing and Predicting Severity of Dysmenorrhea among Adolescents: A Comparative Study. J Obstet Gynecol Cancer Res., 6(2): 81-86.
19. Teherán, A.A., L.G. Piñeros, F. Pulido and M.C. Mejía Guatibonza, 2018. WaLIDD score, a new tool to diagnose dysmenorrhea and predict medical leave in university students. Int. J. Womens Health, 10: 35-45.
20. Kim, M.J., I.H. Baek and B.O. Goo, 2016. The effect of lumbar-pelvic alignment and abdominal muscle thickness on primary dysmenorrhea. J. Phys. Ther. Sci., 28(10): 2988-2990.
21. Kim, D., M. Cho, Y. Park and Y. Yang, 2015. Effect of an exercise program for posture correction on musculoskeletal pain. J. Phys. Ther Sci., 27(6): 1791-1794.
22. Reid, R., A. Steel, J. Wardle and J. Adams, 2019. Naturopathic medicine for the management of endometriosis, dysmenorrhea and menorrhagia: a content analysis. J. Altern Complement Med., 25(2): 202-226.
23. O'Connell, K., A. Davis and C. Westhoff, 2006. Self-treatment patterns among adolescent girls with dysmenorrhea. J. Pediatr Adolesc Gynecol., 19(4): 285-289.
24. Tsonis, O., F. Gkrozou, Z. Barmpalia, A. Makopoulou and V. Siafaka, 2021. Integrating Lifestyle Focused Approaches into the Management of Primary Dysmenorrhea: Impact on Quality of Life. Int. J. Womens Health, 13: 327-336.
25. Marzouk, T.M., A.M. El-Nemer and H.N. Baraka, 2013. The effect of aromatherapy abdominal massage on alleviating menstrual pain in nursing students: a prospective randomized cross-over study. Evid Based Complement Alternat Med., 742421.
26. Adib Rad, H., Z. Basirat, F. Bakouei, A.A. Moghadamnia, S. Khafri, Z.F. Kotenaei, M. Nikpour and S. Kazemiet, 2018. Effect of Ginger and Novafen on menstrual pain: a cross-over trial. Taiwan J. Obstet Gynecol., 57(6): 806-809.
27. Taylor, T., 2014. Treatment of nausea and vomiting in pregnancy. Aust Prescr., 37: 42-45.
28. Reyhani, T., F. Jafarnejad, H. Behnam, M. Ajam and M. Baghaei, 2013. The Effect of Brisk Walking on Primary Dysmenorrhea in Girl Students. The Iranian Journal of Obstetrics, Gynecology and Infertility, 16(46): 14-19.
29. Mazroua, Y.M., A. M. Yousef, S.M. Al-Kosary and M.G. Aly, 2021. Exercises for females with primary dysmenorrhea: Narrative review. Turkish Journal of Physiotherapy and Rehabilitation, 32(3): 9294-9301.
30. Aiyegbusi, A., C.A. Adeagbo and S.I. Uwem-Umoh, 2020. Comparative efficacy of core strengthening and stretching exercises on systemic and quality-of-life symptoms in adolescent college students with primary dysmenorrhea. New Nigerian Journal of Clinical Research, 16(9): 59-64.
31. Velammal, P., 2016. Effectiveness of pelvic bridge exercise on dysmenorrhea among adolescent girls at selected government girls higher secondary school, Madurai. Master thesis of science in nursing, College of Nursing, Madurai Medical College, pp: 1-128.
32. Prabhu, S., S. Nagrale, A. Shyam and P. Sancheti, 2019. Effect of yogasanas on menstrual cramps in young adult females with primary dysmenorrhea. Int. J. Physiother Res., 7(4): 3109-3112.
33. Azima, S., H.R. Bakhshayesh, M. Kaviani, K. Abbasnia and M. Sayadi, 2015. Comparison of the Effect of Massage Therapy and Isometric Exercises on Primary Dysmenorrhea: A Randomized Controlled Clinical Trial. Journal of Pediatric and Adolescent Gynecology, 28(6): 486-491.