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Effect of Aerobic Exercises with Tens Versus Yoga with Tens on Primary Dysmenorrhea in College Students: An Interventional Study

Sony Katkam[1], Mahendra Lodhi[2]

[1]Intern – BPTh, RJS College of Physiotherapy, MUHS, Ahmednagar, India
[2]Associate Professor, RJS College of Physiotherapy, MUHS, Ahmednagar, India

Abstract:
This study has been undertaken to determine and study the effect of aerobic exercises with TENS versus yoga with TENS on primary dysmenorrhea in college students. Both aerobic exercises and yoga along with TENS were given to the participants for 60 minutes per session for 3 consecutive cycles.

Index terms: Primary Dysmenorrhea, Aerobic, Yoga, Tens

INTRODUCTION

The period of adolescence is transition from childhood to adult life along with pubertal development and sexual maturation. Menstruation is the normal process in the women's life which is periodic and it's last from menarche to menopause. It is a normal cycle which is approximately of 21 to 45 days with 1 to 6 days of menstrual flow as it lasts for 40 -45 years. (2) It is monthly shedding of the lining of the uterus. Menstruation is also called as a menses, menstrual cycle or periods. The word 'Dysmenorrhea 'comes from the Greek term which is (difficult monthly flow) (3) with painful menstrual cramps in uterine system. Primary Dysmenorrhea cause a severe pain during the first 3 days. (1) The pain is usually occur in lower abdomen or back and pelvic region and it may radiated to back of the leg and anterior to the thigh. Secondary Dysmenorrhea is a menstrual pain with including of pelvic pathology of underlying disease, disorder or structural abnormality inside the uterus , the disorders are adenomycosis, pcod ,pcos , endometriosis, fibroids, endometrial polyps, interstitial cystitis, pelvic inflammatory disease and possibly use of a intrauterine contraceptive system.(5)

The symptoms include lower abdomen or pelvic pain, systemic -- such as headache, body and joint pain, lethargy, fatigue, sleep disturbances, tender breasts, swollen legs, tiredness, dizziness. Gastrointestinal symptoms – nausea, vomiting, diarrhoea, constipation, bloating, psychological symptoms – anxiety, depression, nervousness and mood disturbances.

The Aerobic Exercise (Aerobic Dance) as it's work to release several neurotransmitter (brain, natural painkillers) estrogen, dopamine which suppress the prostaglandin from raising the estrone-estradiol ratio which then it decreases endometrial proliferation and cause a good blood flow to uterus , as it cause abdominal muscles to be relaxed from the spasmodic pain and maintain the blood flow. It improves the quality of life with improving exercise with greater in pain reduction.

Yoga practices enhances the pursuit of brain and reduce cortisol levels. Yoga therapy makes alteras in central nervous system function and as a result the sympathetic activities are reduced causing

neuromuscular relaxation. It is a type of mind body exercises which combine physical body with mental relaxation. Yoga can suppress the pain by lowering or decreasing the prostaglandin levels production, myometrial ischemia and uterine contractions. The Yoga poses includes [Surya namaskar, Janu sirasana, Paschimotasana, Supta vajrasana, Savasana]. Further it's stimulating the release of beta – endorphins which are analgesics in nature and release of hormones that helps in reduce pain. Tens is a widely accepted method used to promote for the pain control in Primary Dysmenorrhea. It is a non – invasive technique.

NEED OF THE STUDY

Due to Primary Dysmennorhea, there is lack of absentiesm in college ,work and other physical activities. Because of Pain the quality of life of a patient will be affected. There is no study done yet to compare which technique is more effective in reducing pain in primary dysmenorrhea among female college students

RESEARCH METHODOLOGY

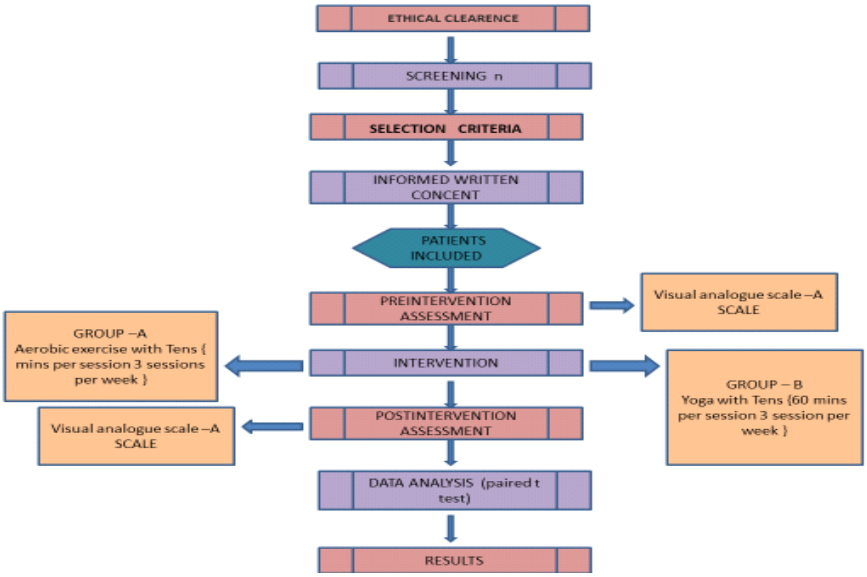
Material

- Yoga Mat
- TENS
- VAS
- Plinth
- Pen
- Written consent form

Methodology

- Study design = Experimental Study
- Study setting = RJS College Of Physiotherapy
- Study duration = 6 months
- Study population = College students
- Sample size = 40
- Sample design = Random sampling method

Procedure



In this ,the instructions given to participants about study and its benefit.

- Procedure will be explained to all patients.
- A written consent will be obtained from all the participants.
- Ethical committee clearance will be obtained.
- All the participants will be screened and divided into 2 groups.
- Group A will be given Aerobic exercise with Tens.
- Group B will be given Yoga with Tens.
- All the participants will be introduces and will be given a briefing about procedure.

Group A Aerobic Exercise with Tens .

- **AEROBIC EXERCISE**

  The exercises will be given for 30 min which include 5 min warm up

  Free active movements of upper limb and lower limb.

  Cross toe touch.

  Dynamic stretch such as lunges, Tendoachilies stretching.

  Aerobic dance for 20 mins which include

  Marching

  V step

  Double step touch

  Single step touch.

  Cool down exercise for 5 mins which include

  Slow marching

  Slow V step

  L step
- TENS -for 30 mins
- Group B Yoga with Tens.
- YOGA
  1. Shavasana
  2. Surya Namaskar
  3. Supta Vajrasana
  4. Janu Sirasana
  5. Pashimottanasana
  6. Shavasna
- TENS – for 30 mins.

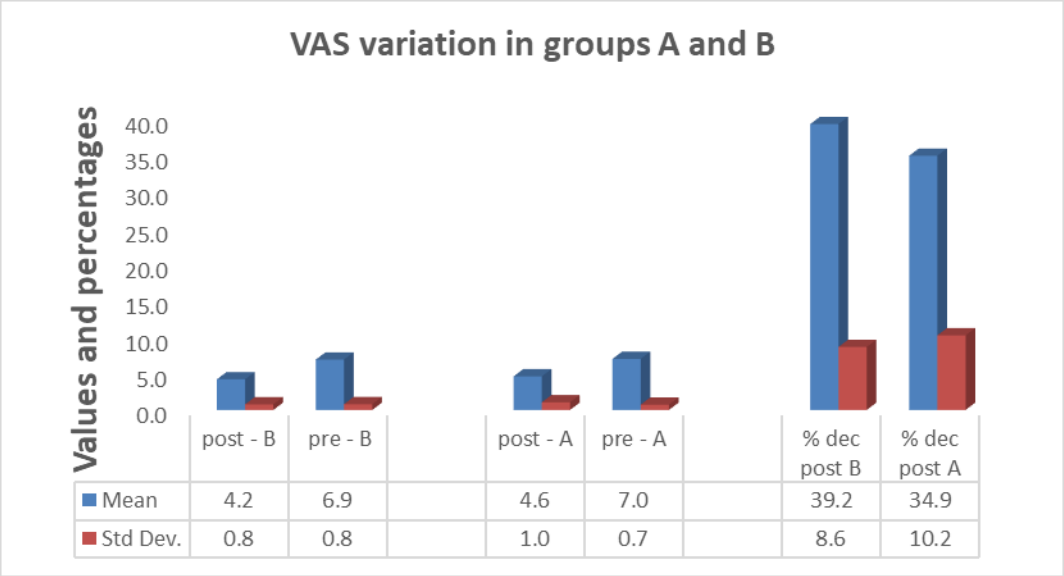
Results and Discussion

Data analysis was performed with spss 20.0 version. A Paired T test was used to determine within the group result.

Table 4.1 :Effect of Aerobic with TENS Versus Yoga with TENS in Primary Dysmennorhera on VAS SCALE :

Parameters	Group	Intervention	Mean	SD	Paired t-test	p-value
Pain	A) Aerobic with Tens	Pret VAS score	7.0	0.7	17.94	<0.01
		Post VAS score	4.6	1.0		
	B) Yoga with Tens	Pre VAS score	6.9	0.8		
		Post VAS score	4.2	0.8	18.38	<0.01

Fig 4.1 Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain on VAS scale.



Both the groups A and B shown effective decrease in pain and quality of life , but group B has significantly effective in decreasing pain and quality of life . Hence , intervention is successfully in decreasing VAS values in group B.

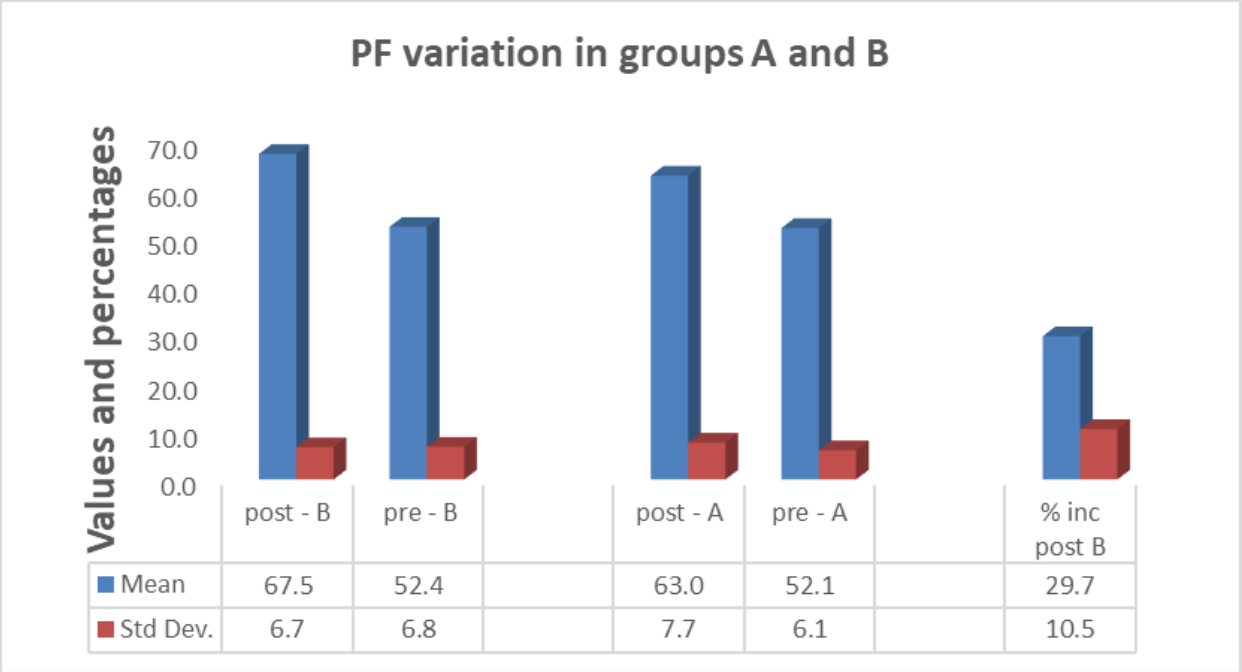
Table 4.2.Effect of Aerobic Exercise with TENS versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 QUESTIONNAIRE :

PHYSICAL FUNCTIONING:

Parameters	Group	Intervention	Mean	SD	Paired t-test	p-value
Physical functioning	Aerobic with exercises	Pre SF-36 Questionnaire	52.1	6.1	13.309	<0.01
		Post SF-36 Questionnaire	63.0	7.7		
Physical functioning	Yoga with tens	Pre SF--36 Questionnaire	52.4	6.8	17.232	<0.01

		Post SF -36 Questionnaire	67.5	6.7		

Fig 4.2 Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 questionnaire { PF } parameter

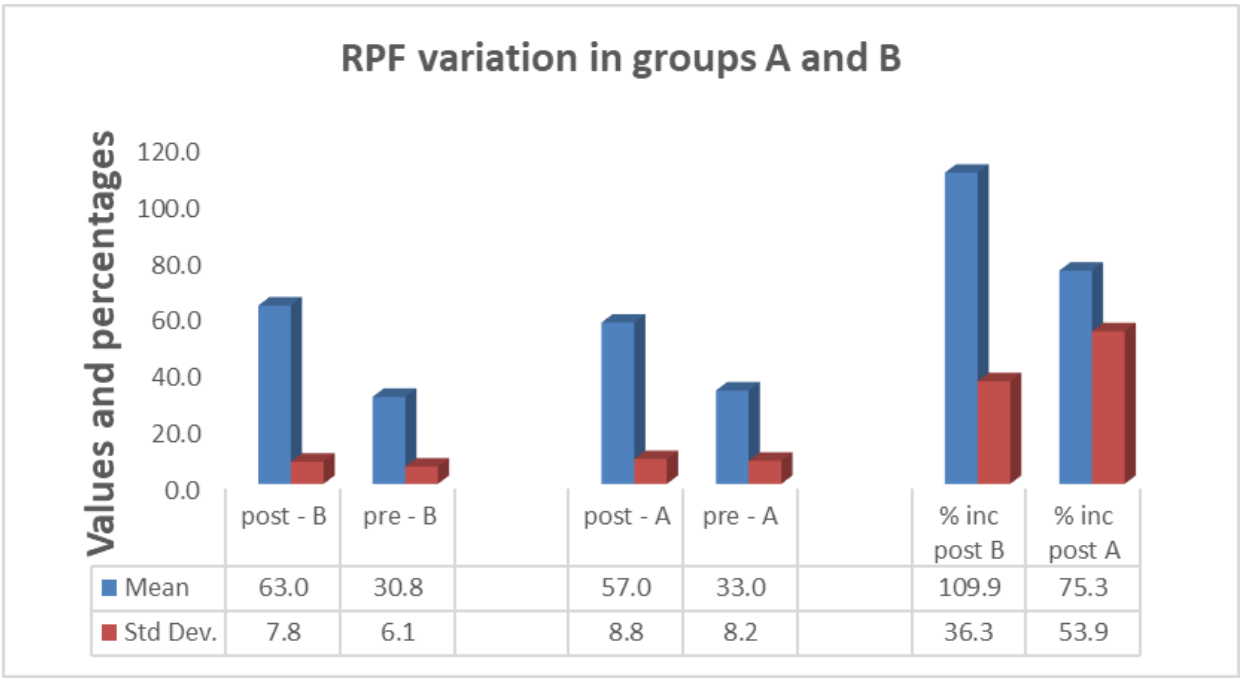


Post PF mean value 63.0 is greater than pre-PF mean value 52.1 in Group
Post PF mean value 67.5 is greater than pre-PF mean value 52.4 in Group B
Percentage increase of post PF value 29.7 is greater in group B compared to that of group A 21.0
Hence intervention is successful in increasing PF values in group B
Table 4.3- Effect of Aerobic Exercise with TENS versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 QUESTIONNAIRE :

ROLE OF PHYSICAL HEALTH (Table 6)

Parameters	Group	Intervention	Mean	SD	Paired t test	p-value
Role of physical health	A) Aerobic exercise with TENS	Pre SF--36 Questionnaire	33.0	8.2	22.562	<0.01
		Post SF-36 Questionnaire	57.0	8.8		
Role of physical health	B) Yoga with TENS	Pre SF-36 Questionnaire	30.8	6.1	18.754	<0.01
		Post SF-36 Questionnaire	63.0	7.8		

Fig 4.3Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 questionnaire {RPH} parameter



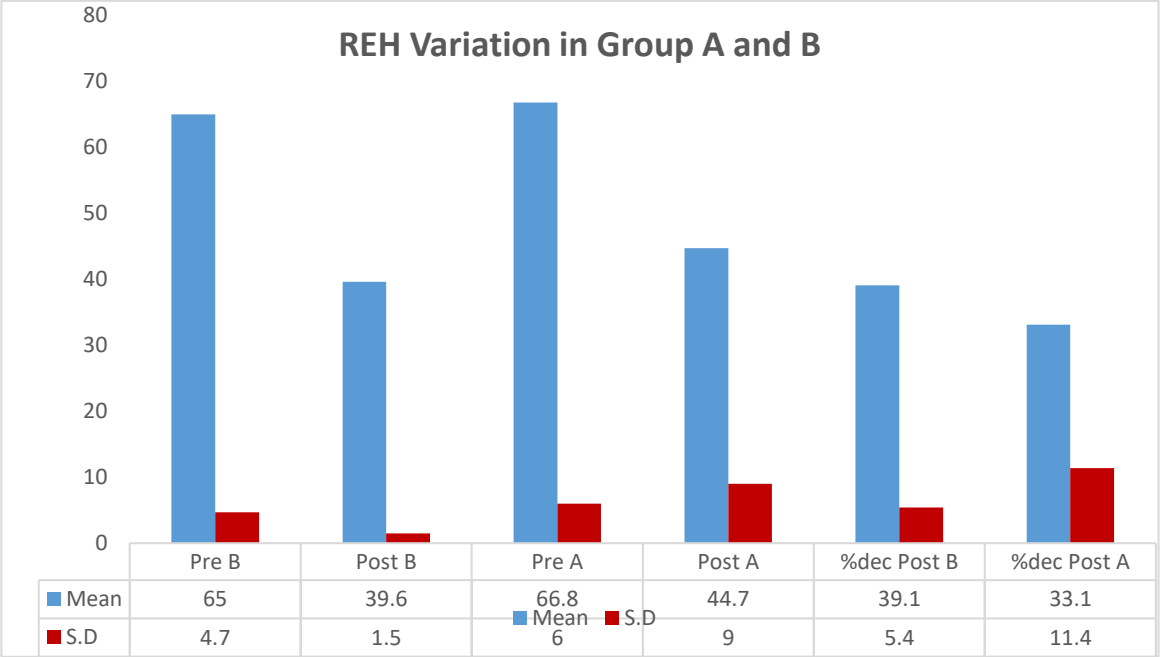
Post RPF mean value 57.0 is greater than pre RPF mean value 33.0
Post RPF mean value 63.0 is greater than pre RPF mean value 30.8
Percentage increase in post PF value 109.9 is greater in group B compared to that of group A 75.
Hence intervention given in group B is successful.

Table 4.4 Effect of Aerobic Exercise with TENS versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 QUESTIONNAIRE :

ROLE OF EMOTIONAL HEALTH

Parameters	Group	Intervention	Mean	SD	Paired t-test	p-value
Role of emotional health	A)Aerobic exercise with tens	Pre SF-36 Questionnaire	66.8	6.0	12.553	<0.05
		Post SF-36 Questionnaire	44.7	9.0		
Role of emotional health	B) Yoga with tens	Pre SF -36 Questionnaire	65	4.7	22.601	<0.05
		Post SF -36 Questionnaire	39.6	1.5		

Fig 4.4. Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 questionnaire {REH} parameter



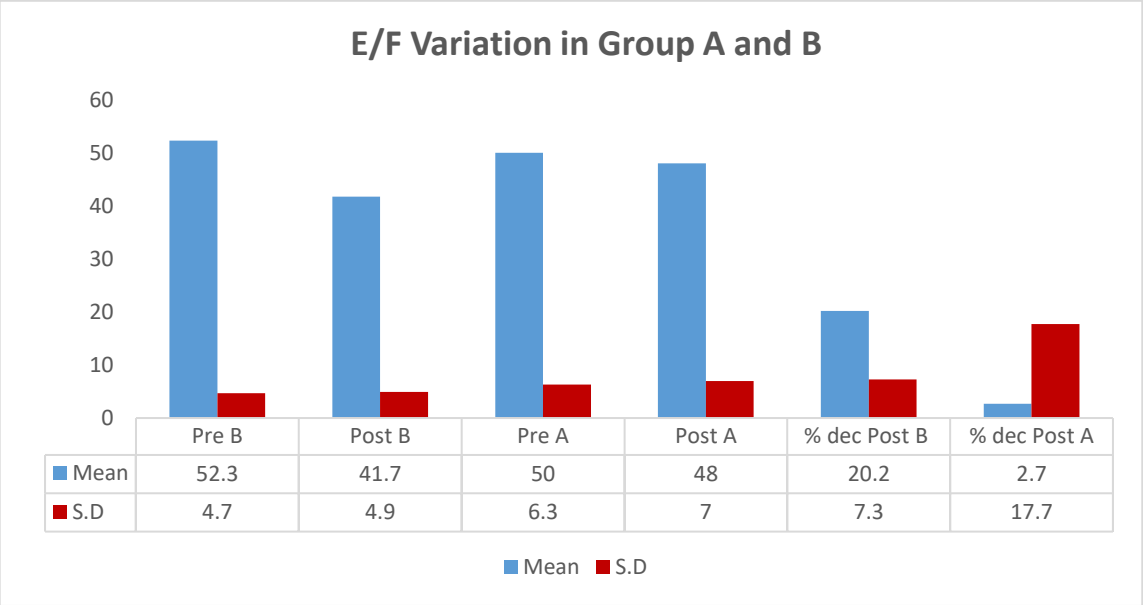
Post REH mean value 44.7 is less than the pre REH mean value 66.8
Post REH mean value 39.6 is less than the pre REH mean value 65.4
Percentage increase in post REH value 39.1 is greater in group B compared to that of group A 33.1.
Hence intervention given in group B is successful.

Table 4.5 Effect of Aerobic Exercise with TENS versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 QUESTIONNAIRE :

ENERGY/ FATIGUE

Parameters	Group	Intervention	Mean	SD	Paired t-test	p-value
Energy /Fatigue	A)Aerobic exercise with tens	Pre SF-36 Questionnaire	50	6.3	1.035	<0.05
		Post SF-36 Questionnaire	48	7.0		
Energy / Fatigue	B) Yoga with tens	Pre SF -36 Questionnaire	52.3	4.7	11.430	<0.01
		Post SF -36 Questionnaire	41.7	4.9		

Fig 4.5. Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 questionnaire { E/F } parameter



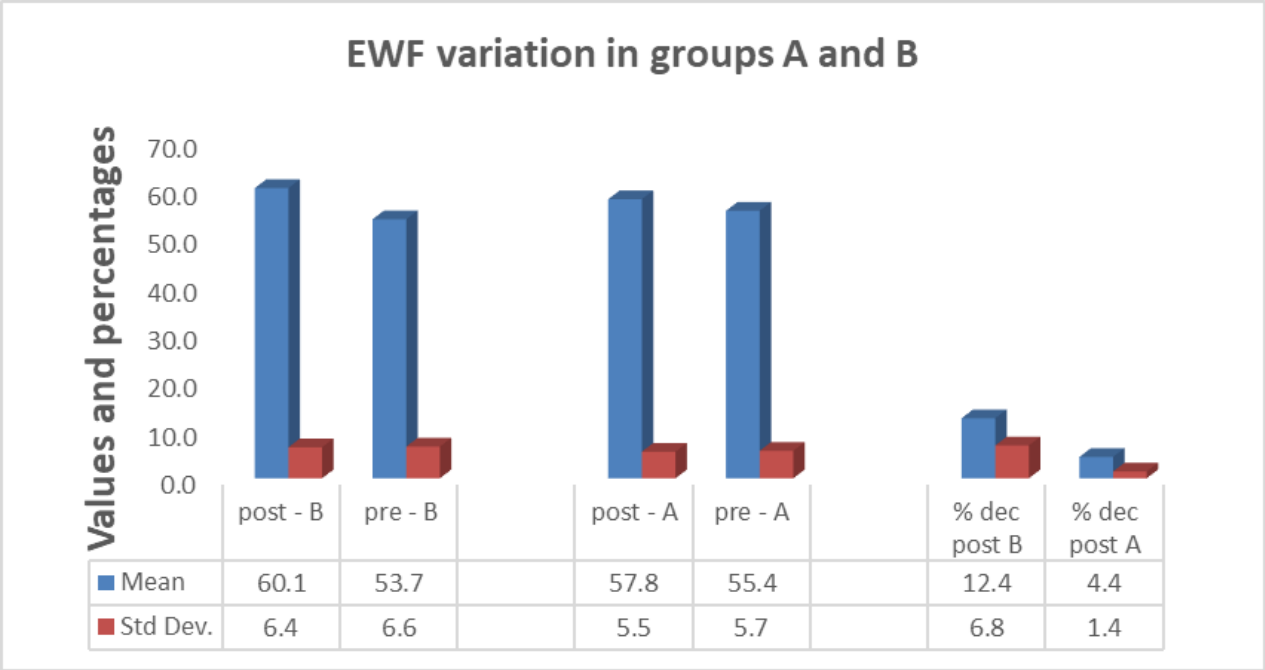
Post E/F mean value 48.0 is almost similar to pre EF mean value 50.0 in grp A.
Post E/F mean value 41.7 is less than the pre-EF mean value 52.3 in grp B.
Percentage decrease in post E/F value 20.2 is greater in group B compared to that of group A 2.
Hence intervention given in group B is successful

Table 4.6 Effect of Aerobic Exercise with TENS versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 QUESTIONNAIRE :

EMOTIONAL WELL BEING.

Parameters	Group	Intervention	Mean	SD	Paired t-test	p-value
Emotional well being	A)Aerobic exercise with tens	Pre SF-36 Questionnaire	55.4	5.7	17.941	<0.01
		Post SF-36 Questionnaire	57.8	5.5		
Emotional well being	B) Yoga with tens	Pre SF -36 Questionnaire	53.7	6.6	8.959	<0.01
		Post SF -36 Questionnaire	60.1	6.4		

Fig 4.6. Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 questionnaire { EWB } parameter.



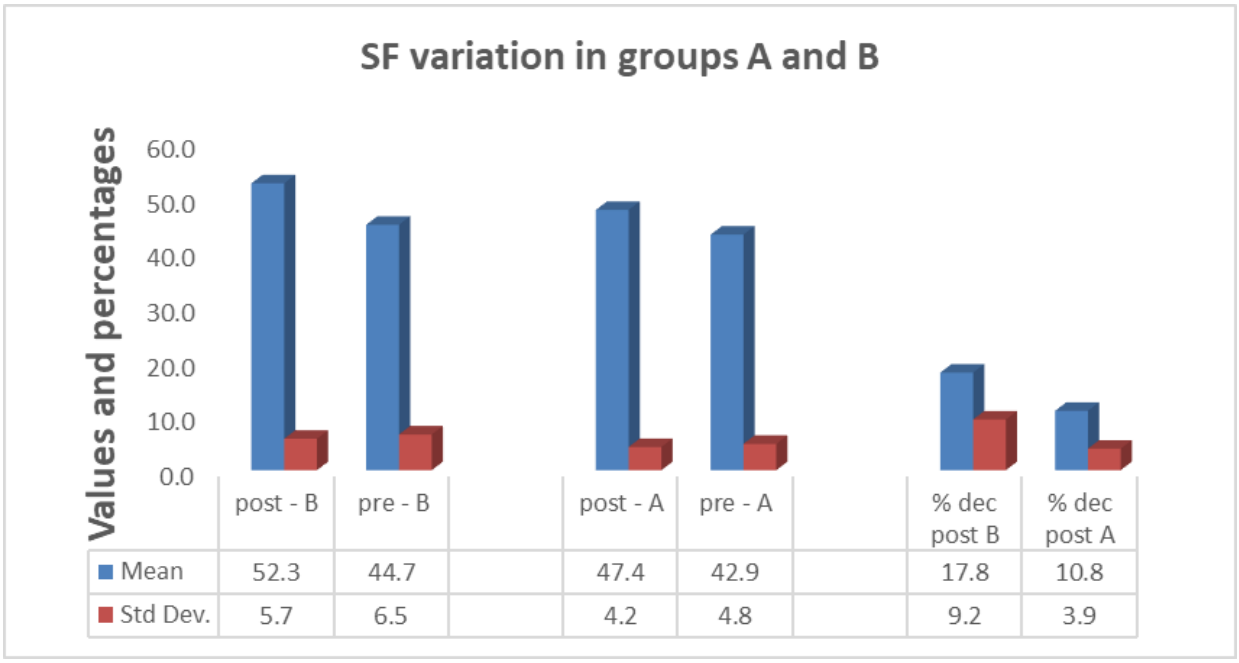
Post EFB mean value 57.8 is greater than the pre EFW mean value 55.4 .
Post EFW mean value 60.1 is greater than the pre EFW mean value 53.7
Percentage increase in post EWF value 12.4 is greater in group B compared to that of group A 4.4.
Hence intervention given in group B is successful

Table 4.7 Effect of Aerobic Exercise with TENS versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 QUESTIONNAIRE :

SOCIAL FUNCTIONING

Parameters	Group	Intervention	Mean	SD	Paired t-test	p-value
Social functioning	A)Aerobic exercise with tens	Pre SF-36 Questionnaire	42.9	4.8	15.755	<0.01
		Post SF-36 Questionnaire	47.4	4.2		
Social functioning	B) Yoga with tens	Pre SF -36 Questionnaire	44.7	52.3	10.541	<0.01
		Post SF -36 Questionnaire	52.3	5.7		

Fig 4.7. Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 questionnaire { SF } parameter.



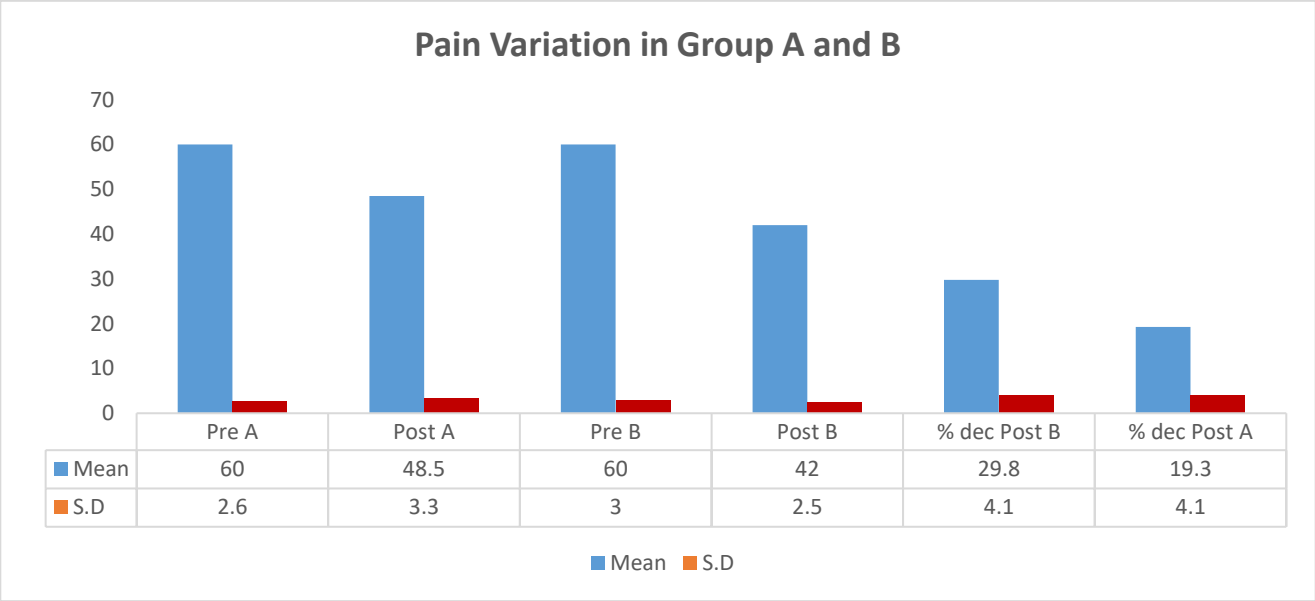
Post SF mean value 47.4 is greater than the pre-SF mean value 42.9 in grp A.
Post SF mean value 52.3 is greater than the pre-SF mean value 44.7 in grp B.
Percentage increase in post SF value 17.8 is greater in group B compared to that of group A 10.8.
Hence intervention given in group B is successful

Table 4.8 Effect of Aerobic Exercise with TENS versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 QUESTIONNAIRE

PAIN.

Parameters	Group	Intervention	Mean	SD	Paired t-test	p-value
Pain	A)Aerobic exercise with tens	Pre SF-36 Questionnaire	60	2.6	21.105	<0.01
		Post SF-36 Questionnaire	48.5	3.3		
Pain	B) Yoga with tens	Pre SF -36 Questionnaire	60	4.2	27.603	<0.01
		Post SF -36 Questionnaire	42	2.5		

Fig 4.8 Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 questionnaire { Pain } parameter.



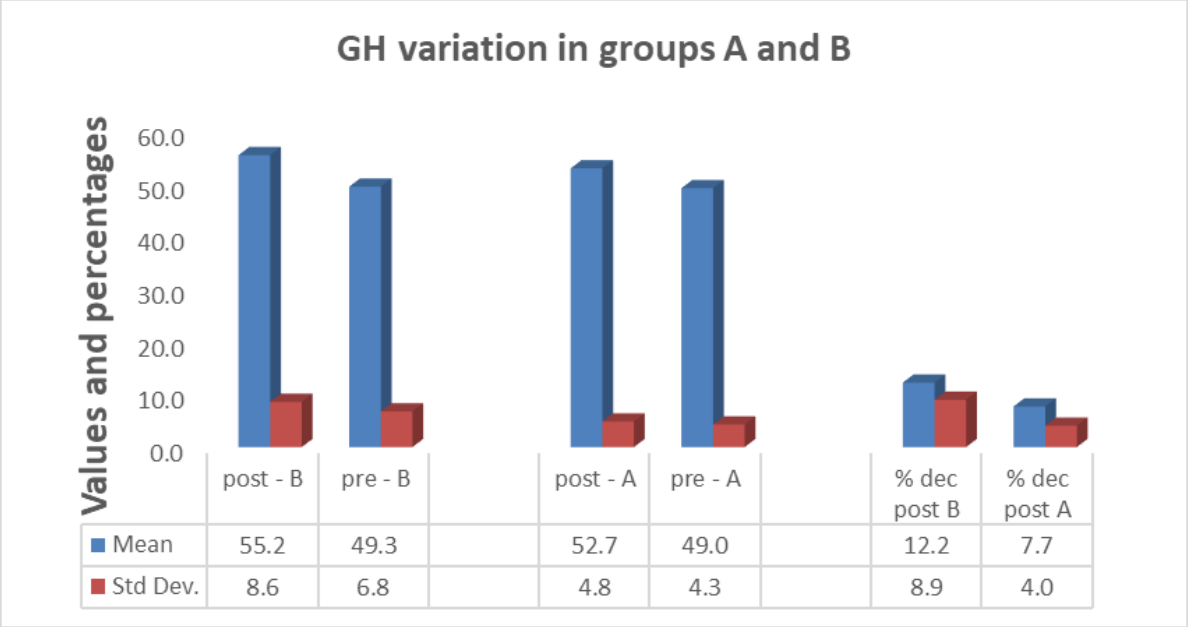
Post pain mean value 48.5 is less than the pre pain mean value 60.0 in grp A.
Post pain mean value 42.1 is less than the pre pain mean value 60.0 in grp B.
Percentage decrease in post pain value 29.8 is greater in group B compared to that of group A.
Hence intervention given in group B is successful.

Table 4.9 Effect of Aerobic Exercise with TENS versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 QUESTIONNAIRE :

GENERAL HEALTH.

Parameters	Group	Intervention	Mean	SD	Paired t-test	p-value
General Health	A)Aerobic exercise with tens	Pre SF-36 Questionnaire	49.0	4.3	8.399	<0.01
		Post SF-36 Questionnaire	52.7	4.8		
General health	B) Yoga with tens	Pre SF -36 Questionnaire	49.3	6.8	5.792	<0.01
		Post SF -36 Questionnaire	55.2	8.6		

Fig 4.9. Bar Graph Representing Effect of Aerobic Exercise with Tens versus Yoga with Tens in reducing pain and improve quality of life in Primary Dysmenorrhea on SF -36 questionnaire { GH } parameter .



	post - B	pre - B		post - A	pre - A		% dec post B	% dec post A
Mean	55.2	49.3		52.7	49.0		12.2	7.7
Std Dev.	8.6	6.8		4.8	4.3		8.9	4.0

Post GH mean value 52.7 is greater than the pre-GH mean value 49.0 in grp
Post GH mean value 55.2 is greater than the pre-GH mean value 49.3 in grp Percentge increase in post GH value 12.2 is greater in group B compared that of group A 7. Hence intervention given in group B is successful

Discussion

Primary dysmenorrhea is described in the scientific literature as one of the most frequent dysfunction in gynecological consultations. It is also cited as one of the commonest reasons behind college or work place absenteeism among young and adult womens.

The treatment of primary dysmenorrhea is mainly focused towards relieving the pain, stress and other symptoms which affects the quality of life.

In a study conducted in 2016 by Anuradha Sutar etc she gave aerobic exercise to subject with Primary Dysmenorrhea to reduce pain . In her study , she concluded that Aerobic exercise was useful in reducing pain and quality of life in Primary Dysmenorrhea.

As described by Michal Elboim, Gabyzon and Kalichman in 2020 they gave Tens On Primary Dysmenorrhea subjects to reduce pain. In his study , he concluded that Tens has shown positive effects in reducing pain and related Primary Dysmenorrhea symptoms and decreased use of additional analgesics.

The study conducted in Oct 2017 by Mato, Eunginichppny and Janyacharoen he gave Yoga on the menstrual pain in Primary Dysmenorrhea subjects to reduce pain and quality of life in young women. In there study ,it conducted that Yoga intervention is able to improve the severity of menstrual pain , physical fitness and quality of life.

The present clinical trial was conducted to study the effect of Aerobic Exercise with Tens versus Yoga with Tens of on symptoms of primary dysmenorrhea for reduction of pain and improve quality of life.

All the participants were selected from college campus . Procedure was explained to all the participants .A written consent was obtained from all the participants. All participants were introduced and were given a briefing about the procedure.

In the present study undertaken a total of 40 participants were recruited for the study of which 20 participants were given Aerobic exercise with Tens which comprised Group A and other 20 participants were given Yoga with Tens and they formed Group B . Pain level were measured by VAS scale and QOL is measured by SF -36 questionnaire in both the study groups before commencing the treatment for 12 weeks with 3 consecutive cycles and after giving the treatment.

In the present study it was observed that mean age of participants with Primary Dysmenorrhea was 19 ± 5 years.

In present study the results of Paired t test revealed that the pain and quality of life of group A participants on VAS and SF -36 questionnaire, the values of VAS post intervention(4.6) was significantly improved than pre intervention (7.0) pvalue(<0.01).On SF-36 questionnaire the parameters are A] The post intervention of PF (63.0) was significantly improved than pre intervention (52.1) p (<0.01).B] The post intervention of RPH (57.0) was significantly improved than pre intervention (33.0) p value (<0.01) .C] The post intervention of REH (44.7) was significantly improved than pre intervention (66.8) p value (< 0.05).D] The post intervention of E/F (48) was significantly improved than pre intervention (50) p value (<0.05) .E] The post intervention of EWB (55.4) was significantly improved than pre intervention (57.8) p value (<0.01). F] The post intervention of SF (47.4) was significantly improved than pre intervention (42.9) p value (<0.01). G] The post intervention of Pain (48.5) was significantly improved than pre intervention (60) p value (<0.01).H] The post intervention of GH (52.7) was significantly improved than pre intervention (49.0) p value (<0.01). A concurrent also seen while studying the pain and and quality of life in group B participants on VAS and SF -36 questionnaire, the values of VAS post intervention (4.2) was significantly improved than pre intervention (6.9) p value (<0.01).On SF-36 questionnaire the parameters are A] The post intervention of PF (67.5) was significantly improved than pre intervention (52.4) p (<0.01).B] The post intervention of RPH (63.0) was significantly improved than pre intervention (30.8) p value (<0.01) .C] The post intervention of REH (39.6) was significantly improved than pre intervention (65) p value (< 0.05).D] The post intervention of E/F (41.7) was significantly improved than pre intervention (52.3) p value (<0.01) .E] The post intervention of EWB (60.1) was significantly improved than pre intervention (53.7) p value (<0.01). F] The post intervention of SF (52.3) was significantly improved than pre intervention (44.7) p value (<0.01). G] The post intervention of Pain (42) was significantly improved than pre intervention (60) p value (<0.01).H] The post intervention of GH (55.2) was significantly improved than pre intervention (49.3) p value (<0.01).

The results of our study suggests that pain and quality of life of group B subjects who participated in Yoga with Tens has significant reduction in pain and quality of life . As regular exercise and yoga has many benefits including increased power for women's heart vascular activity increase the bone density and reducing the stress and increase flexibility.

Conclusion

Our study supported the alternate hypothesis. Both groups showed significant reduction in pain and quality of life after treatment. The Yoga with Tens was more effective in reducing pain and quality of life as compared to Aerobic with Tens in primary dysmennorhea subjects. This reveals that Yoga played an eminent role in proving that combination therapy of Yoga with Tens was more effective in reducing pain and quality of life in primary dysmennorhea subjects.

Limitations

1. The sample size of this study was limited.
2. The age group of the group was limited from 19+ 25 years .
3. Secondary Dysmenorrhea was not included.

Suggestions

1. Further Study may include larger size longer treatment duration.
2. With other interventional like Pilates and Connective Tissue Manipulation can also be used.
3. The age group should be taken more.
4. Rather than randomly allocating participants, the sampling method should have Limitations done accordingly.
5. Further Secondary Dysmenorrhea patients can also be taken.

References

1. Sutar, Anuradha & Paldhikar, Sayli & Shikalgar, Nigar & Ghodey, Snehal. (2016). "Effect of aerobic exercises on primary dysmenorrhoea in college students". IOSR Journal of Nursing and Health Science. 05. 20-24. 10.9790/1959-0505052024.
2. Rodrigues G. and Juliana F., Padilha , Melissa M and Asperetto A .Physiotherapy in primary dysmenorrhea: literature review.article Gerzson2014PhysiotherapyIP: Revista Dor, 2014, Vol.15, 290-295.
3. Margaret Polden and Jill Mantle , Physiotherapy in Obstetrics and Gynaecology, second edition 2004 , Chapter No 9 , page no -289
4. Itani R, Soubra L, Karout S, Rahme D, Karout L, Khojah HMJ. .Primary Dysmenorrhea: Pathophysiology, Diagnosis, and Treatment Updates. Korean J Fam Med. 2022 Mar;43(2):101-108. doi: 10.4082/kjfm.21.0103. Epub 2022 Mar 17. PMID: 35320895; PMCID: PMC8943241.
5. Nagy H, Carlson K, Khan MAB. Dysmenorrhea. [Updated 2023 Nov 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK560834/
6. Yonglitthipagon P, Muansiangsai S, Wongkhumngern W, Donpunha W, Chanavirut R, Siritaratiwat W, Mato L, Eungpinichpong W, Janyacharoen T. Effect of yoga on the menstrual pain, physical fitness, and quality of life of young women with primary dysmenorrhea. J Bodyw Mov Ther. 2017 Oct;21(4):840-846. Doi: 10.1016/j.jbmt.2017.01.014. Epub 2017 Feb 7. PMID: 29037637.
7. Carroquino-Garcia P, Jiménez-Rejano JJ, Medrano-Sanchez E, de la Casa-Almeida M, Diaz-Mohedo E, Suarez-Serrano C. Therapeutic Exercise in the Treatment of Primary Dysmenorrhea: A Systematic Review and Meta-Analysis. Phys Ther. 2019 Oct 28;99(10):1371-1380. Doi: 10.1093/ptj/pzz101. PMID: 31665789.
8. Parveen N, Alshammari R, Alshammari H, Alshammari T, Alsamaan S, Ali N. Aerobic exercises and its effects on primary dysmenorrhea among women at Hail city, Saudi Arabia. IJMDC. (2020), [cited March 11, 2024]; 4(5): 869-874. Doi:10.24911/IJMDC.51-1583320297
9. Dehnavi ZM, Jafarnejad F, Kamali Z. The Effect of aerobic exercise on primary dysmenorrhea: A clinical trial study. J Educ Health Promot. 2018 Jan 10;7:3. Doi: 10.4103/jehp.jehp_79_17. PMID: 29417063; PMCID: PMC5791467.

10. Rodrigues JC, Avila MA, Driusso P (2021) Transcutaneous electrical nerve stimulation for women with primary dysmenorrhea: Study protocol for a randomized controlled clinical trial with economic evaluation. PLOS ONE 16(5): e0250111.
11. Lewers D, Clelland JA, Jackson JR, Varner RE, Bergman J. Transcutaneous electrical nerve stimulation in the relief of primary dysmenorrhea. Phys Ther. 1989 Jan;69(1):3-9. Doi: 10.1093/ptj/69.1.3. PMID: 2783493.
12. López-Liria R, Torres-Álamo L, Vega-Ramírez FA, García-Luengo AV, Aguilar-Parra JM, Trigueros-Ramos R, Rocamora-Pérez P. Efficacy of Physiotherapy Treatment in Primary Dysmenorrhea: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2021 Jul 23;18(15):7832. Doi: 10.3390/ijerph18157832. PMID: 34360122; PMCID: PMC8345570.
13. Azagew, A.W., Kassie, D.G. & Walle, T.A. Prevalence of primary dysmenorrhea, its intensity, impact and associated factors among female students at Gondar town preparatory school, Northwest Ethiopia. BMC Women's Health 20, 5 (2020). https://doi.org/10.1186/s12905-019-0873-4.
14. Stella Iacovides, Ingrid Avidon, Fiona C. Baker, What we know about primary dysmenorrhea today: a critical review, Human Reproduction Update, Volume 21, Issue 6, November/December 2015, Pages 762–778, https://doi.org/10.1093/humupd/dmv039.
15. Karout, S., Soubra, L., Rahme, D. et al. Prevalence, risk factors, and management practices of primary dysmenorrhea among young females. BMC Women's Health 21, 392 (2021). https://doi.org/10.1186/s12905-021-01532-w