

# A RANDOMISED CONTROLLED TRIAL OF EXERCISE AND HOT WATER BOTTLE IN THE MANAGEMENT OF DYSMENORRHOEA IN SCHOOL GIRLS OF CHANDIGARH, INDIA

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**Abstract :** *Objectives :* To estimate the prevalence of primary dysmenorrhoea among school girls and to compare the impact of exercise and hot water bottle on the occurrence and severity of primary dysmenorrhoea among the study population. *Material and methods :* A cross sectional study was done to estimate the prevalence of dysmenorrhoea in two schools of Chandigarh, India. For the Randomised Controlled Trial, group randomisation of the two schools was done into 2 intervention groups (exercise & hot water bottle groups). 53 girls in school 1 and 75 girls in school 2 participated in the intervention. Comparison of baseline Menstrual Distress Questionnaire (MDQ) scores & Visual Analogue Scale for Pain (VASP) scores were done with 1<sup>st</sup>, 2<sup>nd</sup> & 3<sup>rd</sup> month post intervention scores using mean, standard deviation, t-test. *Results :* Prevalence of dysmenorrhoea was 60.7%. Median age of the school girls was 14 years. The mean VASP score decreased from 5.75 to 2.96 (P<0.0001) and from 5.16 to 2.06 (P<0.0001) at 3 months, in the exercise and hot water bottle group respectively. The mean MDQ score decreased from 14.53 to 7.85 (P<0.0001) and from 14.92 to 8.16 (P<0.0001) at 3 months, in the exercise and hot water bottle group respectively. *Conclusion :* Both exercise & hot water bottle can be used in dysmenorrhoeic girls in home setting to provide relief from pain and menstrual distress.

**Key words :** dysmenorrhoea prevalence RCT exercise  
hot water bottle VASP MDQ

## INTRODUCTION

Dysmenorrhoea is one of the major causes of morbidity among the adolescent

girls (1). Majority of the adolescent girls presenting at primary care clinics suffer from some menstrual pain. Prevalence rates have been reported to be as high as 90% and as

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low as 43% (2, 3).

The consequences of untreated primary dysmenorrhoea range from loss of work and school hours to family and personal disruption among female student community (4). Thus, dysmenorrhoea is rapidly developing as a public health problem with its high prevalence, the degree of discomfort felt by the sufferer as well as the reduction in the quality of life of the female students.

In spite of the frequency and severity of dysmenorrhoea, most women in India, specially in rural areas (5) do not seek medical treatment for this condition. They are, in general, not aware about the available treatments. They believe it will simply not help. This situation has been ascribed to the 'culture of silence and tolerance' prevalent among Indian women (6). However the scenario is a bit different among the urban adolescents among whom indiscriminate use of over the counter pain killers associated with undesirable side effects, is frequently reported (7). In Indian settings, access of girls to a doctor may be constrained because of their status in the family & society. Though behavioural therapy and other such simple measures for management of dysmenorrhoea are available, surprisingly, these have not received the desired attention so far. However, such remedies have two useful characteristics - they are simple to use and they practically cost almost nothing. Moreover, till date, no trial has been reported for home level management of dysmenorrhoea in India. Against this background, the present intervention study was planned with the following objectives.

1. To estimate the prevalence of primary dysmenorrhoea among school girls of Chandigarh.
2. To compare the impact of exercise and hot water bottle on the occurrence and severity of primary dysmenorrhoea among the study population.

## MATERIAL AND METHODS

The study was conducted in Chandigarh during April, 2010 – September, 2010. Two schools were randomly selected from the list of schools in Chandigarh. The principals of respective schools & the parents were then contacted for requisite permission. For estimating prevalence of dysmenorrhoea, all school girls in the standard VIII to X of the selected schools, who had attained menarche, were included in the study. All school girls whose parents did not give consent or who were not willing to answer the questions were excluded. The operational definition used in the study for primary dysmenorrhoea was "recurrent, spasmodic menstrual cramps, that begin only a few hours before or with the onset of menstrual flow & lasting maximum for 2–3 days<sup>3</sup>, suprapubic in location with radiation to both lower quadrants, the lumbar area, and into the inner aspects of the thighs and frequently associated with symptoms like nausea and vomiting, fatigue, headache, dizziness that are more or less reproducible from one menstrual period to the other."

For the prevalence study, the sample size was calculated to be 225, at 90% level of confidence with a margin of error 10% (calculated by using the formula  $n=t^2 pq/d^2$  where  $t=1.64$ ,  $d$  (precision) = 0.05,  $p$

(prevalence) = 0.7,  $q = (1-p) = 0.3$ ). Assuming that exercise will bring 40% relief and hot water bottles will bring 15% relief in the study population after 3 months in the post intervention period, sample size of 48 girls in each group was decided at  $\alpha = 0.05$  and power 80% (two sided test) for RCT was calculated using the formula,

$$k \Omega^2/\Delta = k\{(p_1q_1+p_2q_2)/(p_1-p_2)^2\} \text{ where } p_1=0.4, p_2=0.15, k=8.163$$

However, to overcome the problem of dropouts all eligible dysmenorrhoeic girls in each school were recruited.

The yearly schedule of classes and examinations were noted prior to fixing the sessions for the interview and interventions. A separate room was arranged for interviewing the girls, keeping in mind their privacy. With the help of the class teacher, a pretested and pilot tested interview schedule were filled up by the interviewer to record the demographic profile of the respondents. A Menstrual Distress Questionnaire (MDQ) (8) was used to score the severity of dysmenorrhoea and its impact on their life. The original MDQ contains 47 symptoms grouped into eight categories-negative perception (category 1-6), positive perception (category 7), rare symptoms (category 8). Participants were asked to report the symptoms experienced during their most recent menstrual period, using a rating scale in which responses ranged from 1 (no experience of the symptom) to 4 (strongly disabling symptoms). This questionnaire has been shown to be internally consistent (8). The MDQ was modified after the results of pretesting and the pilot study showed overlapping of some questions and the

participants reported it to be exhaustive as well. The original 47 questions MDQ was modified into a shorter version MDQ with 18 questions.

Visual Analogue Scale for Pain (VASP) (9) was used to measure pain during menstruation. The VASP consists of a 10-cm horizontal scale divided into 10 parts and marked 0 to 10. The descriptors 'no pain' corresponds to '0' on the extreme left and 'worst possible pain' corresponds to '10' on the extreme right. Participants were asked to place a mark on the 10-cm line at a point that corresponds to the level of pain intensity they usually feel during menstruation. The distance in centimetres from the zero end of the VASP to the participant's mark was used as a numerical index of the severity of pain. The VASP is sensitive to pharmacological and non-pharmacologic procedures that alter the experience of pain and correlates highly with pain measured on verbal and numeric rating scales (9).

To minimize spillover effect, no individual randomization was attempted. Instead group randomization (according to schools) was done to ensure allocation of the eligible girls in the two intervention groups. The randomization was done by a faculty member not involved in the study. At the beginning, both the groups were given information on female reproductive system, menstrual cycle and dysmenorrhoea. Thereafter, group 1 & 2 were demonstrated steps of 5 exercises and hot water bottle use respectively, with distribution of respective handouts (developed by the investigators). The physical education teacher of the schools imparted the trainings under supervision of the principal investigator (a lady doctor). The

hot water bottles, wrapped in towels (after checking by touch that the temperature was tolerable) were to be applied over the lower abdomen when pain occurred during the menstrual period, for 15-20 minutes each time. The following exercises (10) were to be practised throughout the month except on the days of menstruation, for two sessions a day, each session lasting for 10-15 minutes.

1. Lie face up with legs and knees semiflexed; now perform abdominal breathing about 10 times.
2. Lie on back; now bring your knees to touch your chin as much as possible; straighten back the legs. Repeat for 10 times.
3. Stand straight while holding the back of a chair; stand on your toes for 10 seconds with both heels raised. Resume normal standing position again. Repeat 20 times.
4. Stand straight while holding the back of a chair; now do 5 deep knee bends, each lasting for 15 seconds.
5. Stand with both knee semiflexed and feet together. Try to hold a roll of cloth in the back of both the knees for 1 minute, while doing knee bend.

Once a week visits were made to the schools during the study period, to repeat the demonstrations and to ensure that the interventions were practised correctly. The initial training sessions lasted for 40-45 minutes and subsequent sessions were of 15-20 minutes duration. Phone calls were made to verify from the mothers whether the subjects were regular in using hot water bottles or practising the exercises. The

participants were instructed to maintain a menstrual diary to keep a record of the days when they practiced the interventions.

The post intervention assessment of the severity of menstrual distress (MDQ score) and intensity of menstrual pain (VASP score) was done at 1<sup>st</sup>, 2<sup>nd</sup> & 3<sup>rd</sup> month after the beginning of the interventions. The data was collected by interviews during follow up visits as well as by phone calls during the vacation time. Menstrual diary records were also considered during analysis of the baseline and post intervention data, at the end of each month.

Statistical analysis was done using SPSS package version 15; percentage, mean and standard deviation, paired t test, unpaired t test was done.  $P < \text{or} = 0.05$  was considered statistically significant.

## RESULTS

At the end of prevalence study over a two months period, 53 girls in school 1 and 86 girls in school 2 were identified as dysmenorrhoeic. Fig. 1 shows the trial attrition in the two intervention groups. The overall prevalence of dysmenorrhoea was 60.7%. Prevalence was more in school 2 (62.77%) as compared to school 1 (57.61%). The demographic profile of the dysmenorrhoeic girls are presented in Table I. The results of MDQ, shows that psychological symptoms

TABLE I: Demographic profile of the girls suffering from dysmenorrhoea.

<i>Profile</i>	<i>School 1 (n=53)</i>	<i>School 2 (n=75)</i>
Prevalence of dysmenorrhoea (%)	57.61	62.77
Median age (years)	14.0	14.0
Absent from school [n(%)]	22(41.5)	11(14.7)
Bed rest [n(%)]	23(43.4)	59(78.7)
Visited doctor [n(%)]	5(9.4)	6(8.0)

TABLE II: Activity wise effect of dysmenorrhoea on daily activities based on menstrual distress questionnaire (MDQ) scores.

<i>Impact/symptoms</i>	<i>School 1 n (%)</i>	<i>School 2 n (%)</i>
Muscle stiffness	6 (11.4)	18 (24)
Headache	14 (26.4)	22 (29.3)
Anxiety	16 (30.2)	37 (49.4)
Mood swing	35 (66.1)	59 (78.6)
Cramps	20 (37.7)	14 (18.6)
Painful or tender breast	4 (7.5)	15 (19.9)
Nausea, vomiting	3 (5.7)	10 (13.3)
Crying	30 (56.7)	32 (42.7)
Backache	26 (49.1)	54 (72)
Irritability	34 (64.1)	56 (74.6)
Fatigue	35 (66.1)	55 (73.2)
Feeling sad or blue	33 (62.3)	35 (46.7)
General aches or pains	12 (22.6)	28 (37.3)
Poor school performance	37 (69.8)	45 (60)
Take naps, stay in bed	26 (49)	39 (52)
Stay at home	28 (52.8)	40 (53.4)
Difficulty concentrating	38 (71.7)	57 (75.9)
Avoid social activities	27 (50.8)	41 (54.7)

were more prevalent compared to physical symptoms (Table II). Table III and Fig. 2 & 3 shows that the mean VASP score decreased significantly from baseline to the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> month of post intervention phases in both the exercise & hot water bottle group. Table III also depicts that there was no difference in any outcome variables at baseline between 2 intervention groups. After 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> months of intervention phase there was statistically significant difference in VASP score between 2 groups, with hot water bottle showing better result than exercise, in reducing pain. Change in MDQ was not significant between the groups thereby denoting that the 2 interventions were equally effective in reducing menstrual distress (Table III).

TABLE III: Different outcome variables at different stages of study among exercise and hot water bottle groups.

<i>Outcome variables</i>	<i>Exercise group Mean (CI)</i>	<i>HWB group Mean (CI)</i>	<i>P value* Significance level</i>	<i>P value** Exercise group</i>	<i>P value*** HWB group</i>
<i>Baseline</i>	<i>(n=53)</i>	<i>(n=75)</i>			
VASP score	5.75 (5.13–6.36)	5.16 (4.80–5.51)	0.086 NS	–	–
MDQ Score	14.53 (11.39–17.66)	14.92 (12.36–17.48)	0.849 NS	–	–
<i>At 1 Month after intervention</i>	<i>(n=53)</i>	<i>(n=69)</i>			
VASP score	4.36 (3.79–4.93)	3.55(3.14-3.95)	0.022 <b>S</b>	0.000 <b>S</b>	0.000 <b>S</b>
MDQ Score	14.11 (10.42-17.79)	11.45(9.26-13.63)	0.203 NS	0.669NS	0.000 <b>S</b>
<i>At 2 Months after intervention</i>	<i>(n=48)</i>	<i>(n=67)</i>			
VASP score	3.46 (2.86–4.06)	2.70 (2.34–3.05)	0.028 <b>S</b>	0.000 <b>S</b>	0.000 <b>S</b>
MDQ Score	9.02 (6.60–11.43)	9.91 (7.22–12.59)	0.645 NS	0.000 <b>S</b>	0.000 <b>S</b>
<i>At 3 Months after intervention</i>	<i>(n=48)</i>	<i>(n=64)</i>			
VASP score	2.96 (2.36-3.56)	2.06 (1.74-2.37)	0.007 <b>S</b>	0.000 <b>S</b>	0.000 <b>S</b>
MDQ Score	7.85 (5.34-10.35)	8.16 (5.40-10.91)	0.878 NS	0.000 <b>S</b>	0.000 <b>S</b>

\* The corresponding p value is given for t test, to test the significance of difference (intergroup) between the outcome variables of 2 groups.

\*\* The corresponding p value is given for t test, to test the significance of difference (intragroup) between the outcome variables at baseline & at the end of each month in exercise group.

\*\*\* The corresponding p value is given for t test, to test the significance of difference (intragroup) between the outcome variables at baseline & at the end of each month in hot water bottle group.

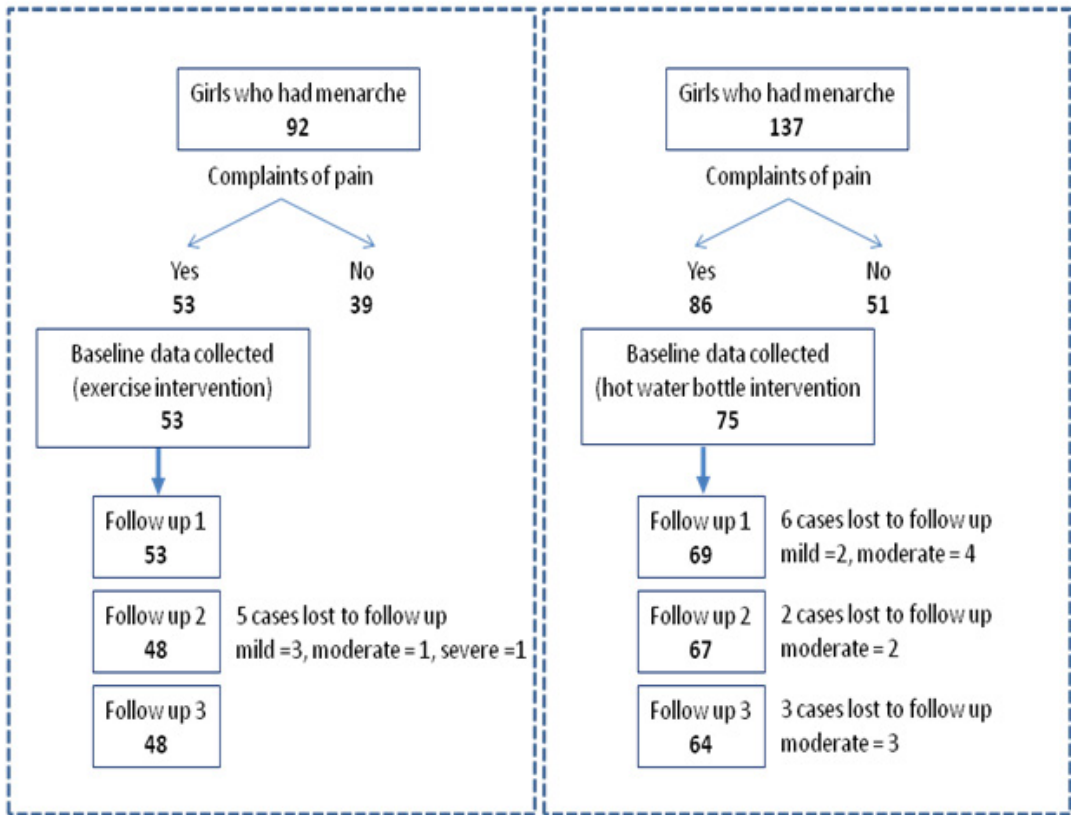


Fig. 1: Study design and trial attrition in school 1 (exercise intervention) and school 2 (hot water bottle intervention).

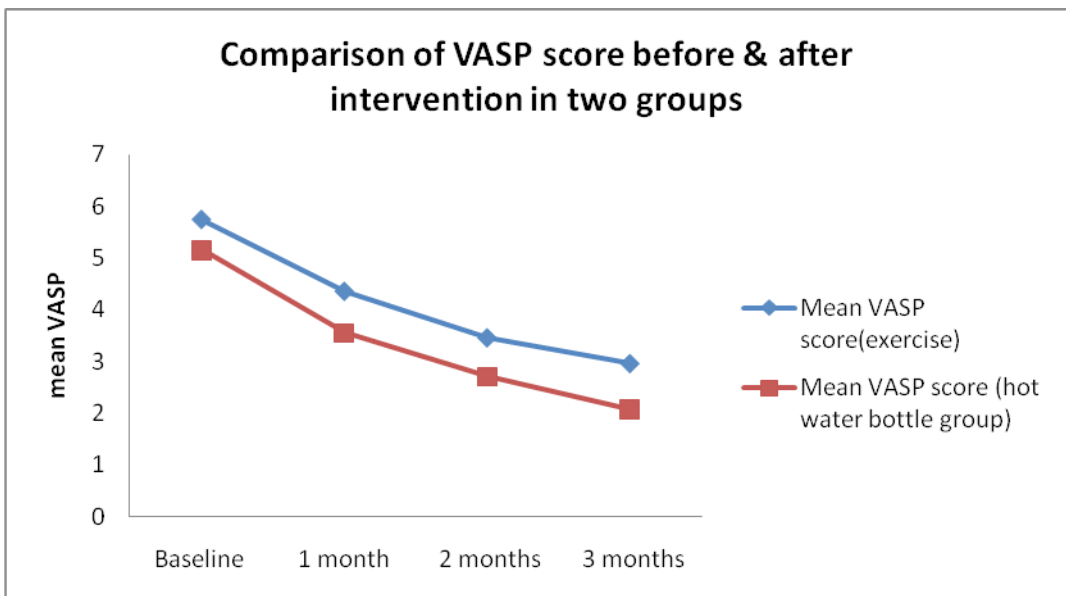


Fig. 2

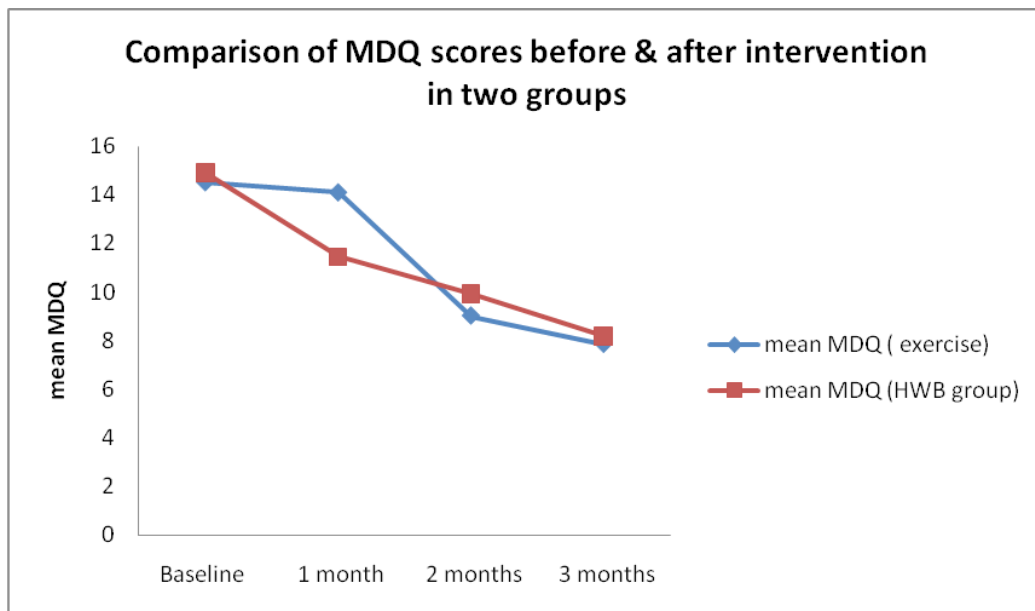


Fig. 3

## DISCUSSION

The present study revealed that majority of school girls (13-17 years) suffered from dysmenorrhoea (prevalence of 60.7%). The finding is comparable to the prevalence of 59.7% reported by Kleinn & Litt (11) and Bergsjø (12) (61%) but higher than that done by Avasarala (5) in India, 2008 (54%). However, prevalence rates reported for dysmenorrhoea vary greatly from study to study, probably due to difference in the methods of collecting data, the study definitions of dysmenorrhoea and pain, and the study populations.

The results also revealed that dysmenorrhoea immensely affected the quality of life of the school girls. It interfered with their daily activities and social relationships. Frequency of bed rest (50.8%) reported in our study was almost similar to

that found by Sharma (13) in Delhi, (54%). One fourth (25.8%) of the girls in our study reported school absenteeism due to dysmenorrhoea which is comparable to in a study from Norway (31%) (12). 53.12% respondents reported avoiding social activities which corroborates with a value of 67.08% reported by Singh (India, 2008) (14). Restriction of the above activities was caused mainly by two factors - physical discomfort and psychological stress.

The present study concluded that both exercise & hot water bottle led to a significant improvement in the severity of pain and menstrual distress in the respective study groups. Subjects in both the groups showed a clear shift from moderate & severe grades towards mild grade. Although the shift was evident after 1<sup>st</sup> month of intervention, it became more prominent at the end of the third month in both the

groups. In the exercise group 28.3% of the dysmenorrhoeic girls became pain free at the end of 3<sup>rd</sup> month of intervention compared to 37.33% in the hot water bottle group. This finding is similar to other studies (15, 16, 17). Golub et al. (18) studied the effects of the Golub exercise on the frequency of premenstrual difficulties and dysmenorrhoea in junior high school girls over a 3-yr period, at the end of which 39% of the exercise group suffered from dysmenorrhoea compared with 61% of the control group ( $P < 0.05$ ). Lundquist (19) and Hubbelli (20) compared Billig and non-Billig exercises, and both exercising groups reported a decrease in symptoms accompanying dysmenorrhoea. Izzo and Labriola (21) further showed that dysmenorrhoea was less prevalent in athletes who had begun their sports activities prior to menarche and there was improvement in symptoms after initiation of sports.

In a review (15) of 4 randomized controlled trials and 2 observational studies, exercise was associated with a reduction in dysmenorrhoea symptoms. Israel et al. (22) randomized 36 college females with primary dysmenorrhoea into an aerobic training group and a control group, where the training group showed significantly lower MDQ scores during the menstrual phase than the controls. Exercise may be a way to reduce the pain of menstrual cramps through the brain's production of endorphins, the body's own painkillers (22). Exercise is a widely accepted way for moderating stress (23). Stress tends to enhance sympathetic activity leading to increased contraction of the uterine muscle innervated by sympathetic nervous system, thus leading to menstrual pain. Increased blood flow to the pelvic organs during exercise may help in reducing

the ischaemic pain during menstruation (21).

Use of heat for menstrual discomfort has been a standard recommendation in medical books since long. Improvement in all the outcome variables in the present study after using hot water bottle almost corroborates with a recently published study by Akin et al (17), where the results indicated that the odds of receiving complete relief while on heat treatment were four times greater than for unheated/placebo treatment. Heat may act as an analgesic through some form of gate control, by central alteration of pain thresholds, or through an altered sense of well-being (24). Heat may also have a direct relaxing effect on the uterus, thus relieving pain (17).

The limitations of this study were – firstly, the diagnosis of primary dysmenorrhoea was purely based on history (clinical or ultrasound examination to rule out secondary dysmenorrhoea was not done). Secondly, since blinding was not feasible in these behavioural interventions, there may have been some bias among the respondents in subjective measurement of pain and menstrual distress. Moreover individual randomisation was not done to avoid 'spill over effects of intervention'.

The strength of the trial was that the interventions were successfully administered by the physical education teacher under the supervision of the principal investigator (a lady doctor) in this study. It is thus, possible that the school teachers can easily impart behaviour therapy to dysmenorrhoeic girls through routine physical education classes. These therapies can be introduced under school health programme. Moreover, the interventions are simple and easy to teach,



purely cost effective and without any significant risk. Thus, they can be effectively implemented for managing menstrual distress in the home settings, specially in developing countries like India where 'womanly' problems get very little attention. In fact, such therapies will prove to be an

empowerment mechanism for hapless dysmenorrhoeic women who are rather forced to tolerate this easily treatable yet significant malady, due to fear of embarrassment, shame or economic constraints.

Conflict of interest : none

## REFERENCES

- Menaker JS. When mens is painful. *American Journal of Nursing* 1962; 62: 94-6.
- Jamieson DJ, Steege JF. The prevalence of dysmenorrhea, dyspareunia, pelvic pain, and irritable bowel syndrome in primary care practices. *Obstetrics and Gynaecology* 1996; 87: 55-58.
- Svanberg L, Ulmsten U. The incidence of primary dysmenorrhea in teenagers. *Archives of Gynaecology* 1981; 230: 173-177.
- Banikarim C, Chacko M, Kelder SH. Prevalence and impact of dysmenorrhea on Hispanic female adolescents. *Arch Pediatr Adolesc Med* 2000; 154: 1226-1229.
- Avasarala AK, Panchangam S. Dysmenorrhoea in different settings: are the rural and urban adolescent girls perceiving and managing the dysmenorrhoea problem differently? *Indian Journal Community Med* 2008; 33: 246-249.
- Singh AJ. Place of menstruation in the reproductive lives of women of rural North India. *Indian Journal Community Med* 2006; 31: 10-14.
- Bulck V. Television and Adolescent Use of Over-the-Counter Analgesic Agents. *The Annals of Pharmacotherapy* 2005; 39: 58-62.
- Moos RH. The Development of a Menstrual Distress Questionnaire. *Psychosomatic Medicine* 1968; 30: 853-867.
- Mark P, Jensen CC, Andrew M. Interpretation of visual analog scale ratings and change scores: a reanalysis of two clinical trials of postoperative pain. *Journal of Pain* 2003; 4: 407-410.
- Abbaspour Z, Rostami M. The effect of exercise in primary dysmenorrhoea. *J Res Health Sci* 2006; 6: 26-31.
- Klein JR. Epidemiology of adolescent dysmenorrhea. *Pediatrics* 1981; 68: 661-664.
- Bergsjö P. Socioeconomic implications of dysmenorrhoea. *Acta Obstetrica et Gynecologica Scandinavica* 1979; 87: 67.
- Sharma A. Problems related to menstruation and their effect on daily routine of students of a medical college in Delhi, India. *Asia-Pacific Journal of Public Health* 2008; 20: 234-241.
- Singh AKD, Singh H, Nel B, Singh P, Tiwari P. Prevalence and severity of dysmenorrhea: a problem related to menstruation, among first and second year female medical students. *Indian J Physiol Pharmacol* 2008; 5: 389-397.
- Daley AJ. Exercise and primary dysmenorrhoea: a comprehensive and critical review of the literature. *Sports Medicine* 2008; 38: 659-670.
- Proctor ML, Murphy PA, Pattison HM, Suckling J, Farquhar CM. Behavioural interventions for primary and secondary dysmenorrhoea. *Cochrane Database of Systematic Reviews (Online)* 2007(3): CD002248.
- Akin MD. Use of continuous low level topical heat in the treatment of dysmenorrhoea. *Obstetrics and Gynaecology* 2001; 97: 343-349.
- Golub. Exercise and dysmenorrhoea in young teenagers: a 3 year study. *Obstetrics and Gynaecology* 1968; 32: 508-511.
- Lundquist. Use of Billig's exercise for dysmenorrhoea in college students. *Res Q* 1947; 18: 44-53.
- Hubbelli JW. Specific and non specific exercise for relief of dysmenorrhoea. *Res Q* 1949; 20: 378-386.
- Izzo A, Labriola D. Dysmenorrhoea and sports activities in adolescents. *Clin and Exper Obste & Gynae* 1991; 18: 109-116.
- Israel R. Effects of aerobic training on primary dysmenorrhoea in college females. *AM J Coll Health* 1986; 33: 241-244.
- Ganon L. The potential of exercise in the alleviation of menstrual disorders and menopausal symptom. *Women & Health* 1986; 14(2): 105-7.82.
- On AY, Colakoglu Z, Hepguler S, Aksit R. Local heat effect on sympathetic skin responses after pain of electrical stimulus. *Arch Phys Med Rehabil* 1997; 78: 1196-1199.