

Original Research Article

Effect of *Moringa oleifera* soup on primary dysmenorrhea in adolescent girls

Sudhakar Pachiappan*, Poorana Pushkalai Saravanan, Janapriya Mani, Jayapriya Chidambaram, Mahalakshmi Madeshwaran, Oviya Vetrivelan

Department of Pharmacology, Swamy Vivekanandha College of Pharmacy, Namakkal, Tamil Nadu, India

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*Correspondence:

Dr. Sudhakar Pachiappan,

E-mail: sudhakar00pharma@gmail.com

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ABSTRACT

Background: Dysmenorrhea causes a substantial burden on the quality of life of female adolescents. The prevalence estimates range from 25 to 90%. Hence this study aimed to evaluate the effect of *Moringa oleifera* (MO) soup on primary dysmenorrhea in adolescent girls.

Methods: This interventional clinical study was conducted on 111 adolescent college-going girls. Age, anthropometric data (height, weight), age of menarche, presence and absence of primary dysmenorrhea (PD), menses irregularities and other associated symptoms were collected primarily through the prepared standard questionnaires. Based on the collected data, 40 primary dysmenorrheal participants were selected and further, the information was collected regarding primary dysmenorrhea associated symptoms like back pain, abdominal pain, headaches, leg cramps, painful/tender breasts, acne, tiredness, anger, mood swing, insomnia, altered appetite, nausea/vomiting or diarrhea. The hemoglobin and red blood count were evaluated in the PD participants. Both the hematological and dysmenorrhea-associated parameters were assessed before and after treatment of MO leaf soup.

Results: Our study results showed that the prevalence of dysmenorrhea is 36%. Dysmenorrhea participants had the most frequent (every month), painful, irregular and longer length of the menstrual cycle. The dysmenorrheal pain was most frequent, shorten, moderately intense and the higher percentage in the lower abdomen, lower side and pain at a different locations. Dysmenorrhea-associated illnesses like tiredness, abdominal pain, back pain, anger and irritability, leg cramps, and mood swings were higher in participants with dysmenorrhea. After administration of MO leaf soup significantly improves the hemoglobin and RBC levels in PD participants. Also, improve the menstrual as well as pain-associated symptoms of PD.

Conclusions: In conclusion intake of MO soup effectively improves the primary dysmenorrhea associated menstrual as well as pain as symptoms and corrects the anemia condition by increasing the hemoglobin and RBC levels in adolescent girls with dysmenorrhea.

Keywords: Hemoglobin, *Moringa oleifera*, Primary dysmenorrhea, RBC

INTRODUCTION

Dysmenorrhea is the most common gynecologic trouble for all ages and races which is caused by pelvic pain discomfort in women. It can be divided into 2 broad categories: PD and secondary dysmenorrhea. PD is a

lower abdominal pain happening during the menstrual cycle, which is not associated with other diseases or pathology. Secondary dysmenorrhea is associated with other pathology inside or outside the uterus.¹ The prevalence of dysmenorrhea can deviate between 16% and 91% in women's reproductive years between the late teens and late 20s.²

Non-steroidal anti-inflammatory drugs (NSAIDs) appear to be the first line of existing therapy for dysmenorrhea. The other medications include oral contraceptive pills (OCPs) and progestin only pills (POP). The drawback of current medications includes stomach ulcers, headache, drowsiness, dizziness and constipation.³ In this study, we have selected the herb *Moringa oleifera* leaves to evaluate its effect on PD rather than these medications to avoid the side effects.

Moringa, a multi-purpose native plant from Africa and Asia and the most widely cultivated species in Northern India belong to the family *Moringaceae*.⁴ The widely used part of this plant leaves are rich in vitamins, carotenoids, polyphenols, phenolic acids, flavonoids, alkaloids, glucosinolates, isothiocyanates, tannins and saponins. The leaves of MO are mostly used for medicinal purposes as well as for human nutrition since they are rich in antioxidants and other nutrients. It also protects against oxidative stress, inflammation, hepatic fibrosis, liver damage, hypercholesterolemia and cancer. MO leaves contain 200 mg/100 g of vitamin C, a concentration greater than what is found in oranges. It is also a good source of vitamin E, with concentrations similar to those found in nuts.⁵ Based on this nutritional value and wider phytopharmacological profile we have selected the MO leaves soup for evaluating its effect on primary dysmenorrhea in adolescent girls.

METHODS

Study design and study participants

This study was an interventional clinical study conducted by the department of pharmacology, Swamy Vivekananda college of pharmacy, Namakkal, Tamil Nadu, India between October 2021 and March 2022. The study proposal was reviewed and cleared by the institutional review board (IRB) of the institution. 111 female pharmacy undergraduate students aged between 18-23 years, who were willing to participate in this study were included. Among them, 40 participant data were included for the primary dysmenorrhea study based on inclusion and exclusion criteria.

Data collection

Written informed consent was obtained from all the participants before the commencement of the study. A questionnaire regarding the menstruation cycle and the associated symptoms was prepared and circulated to them. Before circulating the questionnaire, a brief orientation was given in the local language to all the participants. Privacy and confidentiality were maintained throughout the study.

Study parameters

The primary study parameters included age, anthropometric data (height, weight), body mass index

(BMI) was calculated by the formula weight(kg)/height(meter), further analyzed as per Asian criteria <18, 18-23 and >23 were taken as cut off for underweight, normal and overweight, respectively.⁶ Information regarding menses irregularities and characters, presence, and absence of dysmenorrhea and frequency of menstrual pain were collected to identify the prevalence of primary dysmenorrhea among the study population.

The secondary data were collected from the identified PD participant to assess the dysmenorrhea and associated symptoms included details of menstrual pain (onset, length, location, and type) and other associated symptoms like back pain, abdominal pain, headaches, leg cramps, painful/tender breasts, acne, tiredness, anger, mood swing, insomnia, altered appetite, nausea/vomiting and diarrhea.

The hemoglobin and red blood count of the selected participants were evaluated by standard laboratory technique. Both the hematological and dysmenorrhea-associated parameters were assessed before and after treatment of MO leaf soup.

Preparation of MO leaves soup

The fresh leaves of MO were plucked from the big thick stems and rinsed thoroughly twice in freshwater. The 30 gm of leaves were added to the 200 ml of boiling water and kept boiling for about 10 minutes. Then the soup was filtered and provided for the participants (100 ml for each) on an early morning empty stomach throughout a menstrual cycle.⁷

Inclusion criteria

The participants who were willing to participate in this study. The participant who answered all the relevant questionnaires. Women who had the symptoms of primary dysmenorrhea were included.

Exclusion criteria

Data with inappropriate answer; data with missing information were excluded. Participants taking any other medication; participants with any other reproductive disorder or chronic illness; and those who were allergic to MO were excluded.

Statistical analysis

The details were entered into a Microsoft excel spreadsheet (version 2007) and data was analyzed using GraphPad Prism (Version-8) statistical package to determine the mean and percentages. The mean between two independent groups was analyzed using the paired t test.

RESULTS

The demographic information about study participants was summarized in Table 1. Among the 111 participants, 46% were aged between 18-20 years and 54% were 21-23. From that 26% of participants are overweight, 60% are normal in weight. Almost 97% percent of them were attaining menarche between 12-15 years of age.

The results in Table 2 showed the demographic difference between the study participants with and without primary dysmenorrhea. From that, the maximum of 52% are aged 21-23, 43% are normal in weight, and 95% are attained menarche at the age between 12-15 years in the participants with primary dysmenorrhea. From the participants without dysmenorrhea, a maximum

of 55% aged 21-23 years, 67% are normal in weight, and 98% are attained menarche at the age of 12-15.

Table 1: Demographic information about the study participants (n=111).

Information	N	%	
Age (years)	18-20	51	46
	21-23	60	54
BMI	<18 (underweight)	16	14
	18-23 (normal)	67	60
	>23 (over weight)	28	26
Menarche age (year)	7-11	2	2
	12-15	108	97
	>15	1	1

Table 2: Demographic information associated with dysmenorrhea.

Information	Participant with dysmenorrhea (40)	Participant without dysmenorrhea (71)
Age (year)	18-20	19 (48)
	21-23	21 (52)
BMI	<18 (underweight)	10 (25)
	18-22.9 (normal)	17 (43)
	>23 (over weight)	13 (33)
Menarche age (year)	7-11	1 (3)
	12-15	38 (95)
	>15	1 (3)

Total population n=111.

Table 3 results showed the menstrual characteristics among the study population, from that 64% are regular in menstruation, 36% are having irregular menstruation. 50% of the population are having a length of the menstrual cycle is 28-35 days. 55% are having a bleeding duration of 4-5 days. 89% of participants have moderate menstrual flow. 79% of participants have pain during menstruation and 57% were most frequently experience menstrual pain during each cycle. The participants with irregular menstruation were most frequently experienced pain during every cycle were considered primary dysmenorrhea participants.

The baseline dysmenorrheal indicator showed that the onset of menstrual pain was higher 53% after

menstruation and 37% occur both before and after menstruation. The length of pain was 58% in 1-2 days, 30% in 2-3 days and 12% throughout the period. The occurrence of pain location was higher at 70% in the lower abdomen and 23% in the side of the abdomen and pain at a different locations. 83% of the population had moderate pain severity. Among the associated illness during menstruation the percentage occurrence of tiredness (97%), abdominal pain (95%), back pain (82%), anger and irritability (68%), leg cramps (60%), acne (57%), and Mood swings/emotional disturbances (47%). Apart from the onset of menstrual pain before menstruation, all other symptom occurrence percentage was reduced effectively by the treatment of Moringa oleifera leaves soup (Table 4).

Table 3: Menstrual characters among the study population.

Dysmenorrheal variables	N	%	
Frequency of menstruation	Regular	71	64
	Irregular	40	36
Length of the menstruation cycle (in days)	21-27	44	40
	28-35	56	50
	35-40	10	9
	>40	1	1
Bleeding duration during menstrual cycle (in days)	1-3	23	21

Continued.

Dysmenorrheal variables	N	%	
	4-5	62	55
	5-7	23	21
	>7	3	3
Menstrual flow during menstrual	Mild	6	5
	Moderate	99	89
	Heavy	4	4
	Heavy with clots	2	2
Did you have Menstrual pain during menstruation	Yes	88	79
	No	23	21
If yes occurrence and frequency of menstrual pain	Most frequently (every month)	63	57
	Less frequently (once in three months)	27	24
	Rarely (once in 6 months)	13	12

Total population = 111.

Table 4: Effect of MO soup on dysmenorrheal symptoms in the study participants with dysmenorrhea (n=40).

Dysmenorrheal symptoms	Pretreatment	Post-treatment	Changes (%)
	N (%)	N (%)	
Onset of menstrual pain	Before menstruation	5 (13)	+03
	After menstruation	10 (25)	-12
	Before and after menstruation	7 (17)	-20
Length of menstrual pain	1-2 days	18 (45)	-13
	2-3 days	8 (20)	-10
	Entire period	3 (7)	-05
Pain severity	Mild	18 (45)	-15
	Moderate	13 (33)	-50
	Severe	2 (5)	-05
Pain location	Lower abdomen	5 (12)	-58
	Lower back	4 (10)	-07
	Side of abdomen	8 (20)	-03
	Pain at different location	2 (5)	-18
Associated illness during menstruation	Back pain	26 (65)	-17
	Abdominal pain	21 (52)	-43
	Head ache	3 (7)	-03
	General pain	5 (13)	-25
	Leg cramps/cramp	18 (45)	-15
	Painful / tender breasts	0 (0)	-15
	Acne	13 (32)	-25
	Tiredness	29 (72)	-25
	Anger/short tempered/irritability	16 (40)	-28
	Mood swings/ emotional disturbances	13 (32)	-15
	Insomnia	5 (12)	-10
	Altered appetite	5 (12)	-15
	Nausea/vomiting	5 (12)	-06
Diarrhea	2 (5)	-03	

Table 5: Effect of MO soup on hemoglobin and RBC levels in study participants with primary dysmenorrhea.

S. no.	Parameters	Before treatment	After treatment	Difference in changes before-after
1.	Hb (g/dl)	10.23±1.61	12.60±1.71***	2.36±1.02
2.	RBC (million/mm ³)	3.98±0.89	5.53±0.72***	1.51±0.38

Values are expressed as Mean ± SD, n=40. Symbols represent statistical significance: *** - p<0.001, ** - p<0.01, * - p<0.05.

The results in Table 5 showed the effect of MO leaves soup on hemoglobin and red blood cells level in primary dysmenorrhea participants. Post-treatment the level of Hb and RBC was significantly ($p < 0.001$) increased compared to the pretreatment.

DISCUSSION

Dysmenorrhea is the most common gynecological problem among adolescent and adult females. Although it was not a life-threatening condition, it can cause a substantial burden on the quality of life of women or female adolescents. The prevalence estimated range from 20% to 85% among women and adolescents.⁸ Results of our study were also in line with the previous studies, 36% of this study participants were affected with primary dysmenorrhea.

Some of the previous studies had determined that the prevalence of dysmenorrhea decreased with increasing age thus indicating that PD peaked in late adolescence by the 20s and then the incidence fell with increasing age.⁹ Our study results also showed the highest numbers of girl students who had dysmenorrhea at the age of 18-23 years.

Several studies had exposed a significant association between early age at menarche and dysmenorrhea; the underlying reason could be the fact that the girls who attended menarche early had longer exposure to uterine prostaglandins leading to a higher prevalence of dysmenorrhea.¹⁰ However, since the majority of girls were in the reference category of 12-15 years for the age of menarche, our study results were related to the previous reports. Hence there was no difference in the age of menarche between the dysmenorrhea present and absent participants.

Similarly, linkages of BMI with dysmenorrhea were observed in a few studies.^{10,11} Moreover, the present study findings were also in line with the previous studies, compared to the non-dysmenorrheal participant dysmenorrheal participants were shown abnormal BMI whether they were underweight or overweight.

Numerous studies had reported that dysmenorrhea was more prevalent in women with longer cycles. On the other hand, menstrual bleeding duration of 5 days and over was an important risk factor for dysmenorrhea.¹² Similarly results of our study also showed that participants with dysmenorrhea had the most frequent (every month), painful, irregular and longer length of the menstrual cycle.

The results of this study showed that participants with dysmenorrhea had a higher incidence of onset of menstrual pain after menstruation or either before/or after menstruation. In our previous study, we had reported that the occurrence of dysmenorrheal pain was more frequent, short duration (1-2 days) and higher in the lower abdomen with moderate intense pain.¹¹ Results of this

study were also in line with the previous study, the most frequent, shorten, moderate intense dysmenorrheal pain and the higher percentage of pain in the lower abdomen, lower side, and pain at a different location. The rate of occurrence of dysmenorrhea-associated illnesses like tiredness, abdominal pain, back pain, anger and irritability, leg cramps, and mood swings were higher in participants with dysmenorrhea. Our study results also contested the previous study results.¹³

The prostaglandin produced during menstruation was the major contributing factor in the pathogenesis of dysmenorrhea and associated painful symptoms.¹⁴ Anemia was also a contributing factor to dysmenorrhea-associated symptoms.¹⁵ The results of our study indicated an anemic condition like reduced level of Hb and RBC levels in dysmenorrhea participants, it's in line with the previous study results. After administration of MO leaf soup significantly improved the hemoglobin and RBC levels. This is because the high content of vitamin A and beta-carotene present in Moringa had a protective effect on iron availability which significantly increased the levels of hemoglobin and RBC.

Decreased pain of dysmenorrhea after the administration of MO can occur because the phytoconstituents flavonoids act as analgesics, whose mechanism was mediated by inhibiting the enzymes cyclooxygenase. Inhibiting the enzyme cyclooxygenase, reduced the production of prostaglandin and reduces the pain-associated symptoms of dysmenorrhea. In addition to the flavonoid, moringa also contained the analgesic constituents such as caffeoylquinic, kaempferol and quercetin, in abundant amounts as natural COX-2 inhibitors that will block the enzyme COX-2 so that prostaglandin production is hampered in dysmenorrhea.¹⁶

CONCLUSION

In conclusion, the treatment of *Moringa oleifera* leaf soup effectively improves the menstrual characteristics as well as the pain-associated symptoms by significantly improving the decreased hemoglobin and red blood cells in dysmenorrhea participants. The analgesic mechanism of MO has mainly mediated through its prostaglandins inhibition by inhibiting the cyclooxygenase enzyme.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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