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CLINICAL ARTICLE

Effect of omega-3 fatty acids on intensity of primary dysmenorrhea

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ABSTRACT

Objective: To examine whether dietary supplementation with omega-3 fatty acids relieved symptoms of primary dysmenorrhea. **Methods:** Women aged 18–22 years with primary dysmenorrhea were enrolled in a double-blind crossover study. Women assigned to group 1 (n=47) received 1 omega-3 capsule daily for 3 months, followed by placebo for 3 months. Women in group 2 (n=48) received placebo for 3 months, followed by omega-3 for 3 months. A washout period was performed in both groups. Participants used 400 mg of ibuprofen as a rescue dose if severe menstrual pains were experienced. **Results:** A marked reduction in pain intensity was observed after 3 months of treatment with omega-3 fatty acids ($P<0.05$). Women who received omega-3 fatty acids required fewer rescue doses than women who received placebo ($P<0.05$). The mean numbers of ibuprofen tablets used after 3 months with omega-3 fatty acids were 4.3 ± 2.1 (group 1) and 3.2 ± 2.5 (group 2); the mean numbers of tablets used after 3 months of placebo were 5.3 ± 2.2 (group 1) and 6.0 ± 2.6 (group 2) ($P=0.001$ for both). **Conclusion:** Supplementation with omega-3 fatty acids reduced the symptom intensity of primary dysmenorrhea. Supplementation efficacy was sufficient to decrease the ibuprofen rescue dose.

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1. Introduction

Primary dysmenorrhea is characterized by painful menstruation that, if sufficiently acute, can limit participation in normal activities or even require medical intervention [1]. Typically, cramping pelvic pain occurs shortly before, or at the onset of, menstruation and lasts for 1–3 days [2]. From a biologic standpoint, these symptoms of pain arise as an inflammatory response. A few days before the onset of menstruation, prostaglandins start to accumulate in the uterine muscle; once a critical level is reached, these prostaglandins promote smooth-muscle contraction, which ultimately leads to expulsion of the endometrium [3].

The use of non-steroidal anti-inflammatory drugs (NSAIDs) can provide effective pain relief for women with primary dysmenorrhea [4]. Nonetheless, severe adverse effects may occur after long-term conventional therapy with these drugs [5]. Chronic use of NSAIDs is associated with appreciable adverse effects, such as impaired kidney function and gastrointestinal bleeding [6,7], which could limit their use in primary dysmenorrhea. As an alternative to the use of NSAIDs, several nutritional supplements are reported as being effective for the treatment of primary dysmenorrhea. These supplements include omega-3 fatty acids, magnesium, zinc, vitamin B1 (thiamine) and vitamin E [8]. Research shows that a possible biologic mechanism

underpinning primary dysmenorrhea may be an imbalance between anti-inflammatory (vasodilator) eicosanoids derived from omega-3 fatty acids and pro-inflammatory (vasoconstrictor) eicosanoids derived from omega-6 fatty acids [9]. The omega-3 fatty acids present in fish oil possess anti-inflammatory activities that might be exploited to relieve the symptoms of primary dysmenorrhea, presumably by influencing metabolism of prostaglandins and other factors involved in pain and inflammation [10].

The aim of the present study was, therefore, to further evaluate the efficacy of omega-3 fatty acids in the treatment of women with primary dysmenorrhea.

2. Materials and methods

A double-blind crossover study was conducted among 18–22-year-old female students at Semnan University, Semnan, Iran. The participants all exhibited primary menstrual pain, without significant pathology, and with regular menstrual cycles. The study design was approved by the Ethics Committee of Semnan University of Medical Sciences, Semnan, Iran; all participants signed a consent form.

After a primary examination, women who met the above inclusion criteria were registered to participate in the present study. Women assigned an odd number in the registration list were allocated to group 1; the remainder were placed in group 2.

Women in group 1 each received 1 omega-3 capsule (comprising 180 mg of eicosapentaenoic acid plus 120 mg of docosahexaenoic acid) daily for 3 months. After a 1-week washout period without any medication, the women in group 1 then received placebo for

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3 months. Women assigned to group 2 received placebo for 3 months; after the washout period, they then received 1 omega-3 capsule daily for 3 months. Data were gathered before initiating the intervention, and at 3 months and 6 months after initiation, using the Cox Menstrual Symptom Scale questionnaire [11]. The severity of low-back pain and abdominal pain was graded by the participants. Women with severe pain were advised to take 400 mg of ibuprofen (rescue dose) [12]; the number of ibuprofen tablets taken by each woman was recorded after 3 and 6 months of the intervention.

Data were analyzed using SPSS version 16.0 (SPSS, Chicago, IL, USA) via 1-sample Kolmogorov–Smirnov test, Student *t* test, and Mann–Whitney test. A *P* value less than 0.05 was considered statistically significant.

3. Results

Of the 100 women who enrolled, 5 were lost to follow-up: 3 from group 1 and 2 from group 2. The mean age of the 2 study groups was not significantly different, being 20.0 ± 1.3 years for group 1 versus 19.8 ± 1.2 years for group 2 ($P = 0.428$). In addition, no significant differences were detected in body mass index (BMI, calculated as weight in kilograms divided by the square of height in meters). Women in group 1 had a mean BMI of 23.8 ± 4.0 , compared with 24.0 ± 4.1 for group 2 ($P = 0.766$).

As shown in Table 1, the mean pain severity score before initiation of treatment was similar in both groups (7.5 ± 1.7 versus 7.6 ± 1.9 for groups 1 and 2, respectively; $P = 0.692$). After 3 months' treatment, the mean pain severity score was markedly reduced among women who received omega-3 fatty acids (3.5 ± 2.0) but remained high among those who received placebo (6.9 ± 2.1). The difference between the 2 groups at this time point was statistically significant ($P = 0.001$). After crossover, the mean pain severity score for group 1 (who received placebo for 3 months after the washout period) was 6.2 ± 2.2 , whereas the score for group 2 (who received omega-3 fatty acids for 3 months after the washout period) was 3.8 ± 2.2 ($P < 0.001$). These data confirm that the pain severity score was consistently lower when women received omega-3 fatty acids than when they received placebo.

In addition to lowering the pain severity score, treatment with omega-3 fatty acids also reduced the rescue dose of ibuprofen (Table 2). The mean number of ibuprofen tablets used by group 1 was 4.3 ± 2.1 at 3 months and 5.3 ± 2.2 at 6 months. A similar result was observed in group 2 (6.0 ± 2.6 at 3 months and 3.2 ± 2.5 at 6 months). The difference between the 2 groups was statistically significant at both time points ($P = 0.001$).

4. Discussion

The present study is of importance owing to the high prevalence of primary dysmenorrhea and its complications, and the potential adverse effects associated with conventional treatment options

Table 1
Pain severity score before and after intervention.^a

Study group ^b	No. of women	Pain severity score before intervention	Pain severity score at the end of the first 3 months of intervention	Pain severity score at the end of the second 3 months of intervention
Group 1	47	7.5 ± 1.7	3.5 ± 2.0	6.2 ± 2.2
Group 2	48	7.6 ± 1.9	6.9 ± 2.1	3.8 ± 2.2
<i>P</i> value		0.692 ^c	0.001 ^c	<0.001 ^c

^a Values are given as mean \pm SD unless otherwise indicated.

^b In the first 3 months, women in group 1 received omega-3, while those in group 2 received placebo. In the second 3 months, women in group 1 received placebo, while those in group 2 received omega-3.

^c Via Mann–Whitney test.

Table 2
Number of ibuprofen tablets taken during the intervention.^a

Study group ^b	No. of women	Ibuprofen tablets taken during first 3 months of intervention	Ibuprofen tablets taken during second 3 months of intervention
Group 1	47	4.3 ± 2.1	5.3 ± 2.2
Group 2	48	6.0 ± 2.6	3.2 ± 2.5
<i>P</i> value		0.001 ^c	0.001 ^d

^a Values are given as mean \pm SD unless otherwise indicated.

^b In the first 3 months, women in group 1 received omega-3, while those in group 2 received placebo. In the second 3 months, women in group 1 received placebo, while those in group 2 received omega-3.

^c Via independent samples *t* test.

^d Via Mann–Whitney test.

such as NSAIDs [6,7]. Many studies have previously been conducted on the health benefits of fish oil and its components; however, few studies have examined the effect of these substances on the symptoms of primary dysmenorrhea. The results of the present study showed that daily administration of omega-3 fatty acids markedly reduced dysmenorrheal symptoms and pain. A number of preliminary studies have also indicated a possible role for fish oil supplements in the relief of primary dysmenorrhea; the findings of these studies are summarized below.

Harel et al. evaluated the effect of dietary supplementation with omega-3 fatty acids on dysmenorrhea symptoms among adolescents [10]. The first group received fish oil daily for 2 months, followed by placebo for 2 months. The second group received placebo daily for the first 2 months, followed by fish oil for 2 months. There were no significant differences in Cox Menstrual Symptom Scale between the groups at baseline or after 2 months of placebo. However, there was a significant reduction following omega-3 supplementation ($P < 0.0004$). The findings reported by Harel et al. are similar to those of the current study; however, the present study enrolled a larger group of woman (95 versus 42). In addition, the rescue dose of ibuprofen was recorded, and the study design included a washout period to increase the precision of the data.

In another study, Moghadamia et al. [13] showed that dietary supplementation with omega-3 fatty acids significantly reduced abdominal pain, low-back pain, and need for rescue NSAID medication among a group of adolescent girls [13].

Balbi et al. [14] assessed the influence on menstrual pain of dietary habits and menstrual factors such as age at menarche, duration of menstruation, and menstrual flow. Low consumption of fish, eggs, and fruit correlated with primary dysmenorrhea, as did high consumption of wine. Of note, women without primary dysmenorrhea had the highest level of fish consumption in their diet. The authors did not use a crossover method for their study.

Sampalis et al. [15] evaluated the effectiveness of krill oil for the management of premenstrual syndrome and primary dysmenorrhea [15]. Similar to fish oil, krill oil is rich in eicosapentaenoic acid and docosahexaenoic acid, but the fatty acids are incorporated into phospholipids rather than triglycerides [16]. Sampalis et al. reported that dysmenorrhea and the emotional symptoms of premenstrual syndrome were reduced by krill oil—indicating its higher efficacy for management of premenstrual symptoms compared with omega-3 fish oil. In contrast to the findings of the present study, they found that administration of omega-3 fatty acids was not effective at reducing NSAID rescue dose consumption among women with primary dysmenorrhea.

Finally, Wu et al. [17] showed that supplementation did not alter the levels of arachidonic acid, but the conversion of linoleic acid to dihomo- γ -linolenic acid (a precursor of prostaglandin E_1) was slower in the group with dysmenorrhea—thus triggering inflammation and dysmenorrheal symptoms. Management of dysmenorrhea with nutrition modulation may be an alternative treatment owing to the lack of associated adverse effects.

The results of the present study indicate that dietary supplementation with omega-3 fatty acids can lead to noticeable pain reduction among young women with primary dysmenorrhea. Furthermore, the use of omega-3 fatty acids reduced the rescue dose of ibuprofen required to control extreme menstrual pain. One potential limitation of the present study was the short washout period (1 week). A follow-up study that employs a longer washout period should, therefore, be conducted to fully assess the effects of omega-3 fatty acids. Nevertheless, the use of omega-3 fatty acids could potentially offer an alternative to NSAIDs for the safe and effective treatment of women experiencing dysmenorrheal symptoms.

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Conflict of interest

The authors have no conflicts of interest.

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