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Research paper

The effect of peppermint (*Mentha piperita*) capsules on the severity of primary dysmenorrhea

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ABSTRACT

Background and objectives: Primary dysmenorrhea refers to painful menstrual cramps without an organic cause and is one of the most common problems for women during reproductive ages. Given the high prevalence of primary dysmenorrhea and its undesirable effects on the quality of life, and also given the evidence on the analgesic properties of peppermint capsules, the present study was conducted to investigate the effect of these capsules on the severity of primary dysmenorrhea in female students living in the dormitories of North Khorasan University of Shirvan, Iran in 2014–2015.

Materials and method: This double-blind clinical trial was conducted on 102 eligible female students (aged 18–25) living in the dormitories of North Khorasan University of Shirvan from August 2014 to February 2015. The study subjects were initially matched in terms of the reported severity of primary dysmenorrhea and then divided into a peppermint capsule group (46 students) and a placebo group (44 students). The treatment group received three 330 mg peppermint capsules per day, and the placebo group received three identical placebo capsules containing starch, which were taken from the first to the third day of their menstrual cycle with identical administrations. The severity of pain was measured and compared before the intervention and over two successive cycles based on a visual analogue scale (0–10 cm). The data obtained was analyzed in SPSS-17 using the independent *t*-test and the ANOVA at the significance level of $P < 0.05$.

Results: No significant differences were observed between the two groups in the mean duration and severity of pain before the intervention. After the intervention, a significant difference was observed between the groups in the severity of pain ($P < 0.05$), but no significant differences were observed in the duration of pain.

Discussion: Peppermint capsules appear to be capable of reducing the severity of primary dysmenorrhea through certain analgesic mechanisms. Further studies are recommended to be conducted in order to confirm the use of peppermint in the relief of primary dysmenorrhea.

1. Introduction

Dysmenorrhea or painful menstruation is among the most common gynecological complaints in women, which tends to be a crampy pain in the lower abdomen. It is occasionally manifested as pain in the groin or as backache (Fritz and Speroff, 2011). Dysmenorrhea is generally divided into a primary and a secondary type. No particular problems have been proposed to explain the incidence of primary dysmenorrhea. In primary dysmenorrhea, the pain tends to occur a few hours before or just after the onset of menstruation and lasts between 48 and 72 h. It often entails concomitant nausea and vomiting, diarrhea and headache and also syncope on rare occasions(Jolin and Rapkin, 2007). Secondary dysmenorrhea refers to menstrual pain that is caused by a disorder in the woman's reproductive organs, such as endometriosis, adenomyosis, uterine fibroids, or infection (Novak and Berek, 2007).

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Primary dysmenorrhea often occurs one to two years after the first menstruation, when ovulation has been established (Doty and Attaran, 2006). In general, the prevalence of dysmenorrhea is affected by social status, occupation and age (Granot et al., 2001)

The current evidence suggests that the prevalence of dysmenorrhea has been increasing in recent decades due to environmental and genetic factors. The socioeconomic status such as religion, average gross monthly income, education level, place of residence and length of stay are examples of significant environmental factors contributing to the intensity of dysmenorrhea (Jang et al., 2013) The prevalence of dysmenorrhea is currently reported to be between 50% and 90% in different societies and between 74% and 86.1% in Iran (Esmaeilzadeh and Mojab, 2014). Despite global medical advances, dysmenorrhea is still considered a common cause of absenteeism from work and the overall reduced quality of life in young women across the world (Van Andel et al., 2014), such that it causes 1–3 days of absence from work or school each month through its debilitating effects (Alhusen et al., 2012; Wong et al., 2010). In the United States, 600 million working hours and 2 billion dollars are lost annually if dysmenorrhea is not properly treated (Abbasi et al., 2008). Due to its effects on productivity across society, dysmenorrhea is no longer a women's problem only −rather a national one (Hsu et al., 2006).

Reduced progesterone levels at the end of the luteal phase activate lytic enzymes and produce arachidonic acid and activate the cyclooxygenase pathway (COX) and increase prostaglandin levels (PGE2α and PGF2α)(Novak and Berek, 2007). The condition is generally caused by the increased levels of cytokines and thus production of prostaglandins by interleukins in response to dropped progesterone levels(Jolin and Rapkin, 2007). The release of these substances into the blood stream causes severe uterine myometrial contraction and uterine ischemia and subsequently causes the pain to spread (Chen et al., 2014).

A variety of medical and nutritional methods exist today for the treatment and control of primary dysmenorrhea, including more conventional treatments such as prostaglandin inhibiting drugs and oral contraceptives (French, 2005). The most common side-effects of prostaglandin inhibitors include mild digestive problems such as nausea, dyspepsia, and vomiting, and in more severe cases, renal problems, stomach ulcer, dizziness and ear tinnitus, headache and hepatic complications(Lorensen et al., 2004).

As a result, patients often seek alternative methods of treatment (Chen et al., 2014). Herbal medicines have a long history of use for the treatment of several women's diseases, such as premenstrual syndrome, irregular menstruation and menstrual cramps (Jing et al., 2009). One of the herbs traditionally used in the treatment of menstrual disorders is peppermint. With the scientific name of "*Mentha Piperita*", peppermint is from the Lamiaceae or Labiatae family and is indigenous to Europe, Asia and North America. Peppermint is a first-rate medicinal herb with extensive uses in the pharmaceutical, food and health industries. Peppermint leaf extract contains a number of chemical compounds including 15–20% Menthone, 2–7% Menthyl acetate and 35–45% Menthol to which its medicinal properties are often attributed (Van Wyk and Wink, 2004; Pizzorno and Murray, 2012). It also contains compounds such as caffeic, chlorogenic and rosmarinic acid as well as several flavonoids such as rutin, hesperidin and luteolin, and related tannins which along with menthol contribute to its antibacterial and antiviral properties and antioxidant activities (Sparks et al., 1995).A daily dose of 3–6 g extract (mean of 5 g) is recommended (Fleming, 2009).

Peppermint inhibits spasmodic activity on smooth muscles. This property is attributed to the menthol component and the antagonistic effects against calcium (Pizzorno and Murray, 2012). The menthol component of peppermint also affects the Kappa Opioid receptors, leading to reduced sensations of pain (Brown, 2003; Fluke, 2000). In addition, it has its own cell membrane receptor, through which it reduces cellular inflow in resting positions and increases the stimulation threshold of the cells. Menthol reduces synaptic stimulation and transmission, thus reducing pain (Han et al., 2006; Okazawa et al., 2000). Peppermint extract has an inhibitory effect on the contractile activity of myometrium through inhibition of prostaglandin (PGF2α) and oxytocin, blocks calcium channels and has antispasmodic effects on smooth muscles (Soares et al., 2005; Hamthorn et al., 1988). Menthol also prevents IL-β1 production and histamine secretion (Sparks et al., 1995). Peppermint extract, which contains a large amount of menthol, reduces pain transmission through the peripheral and/or central nervous system (Beesley et al., 1996), and when rubbed on the skin, it stimulates the cold receptors and thus reduces pain transmission (Unsal et al., 2010).

Studies have demonstrated that, similar to acetaminophen a conventional pain reliever, peppermint compounds are effective in reducing headache and relieving the source of pain through modifying receptor sensitivities (Ozgoli et al., 2013). Compounds containing peppermint have no severe side-effects or known drug interactions (Nazar and Usmanghani, 2006).

In view of the properties of peppermint outlined above, the prevalence of dysmenorrhea in the young population of Iran, the non-invasiveness of the treatment and the lack of studies conducted on the effect of peppermint extract on primary dysmenorrhea, the present study was conducted to determine the effect of peppermint capsules on the severity of primary dysmenorrhea in female students living in the dormitories of North Khorasan University of Shirvan, Iran in 2014–2015.

2. Materials and methods

A double-blind placebo controlled clinical trial was conducted from August 2014 to February 2015 on 250 young, female students living in the dormitories of North Khorasan University of Shirvan who were initially identified with primary dysmenorrhea of which 102 students met the inclusion criteria (Fig. 1). The students were included if they were 18–26 years of age and single; had experienced menstrual pain in the first 3 days of bleeding for 3 consecutive periods over the last 6 months; were classified as having primary dysmenorrhea with moderate to severe pain according to the McGill pain index; experienced regular menstruation cycles with 21–35 days intervals; had a BMI in the normal range of 19.8–26 and self-reported to have no symptoms such as burning sensations, itching or abnormal discharge during the study. The students were excluded if they were professional athletes or if they had a chronic disorder such as diabetes, hypertension, cardiovascular disorder, hepatic or renal disorder, infectious disease or epilepsy or were taking or had taken any herbal medications or supplements in the 3 months preceding the intervention, or were taking any special medications. Students were also excluded from the study if they failed to give their consent for trial participation, they did not follow the treatment protocol, took any other herbal medications during the study or were discovered to have a pelvic pathology (myoma, pelvic tumor or endometriosis) in the personal follow-ups.

2.1. Study design

Sample size was determined as 82 based on similar studies conducted and at a 90% confidence level and an 80% test power and based on a comparison of means between the two groups. Taking into account a withdrawal rate of 20%, sample size was estimated at 102 patients (51 cases for each group). Students were first briefed about the study objectives and methods and then asked to