

Influence of Curcumin and Ginger in Primary Dysmenorrhea: A Review

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Abstract

Menstruation is a cycle of oocyte release and preparing uterus for possible pregnancy if fertilization occurs. It begins at puberty and ends at menopause with an average duration of 28 days. Primary menstrual pain is a problem for women throughout the world that can affect daily life. The objective of this paper is to analyze through literature regarding primary dysmenorrhea and natural herbal used to relieve the pain. Data from previous research show that curcumin and ginger are the best candidates for relieving primary menstrual pain.

Keywords: Dysmenorrhea, Curcumin, Ginger, Tamarind

INTRODUCTION

Female menstrual cycle happens to allow ovum released from the follicle and to prepare the uterus for possible pregnancy. It starts at puberty, between the ages 10-16, and ends at menopause around 51. One menstrual cycle usually occurs from 21 days to 35 days, with an average length of 28 days [1]. Menstrual pain (dysmenorrhea) is cramping from the uterus that occurs during menstruation [2]. There are two types of dysmenorrhea: primary and secondary [3]. Primary dysmenorrhea is menstrual pain that occurs in the absence of gynecological disease. It usually starts from the sixth to twelve months after menarche (first menstruation) and it is possible to continue until menopause [4]. Primary dysmenorrhea usually begins around the beginning of menstruation and continue for 8 to 72 hours [5]. Secondary dysmenorrhea probably occurs at any time between the menarche and menopause phases. Usually, it happens after the age of 25 years due to gynecological pathologies such as endometriosis and ovarian cysts.

The prevalence of primary dysmenorrhea is widespread throughout the world. More than 50% of menstrual women around the globe are reported suffering dysmenorrhea, with 10-20% of them having severe pain. It affects their activities because they cannot work or do other activities for 1-3 days [4, 6]. In Indonesia, about 54,8% of females having primary dysmenorrhea, and 9,36% having secondary dysmenorrhea [7]. The symptom of dysmenorrhea can include premenstrual symptoms, mood swings, stomach cramps, headaches, backaches, nausea, and vomiting [6, 8].

Various attempts were made to alleviate the pain of primary dysmenorrhea. Non-pharmacological efforts were also carried

out including hot water bottles [9], exercise [9-13], acupuncture [14], yoga [15], physiotherapy [12, 16], using fruits [17], and herbs [18-22]. This review is focused on exploring the benefits and how effective the curcumin and ginger as herbal medicine to relieve the pain during menstruation based on literature review.

What Happens in the Female Body during Menstruation?

Menstruation is a cycle of degeneration of the uterine lining as a response to interaction among hormones produced by the hypothalamus, pituitary, and ovaries. The length of the menstrual cycle is the number of days between the first day of menstruation from one cycle to the first day of menstruation in the next cycle. The average duration of a normal menstrual cycle is between 25-30 days [23].

Menstruation cycles can be divided into two phases [1, 23 - 25]: (1) follicular or proliferative phase, and (2) Luteal or secretory phase.

(1) Follicular Phase

The follicular phase starts from the first day of menstruation to ovulation. In this phase, estrogen levels in the blood increase by upregulation of receptor FSH (Follicle Stimulating Hormone). It affects the endometrium to rebuild and generate a new functional layer. The purpose of this phase is to increase the uterine endometrium layer. Besides, this step is also critical for creating an environment that is friendly and beneficial to potential incoming sperm. When this new layer grows bigger, its glands expand, and its spiral arteries increase in number. A primordial follicle starts to develop during this process to form a Graafian follicle that sets up for ovulation. Once the Graafian follicle is mature, the surrounding follicle begins to degenerate.

Ovulation, which takes less than five minutes, occurs in the ovary in response to the release of LH (Luteinizing Hormone) from the anterior pituitary gland at the end of the proliferative stage. In this ovulation, the mature follicle releases the ovum. The ovum will then travel to the uterus where fertilization will take place.

(2) Fase Luteal (Sekretori)

This phase usually occurs for 14 days. During this phase, LH-stimulated progesterone is the dominant hormone in preparing the corpus luteum and endometrium for possible fertilized ovum implantation. The corpus luteum is the transformation

of the follicles that have released the ovum.

Increasing progesterone levels from the corpus luteum cause the spiral arteries to develop and transform the functional layer into a secretory mucosa. The endometrial glands enlarge, coil, and begin to release nutrients into the uterine cavity that will support the growth of the embryo until it has been implanted into the endometrial lining that is rich in blood. When progesterone rises, cervical mucus thickens and blocks the entry of sperm and pathogens or other foreign material. Increasing levels of progesterone (and estrogen) inhibit the release of LH by the anterior pituitary.

If fertilization does not occur, the corpus luteum shrinks and signifies the end of the secretory phase as LH blood levels decreased. Estrogen and progesterone levels decrease, making the uterine lining eventually detached. The spiral arteries constrict one final last time and then suddenly relax and open wide. The detached tissue and blood pass out through the vagina called menstruation. This menstrual period usually occurs from zero to the fifth day. The follicular phase begins again to continue the process of the menstrual cycle.

What is Primary Dysmenorrhea?

Primary dysmenorrhea is characterized by lower abdominal cramps that can spread to the lower back and anterior or inner thighs. The painful cramps usually start a few hours before or during the early menstruation period and gradually decrease for two to three days. Sometimes, the cramps accompanied by nausea, vomiting, and diarrhea [6]. Some risk factors associated with primary menstrual pain are menarche at an early age, family history with menstrual pain, abnormal body mass index, the habit of eating fast food, menstruation duration, cigarette, coffee consumption, and psychological symptoms such as depression and anxiety [6, 7].

The etiology of primary dysmenorrhea is not yet fully understood. An imbalance of hormone-like prostaglandins probably causes the symptoms, thereby increasing uterine contractions that cause menstrual pain [21, 26]. Prostaglandins are lipid autacoids derived from arachidonic acid that sustain homeostatic function and mediate pathogenic mechanisms, including the inflammatory response [27]. They are derived from arachidonic acid in the cyclooxygenase (COX) and lipoxygenase (LOX) pathways [27, 28]. Prostaglandins help the uterus to contract and relax so that the thick layer formed at the luteal phase is released from the uterus. High levels of prostaglandins can cause stronger uterine contractions, and around 80% of patients can relieve the pain by using an inhibitor of prostaglandins. Research has shown that menstrual blood in women with primary dysmenorrhea has more PG - PGE₂ and PGF₂α. Pain arises from myometrial contractions caused by PG (especially PGF₂α) originating from the secretory endometrium [28].

In addition, the existence of strong and longer duration of contractions in the uterine and the widening of the uterine during menstruation also causes primary dysmenorrhea [7]. The lack of research in dysmenorrhea might be due to it is considered common and naturally occurred in women. Primary dysmenorrhea indicates that the pain is significant in

chronic pain conditions that further research to relieve menstrual pain is needed.

Curcumin and Their Benefits to Reduce the Menstrual Pain

Research on the effect of curcumin on menstrual pain has been carried out [29–35]. Research conducted in Indonesia mostly uses herbal medicine, which is processed using the main ingredients of curcumin and tamarind. This herbal medicine is believed to reduce primary dysmenorrhea. Several related studies also prove the effectiveness of herbal medicine. Curcumin has active ingredients that have function as antioxidants, anti-inflammatories, and analgesics [21, 36, 37]. Tamarind has active ingredients such antioxidants, anti-inflammatory, antipyretic, and tranquilizers [21]. The effectiveness of herbal medicine has been proven by using statistical methods. All studies concluded that herbal medicine is very effective in reducing the level of pain of primary dysmenorrhea, and they recommend drinking herbal medicine before and during menstruation.

Research conducted by Khayat et al. found that curcumin can also reduce the symptoms caused before menstruation and there are no temporary effects [38]. Besides anti-inflammatory drugs, curcumin can also be used as an alternative to antidepressant drugs.

A comparison of effectiveness among curcumin and other herbs was also carried out. Dyawapur et al. compared between cinnamon tea and curcumin. The study results that both cinnamon tea and curcumin have a significant effect on reducing menstrual pain [39]. Annugrahayyu et al. conducted the effectiveness study between soy drinks and curcumin tamarind. The results indicate that curcumin tamarind reduces more menstrual pain than soy drinks [34]. Sugiharti et al. also compared the effectiveness of curcumin tamarind with ginger tamarind. They found that both were effective in reducing the level of menstrual pain, but curcumin tamarind was slightly more effective in reducing primary menstrual pain [31].

Besides for relieving menstrual pain, curcumin has many benefits. Research shows that curcumin helps in the oxidative and inflammatory conditions, metabolic syndrome, arthritis, anxiety, hyperlipidemia, improves recovery due to inflammation and muscle pain caused by exercise, and can provide other health benefits [36]. Research on the effects of curcumin on tumor growth has also been conducted, and it was found that curcumin inhibits the process of angiogenesis and metastasis on tumor growth [37].

Ginger and Their Benefits to Reduce the Menstrual Pain

Ginger has been widely used as medicine in traditional Chinese medicine for more than 2500 years as an anti-inflammatory in musculoskeletal disorders [40]. Two components in ginger, [6]-Gingerol and Gingerdiones, are potential inhibitors of prostaglandins by blocking the cyclooxygenase (COX) pathway [40, 41]. In fact, the treatment of primary dysmenorrhea using ginger has been recorded in the book *The Canon of Medicine*, written by Ibn

Sina [42]. Several studies have been conducted regarding the effectiveness of ginger to relieve primary dysmenorrhea [17, 31, 42 – 51]. All research found that effectiveness of ginger on reducing primary dysmenorrhea.

Research conducted by Sugiharti et al. [31] and Kostania et al. [52] compared the effectiveness of ginger and curcumin tamarind to relieve primary dysmenorrhea. With the different results of the study, Sugiharti et al. found that curcumin tamarind drinks were more effective in reducing primary dysmenorrhea. In contrast, Kostania et al. found that ginger was more effective.

Ozgoli et al. showed that ginger has an anti-prostaglandin effect that is almost the same as mefenamic acid and ibuprofen, and gingerol is probably an active ingredient for anti-prostaglandins [42]. Besides, the dose must be less than 6 grams to be given on an empty stomach. Research by Rahnama et al. suggested drinking ginger extract from 3 days before and during menstruation [46]. Meanwhile, Rad et al. compared the effects of ginger and Novafen to relieve primary dysmenorrhea. This study recommended choosing ginger as a pain reliever, although it has almost the same effect, natural herbs are safer to consume [47].

CONCLUSION

Based on data from various research relating to natural ingredients used in relieving primary menstrual pain, it was found that curcumin extract, which is usually mixed with tamarind and ginger is very effective in relieving primary menstrual pain. Several studies mention that menstrual pain caused by prostaglandin levels. Based on the literature, curcumin and ginger have an anti-inflammatory and anti-prostaglandins effect of relieving primary menstrual pain. However, further research is needed to explore the etiology of primary dysmenorrhea more comprehensively. In addition, the mechanism of ginger and curcumin for relieving primary menstrual pain also needs to be explored.

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