



Complementary Therapies and Factors Related to Dysmenorrhoea in Adolescents: A Bibliometric Analysis

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Abstract

Complementary therapies for decreasing *dysmenorrhoea* and factors behind *dysmenorrhoea* in adolescents is not clear enough. Researchers need information about trends and novelties for the future research topic of complementary therapies and factors related to *dysmenorrhoea* in adolescents. Thus, the purpose of this study was to identify the complementary therapies for decreasing *dysmenorrhoea* and factors related to *dysmenorrhoea* in adolescents by analysing network visualisation, overlay visualisation and density visualisation on the topic through bibliometric analysis. The data sources used in this study were based on online searches via <https://app.dimensions.ai/>. The literature search used the stages following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart. Paper restricted in publications years 2014-2023, focus in the field of health sciences, nursing, public health, clinical sciences and publication type were included as criteria for inclusion in the study. The data were analysed using *VOSviewer*. After identifying the clusters, the types of complementary therapies that were able to reduce *dysmenorrhoea* were acupressure, acupuncture, calcium sufficiency, curcumin, yoga, aromatherapy, massage and physical activity. Moreover, factors related to *dysmenorrhoea* were HIV, reproductive coercion, reproductive health, oxytocin, prolactin, trauma, metformin, anxiety and breast cancer. Moreover, the newest topics that were being widely researched related to adolescent *dysmenorrhoea* were education, non-suicidal self-injury (NSSI), prolactin and physical activity. On the other hand, topics that were rarely researched related to the topic of adolescent *dysmenorrhoea* were topics about sexual health, reproductive coercion, inflammation, curcumin and physical activity. Complementary therapies and factors that are still rarely studied offer potential novelty in results in future studies.

Key words: *Dysmenorrhoea*; Factors; Complementary therapy; Adolescent.

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Introduction

Female adolescents are populations that experience various changes in hormonal, physical, cognitive and emotional maturity as well as social status in society.¹⁻⁴ This change can be identified from the responsibilities they will face in society and their new roles.⁵ Physical changes are another

issue that occurs in the adolescent population. These physical changes include enlarged hips and breasts, increased height and weight, hair beginning to grow in the armpit and pubic area and menstruation.⁶

Menstruation is a hallmark of puberty signs in adolescents. Generally, menstruation occurs regularly every month.^{1,7} Most prominent complaint during menstruation or even before menstruation is pain.^{8,9} World Health Organization found that 1,769,425 (90 %) of women experience *dysmenorrhoea* with 10-15 % experiencing heavy *dysmenorrhoea*.¹⁰ The pain they experience can occur in 3-7 days, depending on personal conditions. If this problem is not controlled, discomfort and anxiety will happen.^{11,12}

The studies showed that complementary therapy such as progressive muscle relaxation therapy (PMRT) can reduce *dysmenorrhoea*.^{2,13,14} In another study endorphin massage therapy (EMT) was also able to reduce *dysmenorrhoea*.^{13,15,16} Researchers who focused on complementary therapies with natural ingredients state that various natural ingredients such as ginger, turmeric, cinnamon and bay leaves can reduce *dysmenorrhoea* if processed way appropriately.¹⁷⁻¹⁹

Apart from being a therapy, the factors related to *dysmenorrhoea* are essential to identify the impact of interventions in therapy. From the data, the factor that can influence the occurrence of *dysmenorrhoea* is anxiety.^{11,12,20} Moreover, other studies mention that *dysmenorrhoea* is influenced by reproductive health and hormonal status.^{21,22} The hormone that has the most influence on *dysmenorrhoea* is the prolactin.²³⁻²⁵

Interest in research on the topic of complementary therapies for decreasing *dysmenorrhoea* and the factor behind *dysmenorrhoea* in adolescents is not clear enough. In future studies, researchers need information about trends and novelties for the future research topic of complementary therapies and factors related to *dysmenorrhoea* in adolescents. This is a problem that arises among researchers currently. The results of bibliometric analyses may guide future studies by determining the quality and main research areas of existing publications in specific fields. Moreover, the bibliometric analysis enables researchers to easily obtain information about subjects of interest from among numerous and increasing number of published articles.

There are five types of study metrics for data analysis, namely: scientometrics, bibliometrics, cybermetrics, informetrics and altmetrics.²⁶ Bibliometric analysis is more suitable for quantitatively analysing the distribution of research papers, terms

and keywords in determining research trends.²⁷ In addition, bibliometric analysis is a research method used in library and information science to evaluate research performance.²⁸ Bibliometric analysis is essential in assessing research impact where studies are ranked based on the citations received.²⁹

There is no bibliometric analysis on the publication of research topics on complementary therapies for decreasing *dysmenorrhoea* in adolescents. Thus, the purpose of the study was to identify the complementary therapies for decreasing *dysmenorrhoea* and factors related to *dysmenorrhoea* in adolescents by analysing network visualisation, overlay visualisation and density visualisation on the topic through bibliometric analysis.

Methods

Data sources

The data sources used in this study were based on online searches via <https://app.dimensions.ai/>. The literature search used the stages following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart.³⁰ Paper were restricted in publications years 2014-2023, focus was in the field of health sciences, nursing, public health, clinical sciences and publication type of article.

Selecting data

The stages in PRISMA included identification, screening and including as shown in Figure 1. Stage 1 (identification) detected 49,652 records from dimensions.ai, taking into account, each of the main search terms (complementary therapy AND decreasing *dysmenorrhoea* AND adolescent), "article and proceeding document type" and all published data in the data range from 2014 to 2023. In stage 2 (screening), the option "article title, abstract" was selected in the field of each search term, resulting in biomedical sciences, clinical sciences, health sciences, reproductive medicine, neurosciences, health service and systems, public health articles being excluded. In phase 3 (included), the final paper yielded 1,877 articles.

Data analysis

Data were analysed using *VOSviewer*. *VOSviewer* is a computer program for creating and viewing bibliometric maps.³¹ The type of analysis was

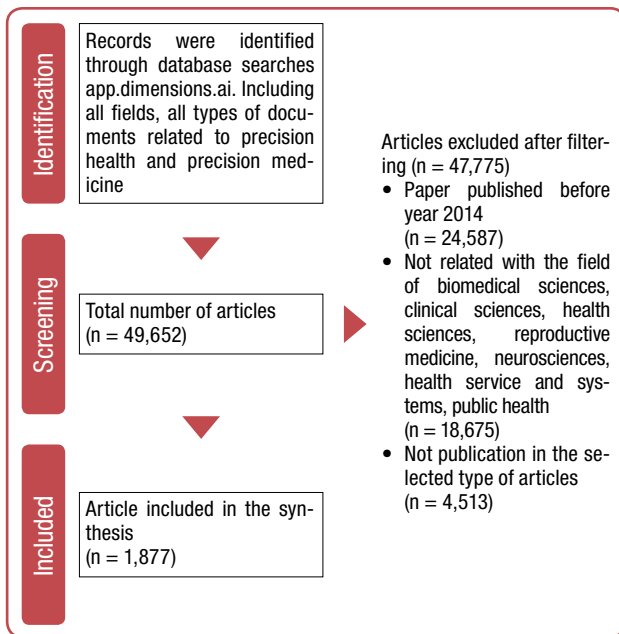


Figure 1: PRISMA Flowchart

selected to create a map based on text data. In this study, the analysis was reviewed by co-occurrence and co-authors.

The procedure for co-occurrence analysis went through the following stages: the data source was

selected, data were read from references manager files. Fields were chosen, fields were selected from which title and abstract was extracted. The counting method selected was full counting. The minimum number of occurrences of a term 10 was selected as a threshold. The number of selected terms was 133.

The procedure for co-author analysis went through the following stages: the type of data was chosen, a map based on bibliographic data was created. An option to create a co-authorship map based on bibliographic data was chosen. Data source was chosen, data from reference manager files were read. Supported file type was: ris. The type of analysis and counting method was chosen: the type of analysis was co-authorship and the counting method was full counting. Threshold was chosen: the maximum number of documents of an author was 2. Out of the 2,624 authors, 49 met the threshold. The author was chosen: for each of the 49 authors, the total strength of the co-authorship links with other authors was calculated. The authors with the greatest total link strength were selected. The number of authors selected was 49.

Results

From the network visualisation (Figure 2), it was identified that there were 151 items divided into 7 clusters with several links 3,740 with a total link strength of 28,710. After identifying the clusters,

the types of complementary therapies that were able to reduce *dysmenorrhoea* were: acupressure, acupuncture, calcium, curcumin, yoga, aromatherapy, massage and physical activity.

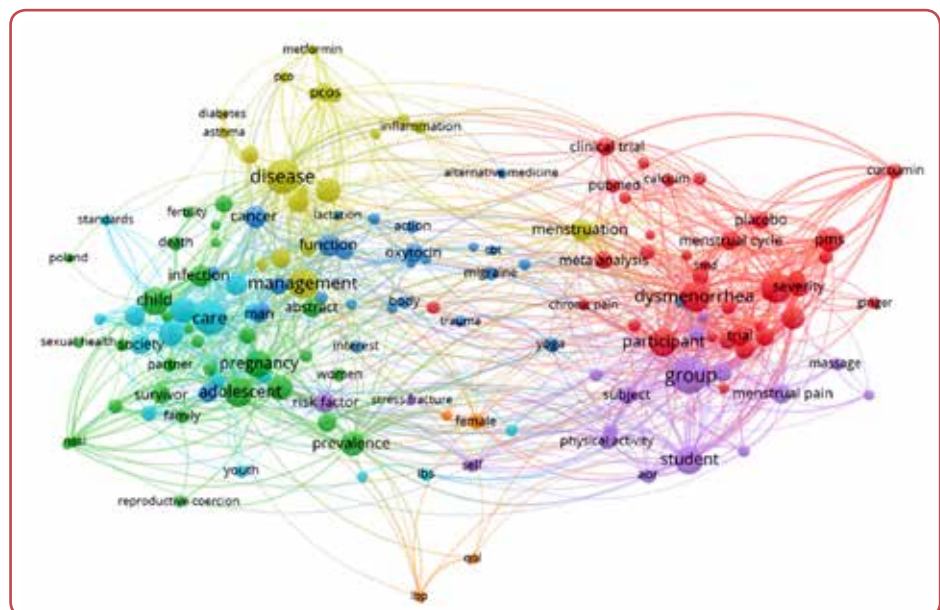


Figure 2: Network visualisation

Moreover, factors related to *dysmenorrhoea* were: HIV, reproductive coercion, reproductive health, oxytocin, prolactin, trauma, metformin, anxiety and breast cancer.

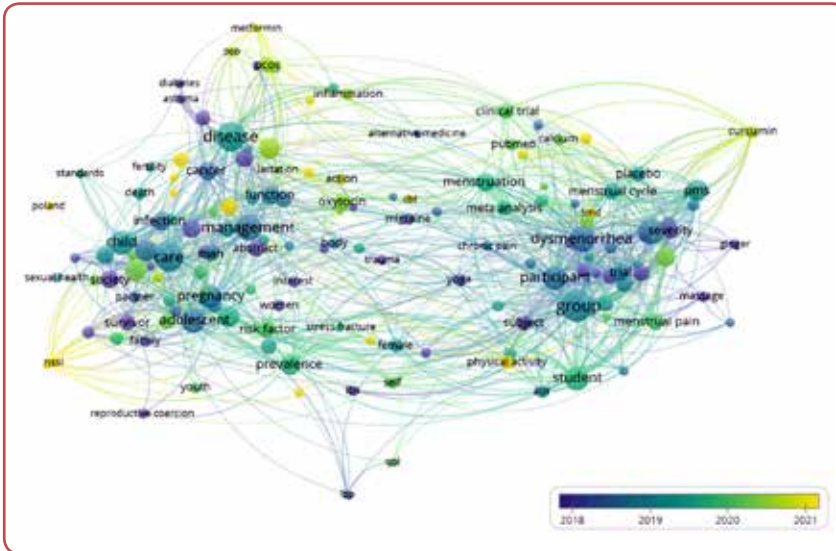


Figure 3: Overlay visualisation

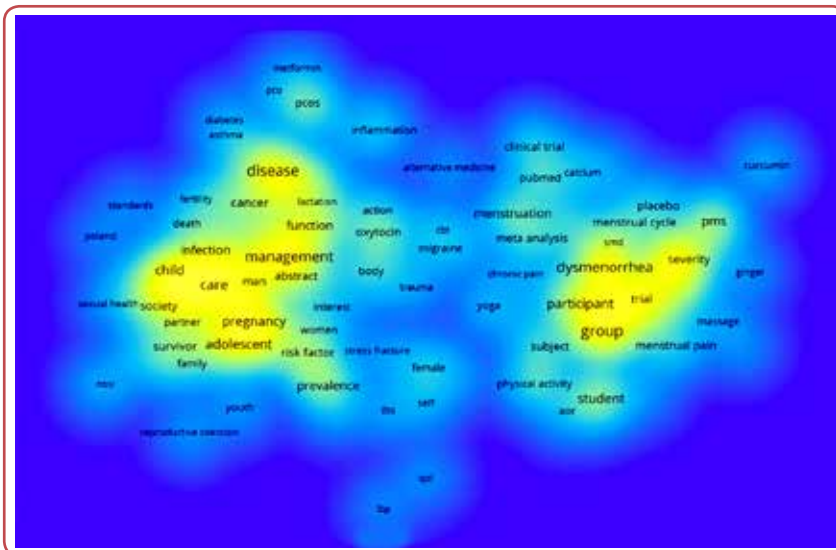


Figure 4: Density visualisation

From the overlay visualisation (Figure 3), it was indicated that the newest topics that were being widely researched related to adolescent *dysmenorrhoea* were education, non-suicidal self-injury (NSSI), prolactin and physical activity.

From density visualisation (Figure 4), it was indicated that topics that were rarely researched related to the topic of adolescent *dysmenorrhoea* were topics about sexual health, reproductive coercion, inflammation, curcumin and physical activity.

Discussion

This study focused on identifying complementary therapies that can reduce *dysmenorrhoea* and factors related to *dysmenorrhoea*. The types of complementary therapies that were able to reduce *dysmenorrhoea* were acupressure, acupuncture, calcium sufficiency, curcumin, alternative medicine, yoga, aromatherapy, massage and physical activity.

Complementary therapies

Acupressure

Acupressure is a traditional complementary therapy originating in China. One of the benefits can be used to minimise *dysmenorrhoea* using the fingers by pressing on certain meridian points (acupuncture points). Emphasis on acupressure meridian points can produce endorphins in the body, emphasis is placed on the Hequ/LI4 (located between the base of the thumb and forefinger) directly increasing endorphins so that it will accelerate pain release.³² Endorphins are hormones that reduce pain and also act as a sedative. When the body feels pain and then acupressure therapy is carried out at a certain point, the body will release endorphins which make the body feel calmer.³³

Acupuncture

Acupuncture therapy has been widely used in many countries to treat primary *dysmenorrhoea* (PD).³⁴ Evidence shows that acupuncture can reduce *dysmenorrhoea* and accompanying symptoms by reducing prostaglandin F_{2α} which is specific for *dysmenorrhoea*, relaxing the uterine muscles, increasing blood flow in the uterus, balancing hormones and psychological symptoms. In PD most patients are symptomatic and tend to use drugs such as analgesics, anti-inflammatory steroids, contraceptive drugs and others and current clinical guidelines for treating PD recommend using NSAIDs and stimulation of acupuncture points as therapy complementary alternatives to medical therapy. The use of NSAIDs has side effects, especially on the digestive side while acupuncture therapy is preferred.³⁴

Calcium supplement

Vitamin D has an important role in female reproduction, vitamin D receptors are expressed in ovarian, endometrial, decidual, placental and fallopian tube epithelial cells.³⁵ Based on several studies that have been conducted, it is known that calcium levels are known to decrease in the luteal phase in response to changes in oestradiol levels. Women who consumed three to four servings of dairy products a day were found to have a lower risk of developing *dysmenorrhoea* compared to those who did not consume dairy products.³⁶ To reduce pain in PD, calcium consumption is needed around 800 - 1,000 mg. The percentage of absorption at the time of calcium consumption depends on the total amount of elemental calcium consumed at one time and the absorption of the

highest amount of calcium consumption at a dose of about 500 mg. With an increase in the amount of calcium intake consumed, the effectiveness of calcium absorption will decrease. So, if someone is taking 1,000 mg/day of calcium from a supplement, they can split the dose and take 500 mg in two separate doses over time, by taking 250–500 mg every 4 h in pain.¹⁰

Curcumin

Curcumin can work as an analgesic which could inhibit excessive prostaglandin release through the uterine epithelial tissue and inhibit uterine contractions so that it could reduce pain during menstruation.³⁷ The mechanism of inhibition of uterine contractions through curcumin is by reducing the influx of calcium ions (Ca²⁺) into the calcium channels of the uterine epithelial cells. Curcumenol as an analgesic agent will inhibit the excessive release of prostaglandins through the uterine epithelial tissue and will inhibit uterine contractions thereby reducing the occurrence of *dysmenorrhoea*. It was found that the *dysmenorrhoea* pain scale after being given turmeric water (*Curcuma longa*) was increased with an average score of 1.93.³⁸

Yoga

One of the non-pharmacological therapies to reduce *dysmenorrhoea* was yoga. Yoga is a relaxation technique that teaches a set of techniques such as breathing, meditation and body positions to increase strength and balance. Relaxation techniques in yoga can stimulate the body to release endogenous opioids, namely endorphins and enkephalins (compounds that function to inhibit pain). Endorphins are produced in the brain and spinal cord. This hormone can function as a natural sedative that is produced by the brain, causing a feeling of comfort.³⁹ There have been many studies on the effectiveness of yoga in reducing *dysmenorrhoea* and it was found that yoga can be used as an effective complementary therapies in reducing *dysmenorrhoea* in women with PD.⁴⁰

Aromatherapy

The principal effect of aromatherapy is to stimulate the *hypothalamus*. The *hypothalamus* is a gland in the brain that controls the hormone system and regulates important bodily functions such as sleep and emotional response. After reaching the *hypothalamus*, the scent stimulus travels through the limbic system and into the *hippocampus*, which is a part of the brain important

for memory. This not only helps the individual associate certain scents with certain memories, but this is also what allows the body to react to the aromas from the aromatherapy. When the aroma is inhaled, the molecules of the aromatherapy oil are carried to the receptor cells in the nose, when these molecules attach to the fine hairs of the nose, an electrochemical message occurs which is transmitted through the olfactory tract to the brain and continues to the olfactory system. The electrochemical messages will stimulate the *hypothalamus* to release the hormone serotonin and endorphin hormones, where the function of the serotonin hormone is to improve mood while the endorphin hormone is a natural pain reliever and produces feelings of relaxation, calm and joy.⁴¹ Aromatherapy that is commonly used to reduce *dysmenorrhoea* is the aroma of shallots, olive oil, *Citrus Hystrix*, *Jasminum officinale*, *Mentha Piperita*, orange, rose, *Nigella Sativa* and ginger.⁴²

Massage

Massage can be a choice in the medical world that has a positive effect in reducing the level of muscle fatigue and pain relief and also as a tool to improve the level of human health both physically and psychologically.⁴³ Through massage, the process of expelling burnt residue (lactic acid) into the bloodstream is accelerated, so recovery is also faster.⁴⁴

Physical activity

Studies on the relationship of physical activity with a decrease in pain, especially *dysmenorrhoea* began to be done a lot.⁴⁵ The results of the study show that physically active individuals have a higher tolerance for pain and do not experience as much chronic pain as those who are sedentary. Individuals who engage in physical activity are associated with releasing endorphins, having better blood flow, lower inflammation and better heart health. This can result in the ability to endure more pain.⁴⁶

Factors related to *dysmenorrhoea*

HIV

Adolescents experience menstrual cycle irregularities at certain times. Complaints such as irregular menstruation or changes in menstrual flow and worsening of premenstrual symptoms, sometimes indicate an underlying health problem. Most of the menstrual changes reported by women living with HIV do not appear to be directly related to the virus.⁴⁷ There is evidence

to suggest that women living with HIV are more likely to experience the absence of menstruation (*amenorrhoea*). Further analysis of international studies conducted from 1996 to 2010 in nearly 9,000 women found that there is a significant association between HIV status and *amenorrhoea*. Women living with HIV have a 70 % chance of having *amenorrhoea* for more than three months.⁴⁸

The association of *amenorrhoea* with HIV was first detected in 1988 when it was noted as an initial complaint in 26 % of newly diagnosed seropositive Ugandan women. Since then many reports of this problem have been reported which may be due to low BMI, chronic stress state, immune dysfunction or from comorbidities. Besides *amenorrhoea*, other mechanisms such as hyperprolactinaemia, polycystic ovary syndrome and premature ovarian failure have also been suggested as a cause of some of the menstrual disorders seen in HIV.⁴⁸

The cause is still being debated. It remains unclear whether *amenorrhoea* is a complication of HIV infection itself or due to other risk factors that are more common in women with HIV, such as low body weight, immunosuppression or a combination of risk factors.

Reproductive coercion

Puberty is marked by the first discharge of menstrual blood (*menarche*) experienced by women, which is a characteristic of the maturity of a healthy, non-pregnant woman. *Menarche* occurs due to increased follicle stimulating hormone (FSH) and luteinising hormone (LH) which can stimulate ovarian target cells. FSH and LH combine with FSH and LH receptors which will further increase the rate of cell secretion, growth and proliferation.⁴⁹ Oestrogen and progesterone hormones will stimulate the uterus and breast glands to be competent to allow ovulation to occur.⁴⁷ *Dysmenorrhoea* was found in 58.8 % of all women. The mean age and age at *menarche* were younger in women with *dysmenorrhoea*. In that study, it was found that the risk of *dysmenorrhoea* occurred 0.97 times lower with age, meaning that the risk of *dysmenorrhoea* was higher in women with a younger age of *menarche* and age of *menarche* affected the incidence of *dysmenorrhoea*.⁵⁰

Reproduction health

Reproductive health is a healthy condition psychologically, socially and physically related to the functions and processes of reproduction. Every

individual must be responsible for maintaining and protecting their reproductive organs, both men and women, especially women who experience menstrual periods because the intimate organs are very susceptible to exposure to bacteria. One of the reproductive health problems in women, especially teenagers during menstruation is *dysmenorrhoea*, the sensation of pain due to contractions of the uterine muscles in every woman is different, this *dysmenorrhoea* condition sometimes disturbs adolescents psychologically due to the uncomfortable sensation of pain felt so that it disrupts activities and quality of life in adolescents.⁵⁰

Oxytocin

Oxytocin is a natural hormone that acts as a neurotransmitter in the brain which is produced by the *hypothalamus* and secreted through the pituitary gland. The hormone oxytocin plays an important role in the male and female reproductive systems. In women, one of the functions of the hormone oxytocin is to stimulate uterine contractions during childbirth and stimulate contractions of breast tissue during the lactation process. During menstruation, increased pre-ovulatory oxytocin secretion in the *hypothalamus* and ovaries can increase gonadotropin-releasing hormone secretion and facilitate ovulation.⁵¹

One of the causes of PD is an increase in the hormone prostaglandin produced in the lining of the uterus. During the menstrual phase, prostaglandins increase the myometrial response which stimulates the hormone oxytocin, where the hormone oxytocin also has the property of increasing uterine contractions. These uterine contractions can cause complaints of pain. In women who are not pregnant or breastfeeding and have high levels of the hormone oxytocin, it will make uterine contractions more active and cause an increase in uterine muscle mass (hypertrophy), so women with high levels of oxytocin experience *dysmenorrhoea* compared to women who have low oxytocin.⁵²

Prolactin

Prolactin hormone is a hormone produced in the pituitary gland, uterus, brain, breast, skin, fat layer and immune cells. Prolactin hormone is owned by men and women. The hormone prolactin is controlled by the main hormones, namely dopamine and oestrogen in the production process. Both of these hormones will send messages to the pituitary gland to produce or stop them.⁵³

Dysmenorrhoea usually occurs during the premenstrual phase. This phase is marked by an increase in the hormones prolactin and oestrogen, one of the signs of an increase in the hormone prolactin in the premenstrual phase up to the first day of the menstrual cycle, namely breasts that feel sore and tight. Conditions where prolactin levels are above normal (*hyperprolactinaemia*) cause irregular menstruation and even *amenorrhoea* so the disruption of the hormone prolactin affects the menstrual cycle.⁵⁴

Psychological trauma

PD often occurs in more than 50 % of women and 15 % of them experience severe pain. PD is experienced by 60-75 % of young women. Three-quarters of these suffer *dysmenorrhoea* with mild and moderate intensity, while another quarter experience *dysmenorrhoea* with severe levels.⁵⁵ *Dysmenorrhoea* results in psychological disorders where one of the psychological factors is stress which is a physiological, psychological response from humans who try to adapt and regulate both internal and external pressures. Sustained stress can lead to depression. The stress response of each person is different, namely due to health conditions, personality, first experience with *dysmenorrhoea*, knowledge, coping mechanisms, level of education, age and emotional management abilities of each individual. Stress can have both positive and negative effects. Positive influence, namely encourage individuals to raise awareness and produce new experiences. The negative effects, cause feelings of insecurity, anger, depression, headaches, stomach aches and insomnia.⁵⁵

Metformin

One of the disorders in the reproductive system is irregular menstrual cycles and not even getting menstruation (*amenorrhoea*). Pelvic inflammatory disease, uterine polyps, cysts, uterine tumours, endometriosis and so on. At this time, a new medical therapy emerged in the treatment of endometriosis, namely by administering the drug metformin.⁵⁶

Research on the effectiveness of metformin in patients with endometriosis, polycystic ovary syndrome (PCOS) and other reproductive disorders has started to be carried out a lot. Until now, the exact cause of endometriosis is not known, so definitive treatment has not been found. Many experts suspect that this condition arises due to abnormal proliferation of endometrial cells caused by reverse menstrual blood flow, mutations in

peritoneal cells or embryonic cells, immune system disorders and hormonal disorders. According to various studies, administering several types of hormonal drugs (including metformin) to patients with endometriosis can suppress the growth of their cysts, minimise the clinical symptoms that appear, relieve the inflammation they cause, as well as increase the chances of pregnancy.⁵⁶

Anxiety

Experiencing menstrual pain recurring every month can increase the risk of experiencing depression, anxiety or stress. In some cases, this psychological disorder exacerbates the severity of menstrual pain so that it has a two-way relationship. Even having depression and *dysmenorrhoea* together can increase the perception of pain severity and reduce response to treatment.⁵⁵ In a critical review, patients with severe *dysmenorrhoea* experienced increased pain sensitivity which could not only be explained by increased prostaglandin factors alone, but there were alternative explanations, which is possibly due to central sensitivity to pain, the hypothesis is that *dysmenorrhoea* may be caused by increased sensitivity to pain, so *dysmenorrhoea* does not only have physical aspects but can have psychological aspects that affect the condition.⁵⁵

Breast cancer

Cancer is a disease that is feared by all individuals, both men and women. In women, one of the most common cancers is breast cancer, according to several studies it was found that women who experience *menarche* at a very young age (< 12 years of age) can increase the risk of breast cancer caused by high levels of oestrogen in the body. There is still no definite causal factor for the occurrence of breast cancer, including the very young age of *menarche*. Other factors that are suspected include the length of time menstruation, menopause, obesity, hormone therapy, use of oral contraceptive therapy, preeclampsia, height, physical activity, radiation exposure and others that need to be studied more deeply.⁵⁷

Education

Health education is an activity to provide and improve knowledge, attitudes and good behaviour of individuals, families and communities to maintain and improve health. Health education is very necessary as an effort to prevent disease, as well as for the problem of *dysmenorrhoea*. *Dysmenorrhoea* has negative effects that cannot be taken for granted, the uncomfortable sensation of pain

causes individuals to feel anxious, stressed, depressed, decreased activity and decreased quality of life so education needs to be given on how to deal with *dysmenorrhoea*. The studies that have been conducted regarding education on how to treat *dysmenorrhoea* have on average obtained good results in increasing knowledge, attitudes and ways of handling *dysmenorrhoea*. The provision of health education is an effective method for increasing knowledge, attitudes and skills.⁵⁸

NSSI

NSSI is a symptom of depression by self-harm. Experiencing menstrual pain repeatedly makes individuals feel anxious when approaching menstruation, if this happens continuously without proper treatment, education and support systems from family and environment, the risk will increase towards depression. *Dysmenorrhoea* is not only physically disturbing to sufferers, from a psychological aspect it can be disturbing to sufferers.⁵⁵

Conclusion

The types of complementary therapies that were able to reduce *dysmenorrhoea* were: acupressure, acupuncture, calcium sufficiency, curcumin, yoga, aromatherapy, massage and physical activity. Moreover, factors related to *dysmenorrhoea* were: HIV, reproductive coercion, reproductive health, oxytocin, prolactin, trauma, metformin, anxiety and breast cancer.

Ethics

This study was a secondary analysis based on the currently existing dataset from the *Dimensions* and did not directly involve with human participants or experimental animals. Therefore, the ethics approval was not required in this paper.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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