

Comparison of cortisol, depression and stress hormone levels in primary dysmenorrhoe adolescents with the application of a combination of facial acupressure with classic music therapy

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ABSTRACT

Background : *Constant chronic dysmenorrhoea pain, should be screened with a single morning serum cortisol concentration. Uncontrolled pain (acute and chronic) initially indicates high serum cortisol concentrations. Then, one of the factors that can influence pain during menstruation is stress.*

Objectives : *This study aims to assess non-pharmacological interventions for facial acupressure (BL-2, Yin Tang, GV 23, GB 15, Tai Yang, GB 14, Ex Hn4, TE 23, Sang Ming, LI-20, Ex Hn 8, ST-3, Si 18, Du 26, REN 24, JiaCenjiang, SJ21, SJ17, GB-2) combined with Mozart classical music in reducing cortisol levels, depression and stress in dysmenorrhoea primary.*

Methods: *This is quantitative research with a quasi-experimental design. The research approach used is pre-post test design. In November 2021-January 2022 at Megarezky University Makassar. There were 42 Adolescents with Primary Dysmenorrhoea for respondents to this research. The sample in this study was divided into three groups, namely an intervention group (combination of facial acupressure with classical music) and 2 control groups which were only given classical music and facial acupressure treatment. Data collected included depression and stress. In addition, cortisol levels were checked using an ELISA Kit. Then the data was analyzed using the Paired T-test, while to see the differences if it was normally distributed using the One Way Anova test and if it was not normally distributed using Kruskal-Wallis.*

Results: *The results of the study found that there was a decrease in cortisol levels, depression and stress when given facial acupressure and classical music, but the reduction was more effective if a combination of facial acupressure and classical music.*

Conclusions: *Among the variables of cortisol levels, depression and stress, the combination of facial acupressure and classical music was significantly more effective in improving stress than just giving facial acupressure and classical music.*

KEYWORD: *dysmenorrhoea; cortisol; depression; stress; face acupressure classical music;*

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INTRODUCTION

Dysmenorrhea is pain in the uterine muscles that occurs before and during menstruation(1). This represents the ovulatory cycle and results from myometrial contractions without any proven disease, which is called primary dysmenorrhea, whereas pain during menstruation that is related to pelvic pathology, such as endometriosis, adenomyosis, or uterine myoma, is referred to as secondary dysmenorrhea (2,3) According to WHO 2015, the percentage of menstrual pain on average is more than 50% of women in every country. Meanwhile in Indonesia the figure is estimated to be 55% of women of reproductive age who suffer from pain during menstruation. The incidence of dysmenorrhea in Indonesia is 64.25%, consisting of 54.89% primary dysmenorrhea and 9.36% secondary dysmenorrhea (4). When Dysmenorrhea only 16.2-19.41% consult a health professional about their menstrual pain. More than half (46.3-53.7%) endure pain and only 36.5%- 37.70% of them use medication(5,6).

One factor that can influence pain during menstruation is stress ⁽⁷⁾. Stress is one of the main causes of menstrual disorders in women (8). Several studies show that stress is the main factor causing menstrual disorders such as menorrhagia, oligomenorrhea, dysmenorrhea and premenstrual syndrome (9). Psychological factors play an important role in the occurrence of primary dysmenorrhea (10). Factors such as social support, anxiety, depression, stress,

neurosis, comfort, and personality influence the onset of menstrual pain(11).

Results of research carried out (12) showed a relationship between stress levels and dysmenorrhea levels. This is according to research (13) that stress has a relationship that causes the body's physiological response which triggers dysmenorrhoea. So it can be concluded that the higher a person's stress level, the more severe the level of dysmenorrhea experienced. Meanwhile, the results of other research state (14) shows that there is a significant relationship but with a rather weak correlation, this is supported by (15) which shows that there is no significant relationship between stress levels and the incidence of dysmenorrhoea.

Severe chronic dysmenorrhea pain, especially if the pain is constant, should be screened for with a single morning serum cortisol concentration. Uncontrolled pain (acute and chronic) initially indicates high serum cortisol concentrations. If pain has been severe and constant for a long time, HPA suppression may occur, resulting in low serum cortisol concentrations (below 1.0 mg/dL) should be considered an emergency. Prolonged high cortisol concentrations can cause serious complications of menstrual disorders. Robust medical pain management is often necessary to maintain abnormal (high or low) serum cortisol concentrations within the normal range and minimize the complications of hypercortisolemia and hypocortisolemia. Serum cortisol should be viewed as an important biomarker for

adequate pain control(9,16,17). The increase in cortisol levels in the group with a history of dysmenorrhea is believed to be the result of the mechanism of HPA activity in individuals experiencing chronic pain and physiologically the body can also reduce pain by releasing endorphins (17,18). Cortisol is synthesized from cholesterol in the adrenal (suprarenal) glands which is controlled through the Hypothalamus-Pituitary-Adrenal (HPA), while secretion will increase in stressful conditions (9). Stress activates the hypothalamic-pituitary axis which affects menstrual function. Increased cortisol secretion causes an increase in uterine muscle contraction thereby aggravating menstrual pain causing menstrual disorders such as dysmenorrhea and irregular menstrual patterns(19). Research shows that in groups with inherent anxiety, because cortisol production increases while CD3 + T cells, CD45 + T cells, CD3 + CD4 + helper T cells, and CD3 + CD8 + cytotoxic T cells are less, this can affect immunity and someone's health.

This shows that cortisol levels were higher in the group of subjects with chronic primary dysmenorrhea compared to the group without a history of dysmenorrhea(20). This research is important to know how to manage depression and stress so that cortisol does not increase, causing primary dysmenorrhea pain, one of which is with non-pharmacological therapy such as facial acupressure with classical music can suppress pain, this technique can be used as

one of the non-pharmacological methods in managing menstrual pain.

MATERIALS AND METHODS

This research is quantitative research with a quasi-experimental design. The research approach used is pre-post test design. Sampling in this research used a non-random purposive sampling technique (non-probability sampling). Sample calculation design for unpaired numbers for three groups with one measurement involving 28 dysmenorrhea teenagers in November-January 2022 at Megarezky University, Makassar. The total number of respondents in each group was 28 dysmenorrhea teenagers aged <25 years, they were randomly divided into two groups, namely the facial acupressure group by pressing acupuncture points on the face. BL-2, Yin Tang, GV 23, GB 15, Tai Yang, GB 14, Ex Hn4, TE 23, Sang Ming, LI-20, Ex Hn 8, ST-3, Si 18, Du 26, REN 24, JiaCenjiang , SJ21, SJ17, GB-2 given by certified therapists training in Putri Kedaton Yogyakarta and classical music groups by listening to relaxing music at a volume that suits the respondent's comfort using earphones, namely Wolfgang Amadeus Mozart's classical music, and each group was given treatment for 15 minutes. The inclusion criteria in this study are young women who experience primary dysmenorrhea on the first day of menstruation, have regular menstrual cycles, are <25 years old and have never been married, and have not taken medication in the last week. Adoles-

cents with wounds and bruises on the face and using dental braces, have hearing problems, are sick or experiencing unbearable pain and are anxious by measuring using the DASS 42 (Depression Anxiety Stress Scales) questionnaire when undergoing intervention, consuming drugs or herbal medicine that may influence pain during the study will be excluded from the study.

This research has received an ethical recommendation with protocol number 769/UN.4.6.4.5.31/PP36/2021 from the biomedical research ethics commission at the Faculty of Medicine, Hasanuddin University, Makassar. Then the data collected from the sample was a depression and stress scale

using the DASS42 questionnaire through direct interviews with respondents and lab results related to pre and post cortisol hormones, then the data was processed using SPSS.

RESULTS AND DISCUSSION

RESULTS

Based on the SPSS test that was carried out, the results showed that the significance value for the overall treatment in the three groups was >0.05 . So statistically it shows a normal data distribution. To find out the test results, statistical data analysis was processed using paired samples T-test and One Way Anova.

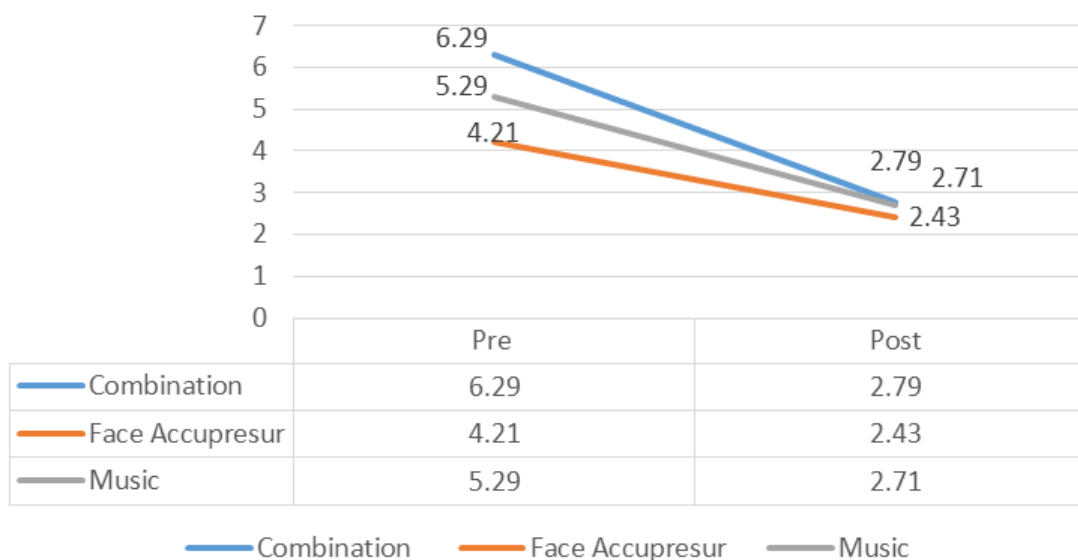


Figure 1. Intensity of Cortisol Levels in Primary Dysmenorrhea

Looking at **Figure 1**, the mean cortisol levels before intervention were higher in the combination group (6.29 ± 2.79) and the control group, namely facial acupressure (4.21 ± 2.26) and classical music ($5.29 \pm$

2.70). Meanwhile, the mean cortisol levels after being given the intervention decreased better in the combination group (2.79 ± 1.42) than in the full-blooded group (2.43 ± 1.60) and music (2.71 ± 1.27).

Table 1. Pre and post cortisol levels

Cortisol Levels (µg/dl)	Combination of			P-Value
	facial acupressure and music (n=42)	facial acupressure (n=42)	Music Classic (n=42)	
Before Intervention (Mean±SD)	6.29±2.79	4.21±2.26	5.29±2.70	0.786 ^b
After Intervention (Mean±SD)	2.79±1.42	2.43±1.60	2.71±1.27	
P-Value	0.001 ^a	0.022 ^a	0.006 ^a	

^aPaired T Test

^bOne Way Anova

Table 2. Pre and post intensity of depression and stress

Variabel	Combination		Facial Accupresur		Music Classic		P-Value			
	Mean±SD		Mean±SD		Mean±SD					
	Pre	Post	Pre	Post	Pre	Post				
Depression	2.64 ±1.08	1.57 ±0.75	2 ±0.6	1.21 ±0.42	2.29 ±1.26	1.57 ±0.85	0.004 ^a	0.001 ^a	0.023 ^a	0.38 ^b
Stress	3.07 ±0.61	1.86 ±0.36	2.43 ±1.01	1.64 ±1.15	2.36 ±0.74	1.29 ±0.72	0.000 ^a	0.009 ^a	0.001 ^a	0.01 ^b

^aUji Wilcoxon

^bUji Kruskal-wallis

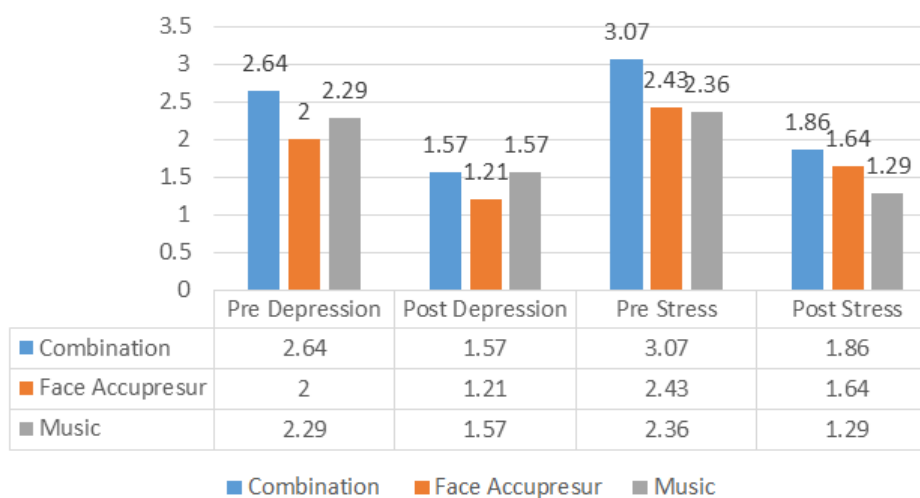


Figure 2. Intensity of Depression and Stress in Primary Dysmenorrhea

From **Table 1**, the three interventions, including the combination of facial acupressure and music, facial acupressure and classical music, all three had a statistically significant decrease ($p < 0.05$), however, in the combination of facial

acupressure and classical music, the reduction in cortisol was better than when given facial acupressure alone and classical music. However, it did not show any significant difference between the intervention group and the two control groups,

namely 0.786 ($p>0.05$).

The results of the questionnaire test shown in **Table 2** show that the average depression and stress decreased in each group. If we look at the mean intensity of pain, depression, anxiety and stress in each group, it looks almost the same, statistical tests show the effectiveness of providing a combination of facial acupressure and classical music intervention for depression and stress ($p<0.05$). However, the only significant difference in each group was the difference in stress intensity, namely 0.01 ($p<0.05$).

From **Figure 2**, it can be seen that the intensity of depression and stress decreased in each group. The average level of depression in the combination group decreased from mild to normal, while stress decreased from moderate to normal. Meanwhile, in the acupressure and classical music groups, the average level of depression and stress decreased from mild to normal.

DISCUSSION

Based on **Figure 1**, After testing cortisol levels using an ELISA kit, the results of this study showed a decrease in the intervention group and the two control groups. There was a difference ($p<0.05$) between before and after the intervention in the combination group, facial acupressure and music. Looking at **Table 1** there was no significant difference between the three intervention groups and the control group ($p=0.786$). The results of this research are in line with theory (21) and

(17) When dysmenorrhea pain occurs, the axis is stimulated, causing corticotropin-releasing hormone (CRH), adrenocorticotrophic hormone (ACTH), catecholamines, and serum cortisol to increase. As acute pain becomes chronic, stimulation of the HPA axis continues, resulting in increased serum cortisol levels or decreased cortisol levels. The natural purpose of increased cortisol is activation of the body's immune defenses and healing to eliminate the cause of pain and facilitate tissue recovery. Uncontrolled and unresolved severe pain can overstimulate and then damage the HPA axis to the point where normal adrenal cortisol secretion does not occur (17). However, these results are not in line with Mohamed's (2020) research that acupressure cannot reduce plasma cortisol levels effectively in primary dysmenorrhea (8). This is caused by the acupressure points BL-2, Yin Tang, GV 23, GB 15, Tai Yang, GB 14, Ex Hn4, TE 23, Sang Ming, LI-20, Ex Hn 8, ST-3, Si 18, Du 26, REN 24, JiaCenjiang, SJ21, SJ17, GB-2 combined with Mozart classical music can provide a feeling of comfort thereby providing stimulation to the hypothalamus to control the sympathetic system and the adrenal cortex system. Furthermore, the sympathetic nervous system will also signal the adrenal medulla to inhibit the release of epinephrine and norepinephrine into the bloodstream. Inhibition of the epinephrine hormone will activate the adrenal cortex fasciculate zone to secrete the glucocorticoid hormone, namely cortisol. This cortisol hormone plays a role in

the feedback process that is sent to the hypothalamus to reduce cortisol levels (21,22). So when cortisol decreases, the mechanism of pain production is based on stimulus (pressure on acupuncture points and the sense of hearing) into nociceptive impulses. A- β , A- δ , and C fibers are distributed to the dorsal horn of the spinal cord, then along the sensory tracts to the brain. Then a series of opioid receptors such as μ , κ and δ in the dorsal horn and the nociceptive system will create a descending pathway originating from the frontal cortex, hypothalamus and other brain areas to the midbrain and medulla oblongata, then to the spinal cord. The result of this descending inhibition process is strengthening, or even blocking (blocking) nociceptive signals in the dorsal horn so that the perception of pain decreases (18).

Based on **Figure 2**, A study shows a positive relationship between psychological stress and dysmenorrhea (23). Stressors such as chronic pain can trigger the hypothalamus to secrete corticotropin-releasing hormone (CRH aka CRF, Corticotropin-Releasing Factor) and Arginine Vasopressin (AVP), thereby triggering the production of Adrenocorticotropin hormone (ACTH) from the anterior pituitary and its activation(19) ACTH encourages the adrenal cortex to produce cortisol, which increases cortisol levels. Glucocorticoids (cortisol) and their receptor binding in the limbic system will activate pathways from the hypothalamic pituitary-adrenal axis so that the cycle will

repeat itself (10), Cortisol levels in the blood vary, the highest levels are found in the morning (08.00 WIB) 20 g / dL and decrease in the evening 5 g / dL (24,25) High levels of cortisol will enter the body's circulation to suppress the growth of the body's immune cells. This hormone will also influence the release of the neurotransmitter adrenaline which will result in inhibition of Gn-RH secretion which results in disruption of FSH and LH production and results in menstrual disorders(10,13,19,24).

Based on **Table 2**, Facial acupuncture or acupuncture stimulates the hypothalamus to control the sympathetic system and the adrenal cortex system. The nervous system will activate various organs and muscles that are under its control, such as controlling heart rate and pupil dilation. Furthermore, the sympathetic nervous system will also signal the adrenal medulla to inhibit the release of epinephrine and norepinephrine into the bloodstream. Inhibition of the epinephrine hormone will activate the adrenal cortex fasciculate zone to secrete the glucocorticoid hormone, namely cortisol. This cortisol hormone plays a role in the feedback process that is sent to the hypothalamus and then reduces anxiety levels (21,22). However, listening to music can produce endorphins (morphine-like substances supplied by the body which can reduce pain) which can inhibit the transmission of pain impulses in the central nervous system, so that the sensation of menstrual pain can be reduced. Music also works on the limbic system which will be

delivered to the system. nerves that regulate the contraction of the body's muscles, thereby reducing muscle contractions(26).

CONCLUSION AND RECOMMENDATION

There is an effect of giving a combination of facial acupressure and classical music in reducing levels of the hormone cortisol, depression and stress. Then there were significant differences in stress intensity in each group. It is hoped that in the future it can be used as additional information and knowledge to choose non-pharmacological methods of facial acupressure and classical music, especially for those experiencing primary dysmenorrhea. Future researchers can examine other factors that can cause levels of the hormone cortisol, depression and stress such as workload, economics, etc. and increase the number of research subjects.

REFERENCES

1. F. Gary Cunningham, Leveno, Bloom H Auth R, Spong. Williams Obstetrics. 25th ed. Philadelphia. McGraw Hill. 2018.
2. Kazama M, Maruyama K, Nakamura K. Prevalence of Dysmenorrhea and Its Correlating Lifestyle Factors in Japanese Female Junior High School Students. *Tohoku Journal of Experimental Medicine (TJEM)* 2015;107–13. doi : <https://doi.org/10.1620/tjem.236.107>
3. Ling, Fang, Caiyun Gu, Xinyu Liu, Jiabin Xie ZH, Meng Tian, Jia Yin AL and YL. Metabolomics study on primary dysmenorrhea patients during the luteal regression stage based on ultra performance liquid chromatography coupled with quadrupole - time - of - flight mass spectrometry. *Molecular Medicine Reports*. 2017;1043–50. doi : <https://doi.org/10.3892/mmr.2017.6116>
4. Charla E, Bingan S. Terapi Musik Instrumental Dayak Terhadap Pengurangan Nyeri Haid (Dismenorrhoe) Pada Remaja Putri Kota Palangka Raya. *Jurnal Kesehatan Poltekkes Palembang (JPP)*. 2020;15(1):14–20. doi : <https://doi.org/10.36086/jpp.v15i1.454>
5. Gebeyehu MB, Mekuria AB, Tefera YG, Andarge DA, Debay YB, Bejiga GS, et al. Prevalence, Impact, and Management Practice of Dysmenorrhea among University of Gondar Students, North western Ethiopia: A Cross-Sectional Study. *International Journal of Reproductive Medicine [Internet]*. 2017;2017:1–8. Available from: <https://doi.org/10.1155/2017/3208276>
6. Nadine SO, Dabou S, Gaele Djoueudam F, Natheu Kamhoua C, Lienou Lienou L, Njina Nguedia S, et al. Title: Primary Dysmenorrhea: Associated Symptoms, Impact and Management among Females in the Menoua Division of the West Region of Cameroon. Cross-sectional Study Running Title: Primary Dysmenorrhea in the Menoua Division. *American Scientific Research Journal for Engineering, Technology, and Sciences [Internet]*. 2020;66(1):26–34. Available

- from: <http://asrjetsjournal.org/>
7. Yanti I, Marlina R. Pengaruh Stres, Status Gizi Dan Aktivitas Fisik Terhadap Kejadian Dismenore Primer Pada Remaja Putri. *HSG Journal (Health Science Growth)* 2018;3(2):72–80. Available from: <https://journal.unsika.ac.id/index.php/HSG/article/view/1563>
 8. Mohamed, Shimaa A., Soheir M. El-kosery MFAE and DAO. Effect of Acupressure on Plasma Cortisol Levels in Effect of Acupressure on Plasma Cortisol Levels in Primary Dysmenorrhea: A Randomized Controlled Trial. *European Journal of Applied Sciences*. 2020;(August):12 (3): 74-80, 2020. doi : 10.5829/idosi.ejas.2020.74.80
 9. Septianingrum Y, Hatmanti NM. Correlation Between Menstrual Pain and Level of Cortisol Among Nursing Student of Nahdatul Ulama University, Surabaya. *International Conference of Kerta Cendekia Nursing Academy*. 2019; 163–8.
 10. Jeon, G.E., Cha, N.H. & Sok SR. Factors Influencing the Dysmenorrhea among Korean Adolescents in Middle School. *Journal of Physical Therapy Science*. 2014;26(9):1342.
 11. Maia, H.Jr., Haddad, C., Coelho, G. & Casoy J. Role of inflammation and aromatase expression in the eutopic endometrium and its relationship with the development of endometriosis. *Research Gate*. 2012;647–58. doi : <http://dx.doi.org/10.2217/whe.12.52>
 12. Rejeki S. Gambaran Tingkat Stres Dan Karakteristik Remaja Putri Dengan Kejadian Dismenore Primer. *Jurnal Kebidanan*. 2019;8(1):50. doi : <https://doi.org/10.26714/jk.8.1.2019.50-55>
 13. Mantolas, Santi L, Trifonia Sri Nurwela RG. Hubungan Tingkat Stres Dengan Kejadian Dismenorea Pada Mahasiswi Keperawatan Angkatan Vi Sekolah Tinggi Ilmu Kesehatan (Stikes) Citra Husada Mandiri Kupang. *CHMK MIDWIFERY Scientific Journal*. 2019; 2:494–494.
 14. Sari D, Nurdin AE, Defrin D. Hubungan Stres dengan Kejadian Dismenore Primer pada Mahasiswi Pendidikan Dokter Fakultas Kedokteran Universitas Andalas. *Jurnal Kesehatan Andalas*. 2015;4(2):567–70.
 15. Ismail, Indria F, Rina Kundre JI. Hubungan Tingkat Stres Dengan Kejadian Dismenorea Pada Mahasiswi Semester Viii Program Studi Ilmu Keperawatan Fakultas Kedokteran Universitas Sam Ratulangi Manado. *E-Journal Keperawatan (E-Kp)*. 2015;3(2):1–8. doi : <https://doi.org/10.35790/jkp.v3i2.9600>
 16. Tennant F. The Physiologic Effects of Pain on the Endocrine System. *Pain Ther*. 2013;2(2):75–86. doi : <https://doi.org/10.1007/s40122-013-0015-x>
 17. Tennant F. Cortisol Screening in Chronic Pain Patients. *Med Central* 2017;12(1): 36–42.
 18. Bahrudin M. Patofisiologi Nyeri (Pain).

- Saintika Medika. 2018;13(1):7. doi : <https://doi.org/10.22219/sm.v13i1.5449>
19. Kural M, Noor NN, Pandit D, Joshi T, Patil A. Menstrual characteristics and prevalence of dysmenorrhea in college going girls. *Journal of Family Medicine and Primary Care* 2015;4(3):426–31. doi : <https://doi.org/10.4103%2F2249-4863.161345>
 20. Jaremka, L.M., Glaser, R., Loving, T.J., Malarkey WB, Stowell, J.R., Kiecolt-Glaser J. Attachment Anxiety is Linked to Alterations in Cortisol Production and Cellular Immunity. *Psychological Science*. 2013 March 1; 24(3). 2014; 24(3):1–13. doi : <https://doi.org/10.1177%2F0956797612452571>
 21. Nugroho RA. *Dasar-Dasar Endokrinologi*. Mulawarman Univ Press. 2016;53(9): 1689–99.
 22. Yao LZ. *akupresur mandiri estetika wajah dan tubuh*. Jakarta: PT Legacy Utama Kreasindo; 2016.
 23. Ertiana D, Akhyar M, Budihastuti UR. Path Analysis of Factors which Correlated with Dysmenorrhea. *Indonesian Midwifery and Health Sciences Journal* 2016;1: 136–45. Available from: <https://doi.org/10.26911/theijmed.2016.01.02.08%0APath>
 24. Ertandri Yodi, Syahredi S. Adnani HB. Cortisol Levels in Chronic Primary Dysmenorrhoea Patients and Non-Dysmenorrhoea : A Cross- Sectional Study. *Indonesian Journal of Obstetric and Gynecology*.2020;8(2). doi : <https://doi.org/10.32771/inajog.v8i2.1128>
 25. Vanessa A. van Ast, Sandra Cornelisse, Marie-France Marinc, Sandra Ackermanne, Sara Garfinkelf and HCA. Modulatory mechanisms of cortisol effects on emotional learning and memory: Novel perspectives. *Psycho neuroendocrinology*. 2013;23(1): 1–7. doi : <https://doi.org/10.1016/j.psyneuen.2013.06.012>
 26. Heryani R, Utari MD. Efektivitas Pemberian Terapi Musik (Mozart) Dan Back Exercise Terhadap Penurunan Nyeri Dysmenorrhea Primer. *Jurnal IPTEKS Terapan* 2017;11(4):283. doi : <https://doi.org/10.22216/jit.2017.v11i4.2486Abstract>