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THE EFFECT OF YOGA ON ESTROGEN IN WOMEN OF FERTILE AGE EXPERIENCING STRESS

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ABSTRACT
Women have the right to physical and mental health in order to be able to regulate and maintain fertility levels, and enjoy sexual life responsibly. However, women are very susceptible to stress, both working and non-working women. Where stressful conditions can affect reproductive health related to the hormonal function of the reproductive system. One alternative that can be used to reduce the impact of stress is by doing yoga. Yoga is thought to suppress cortisol secretion, where cortisol can cause estrogen imbalance through the activation mechanism of the HPA (Hypothalamus-Pituitary-Adrenal) axis and the HPO axis (Hypothalamus-Pituitary-Ovary). This study aims to analyze the effect of yoga on the estrogen hormone in women of childbearing age in the context of stress. The research design uses a posttest only control group design. Before the research began, the research team had received a certificate of Ethical Eligibility from the Health Research Ethics Commission of the Indonesian STRADA Institute of Health Sciences. The population in this study were WUS who were indicated to be stressed based on the DASS scale and had a normal menstrual cycle. Sampling uses purposive sampling. The sample in this study was 57 people who met the inclusion and exclusion criteria. The treatment group was given yoga 24 times with a duration of 60 minutes at each yoga session guided by a professional yoga instructor. Meanwhile, the control group did not receive any treatment, but was monitored every week to avoid samples dropping out. Based on the results of the Mann-Whitney test, it shows a p value of 0.000. This shows that there are differences in estrogen levels in the control group and the treatment group. Yoga is considered effective in maintaining estrogen concentrations within normal limits. In this case, especially in women of childbearing age with stressful conditions. Yoga can have a positive impact both mentally and physically and maintain the function of vital organs such as the reproductive organs in women.

Keywords: Yoga; Stress; Estrogen; Women of Childbearing Age; Reproductive Health

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INTRODUCTION

Every country, including Indonesia, has guaranteed every woman the right to reproductive health as part of human rights. This includes aspects such as fertility, sexuality, and protection against sexually transmitted diseases (STDs) and sexual violence (Indriayani

et al., 2024). Reproductive health is part of the development of public health in Indonesia using a life-cycle approach, so that women have the right to be physically and mentally healthy so that they are able to regulate and maintain fertility levels, and enjoy sexual life responsibly (Armini, 2019). According to WHO, reproductive health is not only free from disability or disease in an aspect related to the reproductive organs, functions and processes, but also the existence of conditions of prosperity and mental, physical and social well-being as a whole (Ismawati, 2023).

One of the scopes of reproductive health is reproductive health services for women of childbearing age (Ismawati, 2023). WUS are married or unmarried women aged 15-45 years and are included in the vulnerable group. In women, peak fertility occurs in the age range of 18-25 years and begins to decline after the age of 27 years and will decline rapidly after women are over 35 years old. This is related to the adequacy of egg reserves in the ovaries. The quantity and quality of egg cells or ovum will decrease with increasing age of women starting from hormonal imbalance (Ningsi et al., 2019).

Stress can change women's reproductive health in many ways, one of which is hormonal imbalance related to the reproductive system (Nugroho et al., 2021). Factors that cause stress come from physical, psychological, or both stimuli. Physical stress is caused by exposure to stressors that are harmful to body tissues, for example exposure to cold or hot conditions, decreased oxygen concentration, infection, injuries, heavy and long physical exercise, etc. While psychological stress, for example, changes in life, social relationships, feelings of anger, fear, depression, etc. Psychological stress can be triggered by excessive demands that come from both internal conditions and the external environment so that their well-being is threatened. Stress problems are often experienced by WUS both working and not working. Sources of stress can come from family, community and environment (Luthfia & Atmaja, 2020).

According to a study, stressors of working women are influenced by the work factor itself plus family factors and other external conditions (Sitorus, 2020). Another study of 100 participants (career women) involved obtained, as many as 19 participants experienced work stress in the low category, 60% in the moderate category, and 21% in the high category. Work stress is caused by a large workload, lack of ability to complete certain jobs, inadequate facilities and time or personal problems (Ayu Kartikasari, 2024) . Meanwhile, stressors in non-working women are caused by physical, emotional, intellectual and interpersonal aspects, where the prevalence of moderate stress experienced by non-working women is 87.8% and the rest experience low stress (Nurhayati, 2021)

A person's stressful state will activate the hypothalamus to produce a substance called Corticotropin Releasing Hormone (CRH) or corticotropin hormone. CRH will then stimulate the pituitary to release Adrenocorticotropin Hormone (ACTH) into the bloodstream. ACTH that floods the bloodstream will eventually reach the adrenal glands to produce and release adrenaline, norepinephrine and cortisol. Adrenaline and norepinephrine act as the body's command to give orders to organs that change their rhythm and physiological processes (Yuliadi, 2021). Cortisol is the main glucocorticoid produced by the adrenal glands. Glucocorticoids are important mediators for other events such as apoptosis. Increased cortisol can trigger oxidative stress and induce apoptosis of granulosa cells. Apoptosis of granular cells disrupts the process of follicle formation, growth and development (folliculogenesis) by decreasing communication between granulosa cells-oocytes which then affects the supply of nutrients and oocyte maturation factors (Yuan et al., 2020). In addition, damage to granulosa cells also causes inhibition of estrogen formation, because in granulosa cells there are aromatase receptors that increase the conversion of androgen to estrogen (Talakua & Unitly, 2020).

On the other hand, increased cortisol release can suppress reproductive function through the HPO (Hypothalamus-Pituitary-Ovary) axis. Cortisol can interfere with GnRH (Gonadotropin-releasing hormone) by inhibiting the hypothalamus. Decreased GnRH secretion causes decreased FSH (Follicle stimulating hormone) production (Domes, Linnig, & von Dawans, 2024; Sharma & Sharma, 2022). FSH itself plays a role in stimulating follicle development and stimulating the synthesis of estrogen secretion synthesized by the

dominant follicle (steroidogenesis) (Santi et al., 2020). If there is a decrease in FSH levels, folliculogenesis and steroidogenesis are inhibited so that the estrogen hormone will not be formed as it should (Larasati, 2023).

The increase and decrease of estrogen hormone levels occur twice in the menstrual cycle. Estrogen hormone levels increase in the mid-follicular phase and then decrease drastically after ovulation. This is then followed by a second increase in estrogen hormone in the mid-luteal phase with a decrease at the end of the menstrual cycle (Inonu, 2020). The functions of the estrogen hormone include calcium homeostasis, controlling the menstrual cycle, influencing growth, development, maturation, and function of the reproductive tract, as well as sexual and behavioral differentiation, osteoblast differentiation in the bone formation process, adipogenesis, reducing low-density lipoprotein (LDL) levels, and regulating the growth and differentiation of axons and dendrites in the brain (Inonu, 2020).

Yoga is a growing integrative health discipline that can improve individual abilities and has been shown to improve the clinical profile of patients with various pathological conditions (Wahyuni, 2020). A study has shown that yoga therapy can reduce clinical symptoms in adult women with depression (Ingunn Hagen & Hagen, 2024). Another study showed that practicing yoga for 35 minutes once a week can reduce stress levels in premenopausal women (Anggraini et al., 2024). Based on the description above, this study aims to determine the effect of yoga in maintaining estrogen hormone levels in the context of women of childbearing age who experience stress.

METHODS

Study Design

This study uses a pure experimental research design (true experiment), namely the posttest only control group design (Akbar, Siroj, Win Afgani, & Islam Negeri Raden Fatah Palembang Abstract, 2023; Syapitri, Amila, & Aritonang, 2021). The research design scheme uses a posttest only control group design, namely a research design by comparing post-test data between the treatment group and the control group without any initial measurement (pre-test).

Setting

This research was carried out from June to September 2024 in Tapanrejo Village involving the Tapanrejo Village PKK.

Research Subject

Population determination is carried out by conducting an initial assessment or collecting initial data, namely assessing stress levels and the range of menstrual cycles (28-30 days). The research population was determined based on the results of the DASS (Depression Anxiety Stress Scale) questionnaire filled out by prospective research samples. Those selected as the population were WUS (fertile age women) with mild to very severe stress levels and had a menstrual cycle of 28-30 days. Examining the menstrual cycle aims to determine the menstrual phase currently being experienced by the respondents in order to determine the estimated phase currently being experienced by the research sample when the blood sample was taken. Because estrogen levels in each menstrual phase vary (have different normal levels in each menstrual phase). The menstrual cycle has three phases, namely the follicular phase, the ovulation phase and the luteal phase. It is also necessary to consider respondents who have a menstrual cycle range of 28-30 days.

From the results of initial data collection, it was obtained that 76 WUS indicated stress with a menstrual cycle range of 28-30 days. In other words, the population in this study was 76 WUS. Then, based on the provisions of the inclusion and exclusion criteria, a suitable sample of 57 WUS was obtained. The inclusion criteria include age 20-45 years, physically healthy, no psychiatric diagnosis, not using hormonal contraception, willing to participate and continue yoga practice, committed to maintaining current level of routine physical activity, not starting practices such as relaxation/meditation, do not do yoga practice outside the specified schedule. Meanwhile, the exclusion criteria are undergoing regular

exercise for the last 3 months, having practiced yoga before, having a history of chronic disease or conditions that might worsen discomfort and addiction: cigarettes / alcohol. All respondents involved in this research have also filled out informed consent and the patient's identity is kept confidential (without name or anonymity).

From the 76 populations, sampling was then carried out using a sampling technique, namely purposive sampling, so that 57 WUS were obtained as research samples. From the 57 WUS, data were obtained on 22 stressed WUS who were estimated to be in the follicular phase at the time of blood collection, 19 stressed WUS who were estimated to be in the ovulation phase at the time of blood collection and 16 stressed WUS who were estimated to be in the luteal phase at the time of blood collection. Then, samples were selected from each menstrual phase group to be classified into the control group and the intervention group. The method of taking 20 samples was by drawing lots/shuffling. The first to the 10th shuffle was put into the control group. The 11th to 20th shuffle was put into the treatment group. And the 21st shuffle was used as a backup sample that would be put into the treatment group. So that the treatment group had 21 samples consisting of 20 main samples and 1 backup sample. The same mechanism was also carried out in the ovulation phase and luteal phase. Thus, the control group consisted of 10 WUS follicular phase stress, 8 WUS ovulation phase, and 7 WUS luteal phase and the treatment group consisted of 11 WUS follicular phase stress (1 as a reserve), 9 WUS ovulation phase (1 as a reserve), and 8 WUS luteal phase (1 as a reserve).

Instruments

The instrument used in this research is an observation sheet. This observation sheet was obtained from the estrogen examination results of all samples released by the SUNLAB laboratory.

Intervention

Group was given yoga 24 times with a duration of 60 minutes in each yoga session guided by a professional yoga instructor. The details of the meeting were held three times a week for two months. The yoga provided was yoga intended for beginners. The basic movements are easy pose, tree pose, downward facing dog pose, cat-cow pose, mountain pose, child's pose, cobra pose, and rasied leg pose. The stages of the training session are divided into a 15-minute warm-up, 30 minutes of Asanas, and 15 minutes of meditation or relaxation.

While the control group was still monitored to prevent samples from logging out of the study. After the program was completed, blood samples from the control group and the treatment group were taken simultaneously to examine estrogen levels.

Figure 1. Example of yoga poses

Data Analysis

The analysis test uses the parametric test of the independent t-test with the condition that the data is normally distributed and the data is homogeneous. Based on the normality and homogeneity tests, it was obtained, Shapiro-Wilk test results show the p-value in the control group p value 0.078 meaning the control group data is normally distributed while the treatment group has a p value of 0.001 meaning the data is not normally distributed. If there is a condition where one of the groups has data that is not normally distributed ($p < 0.005$),

then it does not meet the requirements for an independent t-test but must use an alternative test, namely the Mann Whitney test. Then the results of the Levene's Test on Equal variances assumed were also observed, having a p-value = 0.000, meaning that the data is not homogeneous. Of the two requirements that are not met, then the independent t-test cannot be used, so an alternative hypothesis test is used, namely Mann Whitney.

Table 1. Homogeneous Distribution and Variance of Estrogen Levels

Sample	The p-value of data distribution	Information	The p-value of data distribution	Information
Control Group	0.078	Normal distribution	0,000	Not homogeneous
Treatment Group	0.001	Not normally distributed		

Ethical Consideration

Before the study began, the research team had obtained an Ethical Eligibility certificate from the Health Research Ethics Commission of the STRADA Indonesian Institute of Health Sciences with number 001418/EC/KEPK/I/06/2024. Published on date 27 Juni 2024.

RESULTS

Based on the results of the initial data collection, observation results were obtained based on demographic factors, namely the age of the respondents, such as the data in the table below:

Table 2. Frequency Distribution of Respondents' Age

Respondent Characteristics Based on Age	Frequency	Percent (%)
20 – 29 years	13	26
30 – 39 years	18	36
> 40 years	19	38

The data in table 1 shows that the majority of respondents were aged > 40 years, as many as 19 respondents (38%), those aged 30 - 39 years were as many as 18 respondents (36%) and respondents aged 20 - 29 years were as many as 13 respondents (26%). To determine whether the requirements for the independent t-test are met, Table 1 displays the results of the data distribution and data homogeneity.

Table 3. Mann Whitney Test Results for Estrogen Levels

Variables	Median (Min – Max)	Median Different	P-value
Estrogen levels intervention group	48.19 – 488.80	70.43	0.000
Estrogen levels control group	4.00 – 111.0		

The Mann Whitney test shows a p value of 0.000, meaning that there is a difference in estrogen levels between the control group and the treatment group. This means that yoga has been proven effective in maintaining estrogen levels within normal limits in women of childbearing age who are indicated to be experiencing stress.

DISCUSSION

Based on the results of the analysis test, a p value of 0.000 was obtained, meaning that there was a difference in estrogen levels in the control group and the treatment group. In stressful conditions, there are changes to create a state of balance or homeostasis by activating the nervous system, neuroendocrine and neuroendocrine immune which is called allostasis. Allostasis changes the function of the Hypothalamo-Pituitary-Adrenocortical (HPA) axis (Milleniari et al., 2023). Stressors trigger the Hypothalamus to produce CRH (corticotrophin-releasing hormone) then activate the anterior pituitary to produce ACTH

(Adrenocorticotropin Hormone). ACTH stimulates the production of cortisol from the adrenal cortex (Yuliadi, 2021). Chronic and repeated stressors can cause one or more forms of HPA axis dysregulation, alter cortisol secretion and affect organ function. According to the feedback of the hormonal system, increased cortisol can inhibit the release of gonadotropin-releasing factors that control ovulation in women. In addition, the stimulus of CRH hormone release by the hypothalamus directly inhibits the secretion of GnRH (gonadotropin-releasing hormone) by the hypothalamus from its production site in the Arcuate Nucleus (Amalia et al., 2023) thereby increasing FSH hormone levels. Decreased FSH levels inhibit folliculogenesis and steroidogenesis so that estrogen hormones will not be formed.

One of the modality therapies that can be used to overcome stress and its impacts is yoga practice. Yoga is an ancient practice that involves a combination of body movement, breathing, and meditation. Physically it can help loosen muscles, increase body flexibility and body balance. Psychological benefits, yoga practices that involve deep breathing and meditation can help reduce stress, improve concentration, and create feelings of calm (Indriyani, 2023). One element of yoga that is said to help reduce stress is in the relaxation and meditation section. yoga and meditation techniques reduce stress and anxiety. A study has shown that yoga therapy can reduce clinical symptoms in adult women with depression (Ingunn Hagen & Hagen, 2024). Another study showed that practicing yoga for 35 minutes once a week can reduce stress levels in premenopausal women (Anggraini et al., 2024).

Yoga works on the hypothalamus which inhibits the activity of the anterior pituitary gland and reduces ACTH production, reduced ACTH production affects the adrenal glands and reduces cortisol synthesis by the adrenal glands (Padmavathi et al., 2023). Other studies have also found the possibility that yoga reduces HPA activation (hypothalamic-pituitary-adrenal axis) thereby preventing the secretion of cortisol which is often known as stress hormone (Ingunn Hagen & Hagen, 2024). Comparable studies also demonstrated a reduction in blood cortisol levels following six weeks of daily, one-hour yoga practice. Serum cortisol levels were 16.21±4.2 µg/dL in the yoga group and 19.63±4.9 µg/dL in the control group (Kavitha et al., 2023). Yoga also affects cortisol levels in pregnant women, where the results show that respondents with normal average serum cortisol levels of 40.68 nag/mol were 93.75% (15 respondents in the yoga group), while respondents with abnormal cortisol levels averaging 384.19 nag/mol were 81.25% (13 respondents in the control group) (Kumorojati et al., 2020).

One of the factors that affect estrogen levels is the cortisol hormone. Cortisol is used as a benchmark to assess a person's level of stress. The higher the level of stress, the higher the cortisol in the blood will also increase. It is known that cortisol can suppress the secretion of GnRH by the hypothalamus. GnRH plays a role in stimulating the pituitary gland to produce FSH and LH. FSH plays a role in stimulating the follicles so that the follicles will produce estrogen. If there is a disruption in the formation of GnRH, then the production of FSH will also be affected, leading to a decrease in estrogen production (Larasati, 2023). So according to the researcher's opinion, Yoga is considered effective in maintaining estrogen concentrations within normal limits. In this case, especially in women of childbearing age with stressful conditions. Yoga can have a positive impact both mentally, physically and maintain the function of vital organs such as the reproductive organs in women. Because if stress is not overcome coupled with a long-lasting stressor, it will cause disruption of body function, especially reproductive health function.

CONCLUSION

In this study, it can be concluded that there is a difference in estrogen levels in the control group and the treatment group. In this case, it proves that yoga can be used as a modality therapy to reduce stress levels so that there will be no negative impact on women's reproductive health.

SUGGESTIONS

To find out in detail the impact of yoga on various hormones, researchers can further identify yoga on hormonal changes such as CRH, ACTH, cortisol, GnRH, FSH, LH which have implications for estrogen hormone concentration.

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DECLARATION OF INTEREST

The researchers involved declare that there is no conflict of interest whatsoever related to the publication of this article.

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AUTHOR CONTRIBUTION

Author 1 is responsible as the main author in compiling proposals, research results, and research articles

Author 2 has the task of assisting in compiling proposals, analyzing data and research report results.

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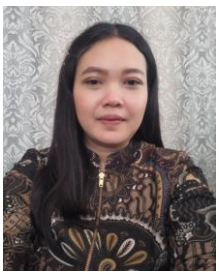

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