



**THE EFFECTS OF PRENATAL YOGA
AGAINST LUNG VOLUME AND SLEEP QUALITY CHANGES
IN THE THIRD TRIMESTER OF PREGNANCY**

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Abstract:

The purpose of this study to find out the truth about (1) the effect of prenatal yoga to changes lung volumes third trimester of pregnancy, (2) the effect of prenatal yoga to changes sleep quality third trimester of pregnancy. The method used in this study is an experimental research method. The research design used *one group pretest posttest*. The sample were used in this study are pregnant women who become followed the yoga exercises in Nismara Mom and Kids Surakarta, with 24 respondents. Data analysis techniques in this study used inferential statistical analysis (inductive). The technique of data collection using *spirometry* to measure lung volume and the *Pittsburg Sleep Quality Index* for measure the sleep quality. The results showed the increase of lung volume. The results of *paired samples t-test* in the 1st test and the 2nd test was show the value of the probability $p = 0,000$. There is means a pregnant yoga exercise influence on changes lung volumes the third trimester of pregnancy. The result of 3th *Wilcoxon test* showed the same thing, the probability value are $p = 0,000$. There is means a pregnant yoga exercise influence of changes lung volumes the third trimester of pregnancy. The results of calculation sleep quality questionnaires using the *Pittsburgh Sleep Quality Index* was indicated the changes quality of sleep. There is seen from *Wilcoxon test* with a probability value $p = 0.000$ indicates that a pregnant yoga exercise influence changed the quality of sleep in the third trimester of pregnancy. The conclusion of this study is a

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prenatal yoga increased of lung volume and sleep quality in the third trimester of pregnancy.

Keywords: prenatal yoga, lung volume, sleep quality, third trimester of pregnancy

1. Introduction

Pregnancy occurs through several events, namely conception (fertilization), cell division (zygote), implantation in the wall of the reproductive tract, and the growth and development of the zygote. Pregnancy causes physiologic changes occur in pregnant woman's body. The physiological changes include changes in organs of the reproductive system, integument system, breast, changes in metabolic, hematological system, cardiovascular system, respiratory system, excretory system, digestive system, endocrine system and the musculoskeletal system, nervous system and eyes. Pregnancy causes an increase in energy metabolism, so the nutritional needs during pregnancy increased. Pregnancy also causes physiological changes in pregnant women. The physiological changes triggered by hormonal changes during pregnancy progresses. These hormones include estrogen, progesterone, the hormone HCG (Human Chorionoc Gonadotropin), and hormone HPL (Human Placental Lactogen) (Sukarni and Margaret, 2013). The effect of high levels of hormones during pregnancy on maternal emotions tend to be on the negative emotion. Negative emotions are often experienced by pregnant women include feeling more sensitive pregnant women, pregnant women require more attention, pregnant women jealous easily and empathize (Werdiningsih, 2013). Pregnant women who are not able to control emotions can cause stress during pregnancy. Stress during pregnancy can cause sleep disturbance in pregnant women.

Irianto (2014) describes the growth of the uterus which mainly occurs in the second trimester is hypertrophy or enlargement of the size of the uterus. This happens due to various stimuli in the uterus to increase in size. Fetal growth makes the uterus stretches so it stimulates protein synthesis in the uterine myometrium. Before the onset of pregnancy, the uterus is one of the organs that are in the pelvic cavity. At the time of the first trimester of pregnancy, the uterus becomes an organ located in the abdominal cavity. The layout is not too anteverted uterus or antefleksi. Its position in the abdominal cavity cavity tend to occupy the upper right, this is because the colon occupies the left part of the pelvic cavity so that the position of the uterus when growth becomes inclined to the right. High uterine fundus is palpable through the abdomen when the position of the uterus is above the simpisis pubis.

Increased skin blood flow during pregnancy serves to remove excess heat that is formed due to increased metabolism. On the skin of the abdomen after mid-pregnancy, the grooves are formed reddish slightly concave, sometimes occur on the skin of the breast and thighs. It is called striae gravidarum, or stretch marks (Cunningham, et al., 2014). Effect of estrogen resulted in hyperplasia of the ductal system and interstitial tissue of the breast. Breast enlarged and tense, happens hyperpigmentation of the skin and glandular hypertrophy Montgomery especially the areola and papilla due to the influence melanofor (Sukarni and Margaret, 2013).

In the third trimester, the mother basal metabolic rate increased by 10-20% compared to the non-pregnant state. It increased by 10% in women with twin gestations. Total additional energy requirement during pregnancy is estimated to reach 80,000 kcal or about 300 kcal per day. Weight gain during pregnancy is largely due to the uterus and its contents, breast, and an increase in blood volume and extravascular extracellular fluid. A small portion of the increase was generated by the metabolic changes that cause an increase in the water cell of new fat and protein deposition (Cunningham, et al., 2014).

Blood volume is a combination of plasma volume and red blood cell volume. Increased blood volume during pregnancy can range from 30-50% and more in a multiple pregnancy. Increased blood volume associated with the increase in CO started 6 weeks of pregnancy. Increased blood volume is also associated with hormonal mechanism. Increased plasma volume by about 50%, it is intended to meet the maternal and fetal metabolism. This increase is closely related to the baby's weight. Women with a multiple pregnancy will increase plasma volume is greater than mothers with normal pregnancies (Irianto, 2014). During pregnancy and during childbirth, heart and circulatory physiological adaptation that great. Changes in heart function began to appear during the first 8 weeks of pregnancy. Cardiac output increased since the fifth week and reflect the reduction in systemic vascular resistance and increased heart rate. Resting pulse rate increased by about 10 beats / minute during pregnancy. Along with the lifting of the diaphragm, heart shifted to the left and to the top and slightly rotate around the axis length (Cunningham, et al., 2014).

Pregnancy affects the respiratory system in lung volume and ventilation. Changes in anatomy and physiology of the respiratory system during pregnancy is necessary to meet the increased metabolic and oxygen for the body needs both mother and fetus. The changes are influenced by hormonal and biochemical influences. Cartilage thoracic muscle relaxation and makes the chest shape change. The diaphragm becomes more rose to 4 cm and a diameter of breast crosswise into 2 cm (Irianto, 2014). In the excretion system found a number of changes due to pregnancy. Urinary glucose

levels can increase during pregnancy tubules decreased ability to absorb glucose. Kidney pregnant women should work as the primary excretory organ for the fetus, as well as associated with increased volume and intravascular and extracellular metabolism. Renal changes during pregnancy associated with the effect of progesterone in the muscle relaxes and the pressure of the uterus changes and changes in cardiovascular system. Increased renal length 1.5 cm, it disebabkan increased blood flow, blood vessels and increasing the volume of fluid interstitial space (Irianto, 2014). Stomach and intestines displaced by the uterus and continue to grow during pregnancy. Hemorrhoids are quite common during pregnancy. The disorder is mainly caused by constipation and increased pressure in the veins under the enlarged uterus (Cunningham, et al., 2014).

Function of the hormone progesterone stimulate breast gland enlargement, assist in the formation of sex, and maintain a pregnancy. High levels of the hormone in pregnant women, particularly the hormone progesterone and physical changes that occur in pregnant women will have an impact on the psychological condition of pregnant women. Effect of high levels of hormones during pregnancy tend to be negative emotions. Some negative emotions are often felt by pregnant women are easily offended (pregnant women to be more sensitive), require more attention than usual, jealous, and easy to empathize (Werdiningsih, 2013).

Progressive lordosis is a typical picture of a normal pregnancy. Lordosis as compensation anterior position of the enlarged uterus. During pregnancy, joint sacroiliaca, sacrocoxigeus, and pubic increased mobility. Joint mobility may play a role in maternal posture changes and vice versa can cause discomfort in the lower back. This interferes with the advanced stages of pregnancy, when pregnant women sometimes feel pain, numbness, and weakness in the extremities atasnya.akibat great lordosis with anterior neck flexion and shoulder girdle melorotnya that cause drag on the ulnar and median nerves (Cunningham, et al., 2014).

Women often report problems with concentration, attention, and memory during pregnancy and childbirth. About 12 weeks and continued throughout the first 2 months postpartum, women have difficulty falling asleep, reduced hours of sleep a night, and decreased sleep efficiency and frequent waking. Frequency and duration of episodes of sleep apnea reported to have decreased significantly in pregnant women than in women postpartum (Cunningham, et al., 2014).

Corneal sensitivity is reduced, and the biggest change took place in akhir gestation. Turbidity brownish red on the posterior surface of the cornea (Krukenberg spindles) is also more common during pregnancy (Cunningham, et al., 2014).

Yoga is a comprehensive health system (holistic) formed from ancient Indian culture since 3000 BC ago. Yoga or yuj in the ancient Sanskrit language, it means union. The union between the atman (self) and Brahman (the Almighty). Through yoga one will better know him, know his thoughts, and know his soul. If someone is getting to know her, the closer to the Creator (Sindhu, 2013).

Flow yoga widely practiced today is Hatha Yoga. Hatha yoga is traditionally is a type of yoga that focuses its practice on asanas (yoga postures or technical mastery of the body), pranayama (technical mastery of breath), bandha (locking techniques of energy), mudra (control techniques of energy), and kriya (cleansing technique of the body) (Sindhu, 2009).

Yoga for pregnancy can be done through Asana. The benefits of yoga are pregnant women through the physical benefits, the benefits of mental and spiritual benefits. The physical benefits gained are (1) to make the posture to be good, well-built and strong throughout gestation, (2) the blood circulation and supply of oxygen, nutrients and vitamins to the fetus, (3) strengthening the back muscles to carry weight because of pregnancy and to avoid injury to the back (lumbago), (4) train the pelvic floor muscles that serve as muscle birth to be strong to support the load as a result of pregnancy, as well as to support the bladder and bowel, and (5) reduce some discomfort during the ages pregnancy, such as back pain, back pain, morning sickness, weak bladder, heartburn, constipation, etc. (Islafatun, 2014). Sindhu (2009) explains that there are four pregnant yoga session include: 1) breathing techniques, 2) heating technique, 3) Exercise postures, 4) Meditation.

Lung volume consists of tidal volume, inspiration reserve volume, expiratory reserve volume and residual volume. Tidal volume is the volume of air inspired and diekspirasi every time breathing normally, the amount is 500 ml in men. Inspiration backup volume is the volume of air that can be inspired extras after breathing normal and above normal tidal volume and done with a strong inspiration. This volume of 3000 ml. Expiratory reserve volume is the volume of extra air that can still be diekspirasi through a strong expiration at the end of normal tidal expiration. Normal amount is 1100 ml. The residual volume is the volume of air that still remains in the lungs after the most powerful expiratory volume is the amount of approximately 1200 ml (Wiaro, 2013).

Quality of sleep can be measured using the *Pittsburgh Sleep Quality Index (PSQI)*. PSQI is an instrument for measuring the quality of sleep in adults consists of seven components of the test, which is a subjective sleep quality, sleep latency, sleep duration, sleep efficiency daily, sleep disturbances, use of sleeping pills, and dysfunction of daytime activity. Each component has a value range of 0-3 with 0 menunjukkan no

trouble sleeping and 3 showed severe sleep problems. Scores of the seven components are aggregated into a global score with a range of grades 0-21. Total score is adjusted to criteria that are grouped as follows. The value ≤ 5 is good sleep quality, and poor sleep quality if value > 5 .

2. Materials and Method

The research was conducted in Nismara Mom and Kids, Jl. RM. Said 149 Surakarta in October-December 2016, with the implementation of one time in one week that is on Sunday. This research is an experimental study that researchers conduct experiments or treatment of independent variables and then measure the results or effects of the experiment on the dependent variable (Sujarweni, 2015). The design of the study is *one group pretest posttest design* is the study design with one group without a comparison group (controls) (Notoatmojo, 2012). In this study, researchers gave the treatment of pregnancy yoga exercises to sample and measure lung volume and sleep quality in before treatment and after treatment is given.

The study population was the whole object of the study or the object under study (Elfrinda, et al, 2011). Samples according Sujarweni (2015) is part of a number of characteristics possessed by the population used for the study. Sugiyono (2015) explains that purposive sampling is a sampling technique with particular consideration of data sources. Samples taken by the researchers are part of the population who met the inclusion criteria (criteria that can be taken for research). Criteria for inclusion in this study were (1) women of reproductive age, (2) women with first pregnancy (primigravida) and pregnancies of more than one (multigravida), (3) women with third trimester of pregnancy, (4) pregnant women who previously have not never follow the sport on a regular basis, (4) the pregnant woman who follows a pregnant yoga exercise routine. The number of samples in this study were 24 people.

The data analysis technique is the analysis of research data. Steps of data analysis techniques are as follows: (1) Data respondents including age, education, work and pregnancy, were analyzed with descriptive statistical analysis is then processed by SPSS (*Statistical Product and Service Solutions*). (2) Data from the measurement of lung volume and quality of sleep were analyzed by inferential analysis (inductive), and then processed with SPSS. The results form the data with SPSS is normality test with the *Kolmogorov-Smirnov test* form to the data by the samples > 50 or the *Shapiro-Wilk* for data with a samples < 50 . (3) The data are seen normality, if a normal distribution (p value > 0.05), the data analysis with *paired sample t test*. If the data is not normally distributed ($p < 0.05$), the data analysis with *Wilcoxon test*.

3. Result

Respondents in the study was 24, with characteristics such as age, education, occupation, and pregnancy. The number of respondents in the age group 18-25 years is the fourth of respondents (16.7%), while the number of respondents in the age group 26-49 years is 20 respondents (83.3%). The number of respondents with a diploma degree as much as 3 respondents (12.5%), while the number of respondents with undergraduate education as much as 21 respondents (87.5%). It shows the number of respondents with undergraduate education many pregnant yoga exercises that follow. The number of respondents who worked as many as 16 respondents (66.7%), and respondents who did not work as much as 8 respondents (33.3%). Respondents who follows the pregnancy exercise more working than not working. Characteristics of respondents in the form of pregnancy with the number of respondents primigravidae many as 13 people (54.2%). The number of respondents with secundagravida many as 10 people (41.7%), and the number of respondents multigravida by 1 person (4.2%). The frequency of respondents dominate primigravidas pregnancy pregnant yoga exercises.

The results of data processing of the results of lung volume variables using the *Shapiro-Wilk normality test* on pretest 1 with probability (p) > 0.05 , then the normal distribution of data. The results of counting at 1th posttest with $p = 0.287 > 0.05$, then the normal distribution of data. Calculation of lung volume variable on 2nd pretest with $p = 0.231$ then the normal distribution of data because of $p > 0.05$. Counting on the 2nd posttest normal distribution with $p = 0.141 > 0.05$. Lung volume variable count results on the 3th pretest with $p = 0.041 < 0.05$, the data are not normally distributed. Counting on the 3th posttest with $p = 0.006 < 0.05$, the data are not normally distributed. Calculation quitionary variable sleep quality using *Saphiro-Wilk normality test* on the pretest showed $p = 0.006 < 0.05$, the data are not normally distributed.

Counting sleep quality questionnaires at posttest shows the value of $p = 0.000 < 0.05$, the data are not normally distributed. Normality test results that have been carried out followed by a test of the effect of using a *paired sample t-test* (normal distribution of data) in the calculation of the variable 1th posttest-1th pretest and 2nd pretest-2nd posttest. In the 1th pretest-1th posttest showed a significant effect seen from the value of $p = 0.000 < 0.05$, the H_a accepted and H_o rejected. The results tally with *paired samples t-test* on the 2nd pretest-2nd posttest showed no significant effect that the value of $p = 0.000 < 0.05$, H_a accepted and H_o rejected. The results tally with the *Wilcoxon test* (data not normally distributed) on 3th pretest-3th posttest shows no significant effect with $p = 0.000 < 0.05$, which means H_a accepted and H_o rejected. Calculation of pretest

and posttest questionnaires using the *Wilcoxon test* showed no significant effect with $p = 0.000 < 0.05$, H_a accepted and H_o rejected.

4. Discussion

Changes of Lung Volume, prenatal yoga conducted by pregnant women in the third trimester at Nismara Moms and Kids Surakarta (Central Java, Indonesia) indicate changes in lung volume. It can be seen from the test results *paired sample t-test* on 1th test and 2nd test which shows a probability value $p = 0,000$ which means there is a prenatal yoga influence on changes in lung volumes in the third trimester of pregnancy. *Wilcoxon test* results on the 3th test shows the same thing, that is a probability value $p = 0,000$ which means there is a prenatal yoga influence on changes in lung volumes in the third trimester of pregnancy.

Changes Sleep Quality, the results of questionnaires calculation sleep quality using the *Pittsburgh Sleep Quality Index* indicates changes in the quality of sleep. It is seen from *Wilcoxon test* with a probability value $p = 0.000$ indicates that there is a prenatal yoga influence to change the quality of sleep in the third trimester of pregnancy.

The implications of the changes lung volume and sleep quality in the third trimester of pregnancy make a positive contribution in relation to prenatal yoga care in the health service. This suggests that lung volume in pregnant women may increase after doing prenatal yoga, so that respiratory symptoms experienced by pregnant women can be reduced. The sleep quality in pregnant women also increased after doing prenatal yoga, so pregnant women will be more comfortable and more refreshed when you wake up and can daily activities properly.

5. Conclusion

Based on the results of the study showed that prenatal yoga increases lung volume and quality of sleep in the third trimester of pregnancy.

Aknowledgement

1. Prof. Dr. Muchsin Doewes, dr., SU, AIFO and Prof. Dr. Agus Kristiyanto, M.Pd. as lecturers who have given a lot of knowledge, guidance and direction in the completion of this thesis.
2. Respondents and the parties involved in the research.
3. All those who have helped researchers in completing this study.

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