

# The Effect of Prenatal Yoga on Hb Level and Bodyweight of Second- and Third-Trimester Pregnant

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## ABSTRACT

Maternal mortality is closely related to anemia. The results of RISKESDAS 2018 regarding anemia in pregnant women showed a score of 48.9%. Besides anemia, another indicator to predict risk in pregnancy is weight gain. One of the solutions to improve maternal health and prevent complications is through the provision of prenatal yoga. Prenatal yoga exercises may improve blood circulation, pushing water from the vascular to the interstitial, causing plasma volume to decrease and increasing hemoglobin levels. With regular prenatal yoga practice, weight gain and body fat will be less. This study aims to find out the effect of prenatal yoga on weight gain and Hb levels in second- and third-trimester pregnant women. Therefore, the researcher applied a comparative study with a quasi-experimental design. Samples were 63 second- and third-trimester pregnant women. The methodology of collecting data by measuring the body weight and the hemoglobin (Hb) level. The researcher analyzed the obtained by t-test, Paired t-test, Friedman test, and Mann-Whitney test. The results indicated that the weight gain in pregnant women from the intervention group was slightly less than that of the control group ( $p < 0.001$ ). Hb levels in the intervention group was lower, with a consistent pattern. In conclusion, pregnant women participating in prenatal yoga had lower weight gain than those who did not participate in prenatal yoga. Besides, they also had a lower Hb level increase by a consistent pattern than those who did not participate in prenatal yoga.

**Keywords:** Prenatal Yoga, Bodyweight, and Hb level.

## 1. INTRODUCTION

Data from the 2015 SDKI indicated that the maternal mortality rate (MMR) was 305/100,000 live births. The causes of maternal death are bleeding (30.3%), hypertension (27.1%) infection (7.3%) prolonged labor (1.8%) and others (40.81)[1]. The results of 2018 RISKESDAS showed that anemia in pregnant women was 48.9%. Meanwhile, in 2013, it was only 37.1%[2]. In point of fact, the high maternal mortality rate is closely related to anemia.

The Institute of Medicine recommends that the bodyweight increase during pregnancy is around 11.5 - 16 kg with a normal pre-pregnancy body mass index (BMI). If the BMI is  $\geq 30$  (overweight), the

recommended body weight increase during pregnancy is 5 - 9 kg[3]. Ika Y (2015) found that weight gain in third trimester pregnant women was significantly associated with the incidence of preeclampsia ( $\alpha < 0.05$ )[4] She added that the low weight gain had a correlation with low birth weight.

One of the preventive efforts to improve maternal health is through the provision of prenatal yoga. The ACOG recommends normal pregnant women do physical exercise[5]. In line with that, movements in prenatal yoga may improve blood circulation, increase oxygenation, and stimulate changes in intravascular osmotic pressure, in which it pushes water from the vascular compartment to the

interstitial space, causing plasma volume to decrease and increasing hemoglobin levels. Regular physical exercise also results in less weight gain and body fat. The elasticity of blood vessels will increase due to reduced fat deposits and increased muscle contraction of the blood vessel walls. The high elasticity of blood vessels will facilitate blood circulation[7] Pregnant women who exercise regularly will gain less weight and body fat than those who are less active[8] In a meta-analysis study, the increase of weight gain was lower in the group physical activity[9].

**2. METHOD**

The researchers in this study applied a quasi-experimental method with a pretest-posttest with control group design[10]. The population was all second- and third-trimester pregnant women at Minasatene Health Center, totaling 202 people. Samples were selected using consecutive sampling. The used sample size was based on the minimum sample size, namely 31 subjects in the treatment group and 32 subjects in the control group. Furthermore, data collection was carried out for 8 weeks.

**3. RESULTS AND DISCUSSION**

63 pregnant women participated in this study. 32 of them were given regular prenatal yoga practice, while 31 of them were put in the control group. In the initial planning, prenatal yoga was given for 12 weeks. However, due to the COVID-19 pandemic, it was only carried out for 8 weeks. Furthermore, the distribution of respondent characteristics can be seen in the following table.

**Tabel 1.** Distribution of the respondent characteristics

Characteristics	ffrequency (%)		p-value*
	Control (n=31)	Intervention (n=32)	
Age			
Risky	7 (21.9)	3 (9.7)	0.191
Not Risky	25 (78.1)	28 (90.3)	
Gravida			
Primigravida	9 (28.1)	10 (32.3)	0.726
Multigravida	23 (71.9)	21 (67.7)	
The History of partum			
Never	9 (28.1)	10 (32.3)	0.980
Nulliparous	6 (18.8)	7 (22.6)	
Nulliparous	17 (53.1)	14 (45.2)	

Multiparous			
History of abortion	30 (93.8)	30 (96.8)	0.580
Never	2 (6.3)	1 (3.2)	
Ever			
Gestational age			
Second Trimester	18 (56.3)	18 (58.1)	0.887
Third Trimester	14 (43.8)	13 (41.9)	
Third Trimester			
Educational Level	17 (53.1)	18 (58.1)	0.699
Low	15 (46.9)	13 (41.9)	
High			
Occupational Status	11 (34.4)	10 (32.3)	0.861
Working	21 (65.6)	21 (67.7)	
Not working			

\*Test of homogeneity of variance.

The table above shows the characteristics of respondents, both groups of homogeneous data variance The age of the both groups is dominantly not at risk (20 – 35 years). According to the gravida, most of the participants in both groups are multigravida (the number of pregnancies of ≥ 2 times). When considered from the history of childbirth, the participants in the both groups are multiparous (the number of pregnancies of ≥ 2 times). In addition, most of the pregnant women in both groups have no history of abortion. Furthermore, they are dominant in the third trimester of pregnancy. Based on the latest education, they tend to have a low education level (elementary or junior high school). According to the occupation, most of them do not work (housewives)

**3.1 Comparison of body weight gain in pregnant women**

**Table 2.** Differences in the bodyweight of pregnant women in each measurement

Groups	Mean (kg) ± SD			p-value
	Initial	First-week	Second-week	
Control	53.07 ± 7.01	56.35 ± 7.09	59.90 ± 7.32	< 0.001 <sup>a</sup>
Intervention	53.46 ± 7.26	56.65 ± 7.13	59.62 ± 7.22	< 0.001 <sup>a</sup>
<b>p-value</b>	0.829 <sup>b</sup>	0.867 <sup>b</sup>	0.880 <sup>b</sup>	

<sup>a</sup> One-sample t-test; <sup>b</sup> Independent sample t-test.

In the first measurement there was an increase in the control group with a mean score of 56.35 and the second- measurement with a mean score of 59.90. The increase is statistically significant with a *p*-value of > 0.05, meaning that there is a difference in the bodyweight in the control group. In the intervention group, there is also an increase in the bodyweight of pregnant women from the initial measurement until the first-week measurement with a mean score of 56.65 and the second-week measurement with a mean score of 59.62 after the provision of prenatal yoga. The increase is statistically significant with a *p*-value of > 0.05, meaning that there is a difference in the bodyweight of pregnant women from the initial measurement to the first-week and second-week measurements after the provision of prenatal yoga. It can be considered that by doing yoga exercises, the bodyweight of pregnant women does not increase much every week.

The table also shows that after the independent t-test was conducted, the initial measurement between both groups indicates that the in intervention group is slightly higher than that of the control group. In the first measurement, the bodyweight of pregnant women in the intervention group is still higher than that of the control group. In the second measurement, the bodyweight of pregnant women in the mediation bunch is lower than that of the benchmark group although the difference is still not significant. It can be considered that the body weight of pregnant women who do not do prenatal yoga increases every month, while the bodyweight of pregnant women who do prenatal yoga does not increase much every month. The bodyweight of pregnant women is summarized in the following figure.

This result is in line with a study by Suryani (2015) which measured the pregnant who did the regular and irregular physical exercise. The results of her study indicated no difference between treatment and control groups before and after being given pregnancy exercise (*p* > 0.05). Furthermore, mothers' weight gain during pregnancy was less in the treatment group with a mean score of 8.68 ± 2.08 than that of the control group with a mean score of 9.96 ± 2.41.<sup>22</sup> This is following the theory that physical exercise in prenatal yoga will lead to less weight gain and body fat.<sup>11</sup> Furthermore, prenatal yoga is useful for strengthening muscles to withstand the burden of pregnancy, increasing blood circulation, and increasing lung capacity.

### 3. 2 Comparison of body weight in pregnant women before and after the provision of prenatal yoga

**Table 3.** Differences in the bodyweight before and after the provision of prenatal yoga

Groups	Measurement	Mean Diff (kg)	SD	<i>p</i> -value*
Control	Pre-Post1	3.27	1.66	< 0.001
	Pre-Post2	6.82	3.14	< 0.001
	Post1-Post2	3.54	1.65	< 0.001
Intervention	Pre-Post1	3.18	1.36	< 0.001
	Pre-Post2	6.15	2.39	< 0.001
	Post1-Post2	2.96	1.14	< 0.001

\*Paired sample t-test.

There was an increase in the weight of pregnant women from the initial measurement to the first measurement with an average increase of 3.27 kg in the control group. From the initial measurement to the second measurement, the average increase is 6.82 kg. Furthermore, the difference in the increase in body weight of pregnant women from the first measurement until the second-week measurement is 3.54 kg.

Meanwhile, in the intervention group, there is a difference in the bodyweight of pregnant women from the initial measurement until the first measurement with an average increase of 3.18 kg. In addition, from the initial measurement to the second measurement, the average increase is 6.15 kg. Furthermore, the difference the increase in body weight of pregnant women from the first-week measurement until the second measurement is 2.96 kg.

From the table above, it can be concluded that, in each measurement, there are differences in body weight gain before and after the provision of prenatal yoga. This can be considered from the *p*-value of < 0.001. Bodyweight gain during pregnancy must be adjusted to BMI before pregnancy. Excessive body weight gain is associated with the incidence of

preeclampsia. Meanwhile, less bodyweight gain is associated with the final result of pregnancy. Bodyweight gain in pregnant women exceeding 15 – 17.5 kg may cause fat accumulation in mother and fetus, which can cause water retention[12].

There are several factors of increasing pregnant body weight. The main factors are mothers' nutritional status and food consumed during pregnancy. The provision of prenatal yoga may lead to a consistent increase in the bodyweight of pregnant women during pregnancy. When doing exercise, mothers will train and flex their muscles, improving blood flow. Therefore, the addition of cellular fluid due to metabolic changes will decrease[13]. Muscles that contract during exercise will use adenosine triphosphate in the mitochondria so that energy reserves will be reduced[14]. This is one of the factors that makes the increase of body weight to be more controlled to mothers who carry out prenatal yoga exercises.

This is in line with research conducted by Haakstad & Bo (2011) on regular exercise to prevent excess weight gain during pregnancy. The result is that regularly doing aerobic exercise significantly reduces weight gain during pregnancy[15]

**3. 3 Comparison of the increase of Hb levels**

**Table 4.** Differences Hb levels

Groups	Mean (gr/dl) ± SD			p-value
	Initial	First	Second	
Control	10.43 ± 0.92	10.84 ± 0.98	11.26 ± 1.11	< 0.001 <sup>a</sup>
Intervention	11.06 ± 0.90	11.37 ± 0.81	11.68 ± 0.75	< 0.001 <sup>b</sup>
<b>p-value</b>	<b>0.010<sup>c</sup></b>	<b>0.046<sup>c</sup></b>	0.189 <sup>c</sup>	

<sup>a</sup> Friedman test; <sup>b</sup> one-sample t-test; <sup>c</sup> Mann-Whitney test.

After the Friedman test, there was an expansion in the Hb level of pregnant ladies in the control group from the initial measurement to the first measurement, which was 0.41 g/dl. In the second measurement, it increased to 0.42 gr/dl ( $p > 0.05$ ). In the experimental group after the one sample t-test, there was also an increase in the Hb level of pregnant women from the initial measurement to the first measurement of 0.31 g/dl. In the second

measurement, there was the same increase after giving yoga practice ( $p > 0.05$ ). It can be concluded that by doing prenatal yoga exercises, pregnant women's Hb levels can have a consistent increase week by week.

Table 4 also shows the results of the Mann-Whitney at the initial measurement between control and intervention groups. It indicates that the Hb levels of pregnant women in the intercession bunch are higher than that of the benchmark group and there is critical contrast between the two gatherings. At the first measurement between the two groups, Hb levels of pregnant ladies in the mediation bunch are as yet higher than that of the benchmark group and there is a critical distinction between them. At the second measurement, the Hb levels of pregnant women in the intercession bunch are somewhat higher than that of control bunch. In any case, the thing that matters isn't critical. It can be considered that the Hb levels of pregnant women who do not do yoga exercises increase week by week. Meanwhile, pregnant women who do yoga exercises experience a consistent increase in their Hb levels.

During pregnancy, hematological and cardiovascular changes occur. In pregnancy blood volume increase progressively at 6 – 8 weeks of gestation and will reach a maximum at approximately 32 – 34 weeks of gestation. The increase in blood volume includes the volume of plasma, red blood cells, and white blood cells. Plasma volume increases by 40 – 50%, and red blood cells increase by 15 – 20%, causing hemodilution and decreased blood viscosity. This situation causes physiological anemia. The exact mechanism of the increase in blood volume is unknown. Several hormones, such as renin, angiotensin, aldosterone, estrogen, and progesterone, are thought to play a role in this mechanism[6].

A study conducted by Mardianti (2018) revealed a significantly different increase in Hb levels in the two groups of pregnant women. In addition, she found that there was significant different increase in Hb levels with a p-value of 0.00 before and after the provision of pregnancy exercise in pregnant women who did the pregnant exercise with and without breathing exercises[16].

Hb levels that increase due to physical exercise are presumed to occur in line with changes in plasma volume. Sweat or body fluids that come out during exercise cause plasma volume to decrease and Hb levels relatively increase.<sup>17</sup> Pregnant women are

recommended to do moderate physical exercise, such as prenatal yoga.

**3.4 Comparison of Hb level in pregnant women before and after the provision of prenatal yoga**

**Table 5.** Differences in Hb levels before and after the provision of prenatal yoga

Groups	Measurement	Mean Differences (gr/dl)	SD	P Value
Control	Pre-Post1	0.41	0.92	<0.001 <sup>a</sup>
	Pre-Post2	0.83	0.98	<0.001 <sup>a</sup>
	Post1-Post2	0.42	1.11	<0.001 <sup>a</sup>
Intervention	Pre-Post1	0.31	0.16	<0.001 <sup>b</sup>
	Pre-Post2	0.61	0.32	<0.001 <sup>b</sup>
	Post1-Post2	0.31	0.17	<0.001 <sup>b</sup>

<sup>a</sup> Wilcoxon test; <sup>b</sup> paired sample t-test.

The difference in the average Hb levels of pregnant women from two groups before and after the provision of prenatal yoga. In the control group, there differences in the Hb levels of pregnant women from the initial measurement the first measurement with an average Hb level increase of 0.41 g/dl. In the initial measurement to the second measurement, there are differences in Hb level increase, namely 0.83 gr/dl. Furthermore, the Hb level increase from the first measurement the second measurement is 0.42 gr/dl.

Meanwhile, in the intervention group, there are also differences in Hb levels from the initial measurement to the first measurement with an average Hb level increase of 0.31 g/dl. In the initial measurement to the second-week measurement, there are differences in the Hb level increase, namely 0.61 gr/dl. Furthermore, the Hb level increase from the first-week measurement to the second-week measurement is 0.31 gr/dl.

Generally, in people who frequently do physical exercise, Hb levels tend to be higher due to the increased need for O<sub>2</sub> and hemoglobin which serves to deliver O<sub>2</sub> to muscle cells. This condition is possible because the increase in Hb levels due to physical exercise only plays a small role, while the Hb level of a pregnant woman is highly dependent on

the type of iron consumed and the bioavailability of iron in food.

Prenatal yoga is a form of physical exercise that is beneficial because the movements in prenatal yoga may cause blood circulation in the body to increase, oxygen to be transported to the muscles, and the number of body tissues to increase. Prenatal Yoga can increase circulatory strain and cause changes in intramuscular osmotic tension with the goal that it pushes water from the vascular compartment to the interstitial space, making plasma volume decline and automatically raising Hb levels.<sup>18</sup> Therefore, prenatal yoga possesses many benefits during pregnancy, labor, and postpartum. For this reason, prenatal yoga is important to do during pregnancy.

**4. CONCLUSIONS**

The body weight of pregnant women who do not do prenatal yoga increase every month. Meanwhile, pregnant women who do prenatal yoga do not experience a significant increase in body weight every month. There is in body weight gain before and after the provision of prenatal yoga ( $p < 0.001$ ). There was an increase in the Hb level of pregnant women in the control group from the initial measurement of the first and second measurements ( $p > 0.05$ ). In addition, there was an increase in Hb levels of pregnant women in the control group in each measurement. In the intervention group from the initial measurement to the first measurement to the second measurement the pattern of Hb increase was the same after giving prenatal yoga ( $p > 0.05$ ). By doing prenatal yoga, pregnant women's Hb levels have increased with a consistent pattern. There is a significant increase in respective groups of pregnant women. However, after the two groups are compared, there is no significant difference found.

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