"Effectiveness Of Nano Particles Of Moringa Oleifera Leaf Extract On Anxiety, Serotonin Levels In Pregnant Women With Hypertension"

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Abstract:

Background: Hypertensive *Pregnancy Disorders* are one of the causes of increasing morbidity rates and maternal, fetal, and neonatal mortality rates. Management of hypertension in pregnancy can be done pharmacologically and nonpharmacological. Non-pharmacological therapy, which can be used to reduce anxiety levels is herbal therapy from Moringa leaves processed with nanoparticle technology.
Objective: research to prove the intervention of nano acupressure particles of moringa oleifera extract (NoPEMO) can reduce anxiety (HARS scale) and increase serotonin.
Method: *True experiment*, with *Randomized Control Trial group design,* in two groups, namely the nano-particle group of moringa oleifera extract (NoPEMO), and the control group. Respondents were pregnant women with hypertension as many as 20 people.
Results: As many as 20 pregnant women with hypertension showed an average age of 28.60±31.20 years, from the results of the study, showed that in 2 treatment groups before and after the intervention there were significant differences (p<0.001). NoPEMO can lower anxiety (23.30±16.40), and increase serotonin levels (134.37±213.32).
Conclusion: Nanoparticles of moringa oleifera extract (NoPEMO) 500 mg/day affect blood pressure through a decrease in anxiety levels, and an increase in serotonin levels in pregnant women with hypertension.

Keywords: Nanoparticles of moringa oleifera extract, anxiety levels (HARS scale), serotonin levels.
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Intorduction

Hypertensive Pregnancy Disorders are one of the causes of increased morbidity and mortality in maternal, fetal, and neonatal. [1.2] According to *the Hypertension in Pregnancy Guideline from the American College of Obstetricians and Gynaecologists* (ACOG) 2013 it is estimated that 10% of pregnancies worldwide have hypertension during pregnancy. [1] Based on data from the Ministry of Health in 2020, the maternal mortality rate in Indonesia has increased from 4,197 cases in 2019 to around 4. 627 inhabitants in 2020, or as many as 230 per 100,000 live births. Based on data from the Central Java Health Office in 2021, the maternal mortality rate in Central Java shows 98.6 per 100,000 live births (530 cases) in 2020. [2.3] Causes of maternal death in Indonesia in 2019, caused bleeding (32%), hypertension (26%), infections (7.3%), and others, such as heart disease, and diabetes mellitus (40.8%). [5th]

In addition, hypertension in pregnant women is also influenced by several factors, including age, nutrition, multiple pregnancies, and anxiety. [1,4] The anxiety and depression that appear during pregnancy affect negative psychological changes between the mother and the fetus. [5,6,7] Previous studies have shown that pregnancy anxiety levels will increase when they know there are risks or complications in their pregnancy. [8.9] Anxiety conditions, will stimulate the hypothalamus to synthesize *Corticotropin Releasing Hormone* (CRH) as part of the biological response due to stress. CRH will stimulate the secretion of *Adreno Cortico Tropin Hormone* (ACTH) and serotonin that

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suppress the immune system, namely *immunoglobulin* G (IgG). 10,11,12

Management of hypertension in pregnancy can be done pharmacologically and nonpharmacological. Non-pharmacological treatment is a form of treatment service that uses methods, tools, or materials used as alternatives or complements to certain medical treatments. 13,14,15 In the world community and Indonesia has long applied herbal therapy in overcoming their health,14, while the implementation for pregnant women is still small. Another non-pharmacological therapy that can be applied to overcome the risk of hypertension in pregnant women is by giving herbal leaves noPEMO (*moringa oleifera*) in the form of nano-extracts. According to WHO recommendations pregnant women, especially pregnant women with risks, to consume more nutrients that contain a lot of calcium and antioxidants. 16.17 Moringa leaves based on the results of research, contain a lot of flavonoids, calcium and antioxidants, which are good for consumption by pregnant women.

Method

The design of this study is *a true experiment* study, with *a randomized pretest-posttest control group design*. The affordable population in this study was all hypertensive pregnant women with blood pressure ≥ 130/90 mmHg who checked their pregnancies at the Puskesmas. A total of 20 respondents were pregnant women with hypertension. The study was conducted in the banyumas regency. Banyumas Regency is one part of the central Java province

Result

The results of the distribution of respondents' characteristics of all groups have obtained the age of respondents most of the 30% were over 35 years old, the respondents' education was mostly 35% junior high school educated, the respondents' working status was mostly 85% not working, the respondents' anxiety was mostly 72.5% experienced moderate anxiety.

Table 1 Characteristics of respondents by Variables, inclusion criteria, and intervention groups

Indicator	NoPEMO			Control			Itself
	N	Mean %	SD	N	Mean %	SD	
Age	10	31,20	6,18	10	29,30	4,62	.174
Education							
- SD	1	10	-	3	30	-	.135
- SMP	5	50	-	2	20	-	.358
- SMU	3	30	-	4	40	-	.132
- PT	1	10	-	1	10	-	.606
Work							
- Work	4	40	-	0	0	-	.241
- Doesn't work	6	60	-	10	100	-	.966
Anxiety/ Hars Scale	10	23,30	7,57	10	18,60	8,37	.623
Serotonin	10	213,32	156,42	10	200,63	177,20	.109

Table 2 Distribution of Average Serotonin Levels and HARS Scale Before and After Intervention in Intervention and Control Groups

Variable	Group	*Mean pre*	*Mean post*	*Mean differenced*	*SD*	*P-Value*
Serotonin	NoPEMO	106.63	128.39	21.76	15.347	0.002
	Control	200.63	127.63	73.00	228.087	0.338
HARS	NoPEMO	18.90	9.50	9.40	6.75	0.002
	Control	18.60	18.80	-0.20	0.422	0.168

Based on the table above, shows the results of different tests or *Paired T-tests* in the NoPEMO group and the control group in the Serotonin variable. The results of the intervention analysis in the NoPEMO group before and after the intervention was given with a mean (106.63 ±128.39), a standard deviation of 15.347, and a significance value of p = 0.002. Analysis of the intervention in the control group before and after the intervention showed a mean (200.63±127.63), a standard deviation of 228.087, and p=0.338.

the difference test or *Paired T-test* in the NoPEMO group, and the control group in the Anxity variable. The results of the intervention analysis in the NoPEMO group before and after the intervention was given with a mean (18.90±9.50), a standard deviation of 6.75, and a significance value of p=0.002. The results of the intervention analysis in the control group before and after the intervention was given with a mean (18.60±18.80), a standard deviation of 0.422, and a significance value of p=0.168. The results of the analysis showed that NoPEMO affected increasing serotonin levels and decreased anxiety levels in pregnant women.

After the data is declared to be normally distributed and homogeneous, the One Way

Anova test is then carried out. Test Results One Way Anova Serotonin Test as follows Table 3

ANOVA

Skala_Hars

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	423.200	1	423.200	7.863	.006
Within Groups	4198.000	78	53.821		
Total	4621.200	79			

ANOVA

Serotonin

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	69049.816	1	69049.816	4.266	.042
Within Groups	1262447.807	78	16185.228		
Total	1331497.623	79			

Based on the table above, it can be seen for the significance value/p-value of the variable Skala_Hars of 0.006, so the value ≤ α (0.05). Thus, there was a significant difference in the average of Anxiety test data against each group of interventions. While the Serotonin variable is 0.042, so the value ≤ α (0.05). So, there was a significant average difference in Serotonin test data against each group of interventions.

Changes in Anxiety Levels (HARS Scale) and Serotonin Levels

The results of anxiety levels (HARS scale) based on the type of treatment given, in detail can be seen in the figure below

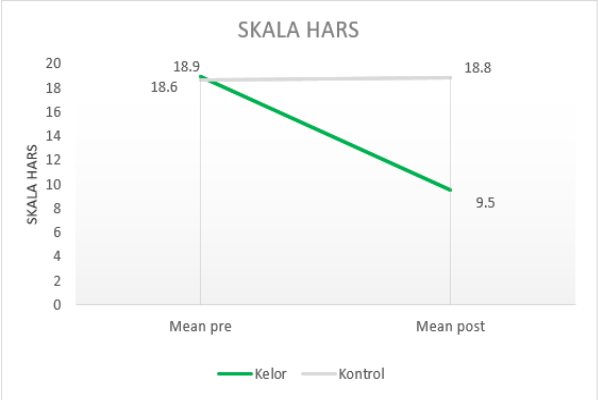

Figure 1. HARS scale changes by Group Treatment between *Pre* and *Post*

Figure 1. showed an average change in anxiety levels (HARS scale) before and after noPEMO was administered showed an average (106.63±128.39), and the control group experienced an average decrease (200.63±127.63).

Figure 2 Changes in *Serotonin* Levels by Treatment Group between *Pre* and *Post*

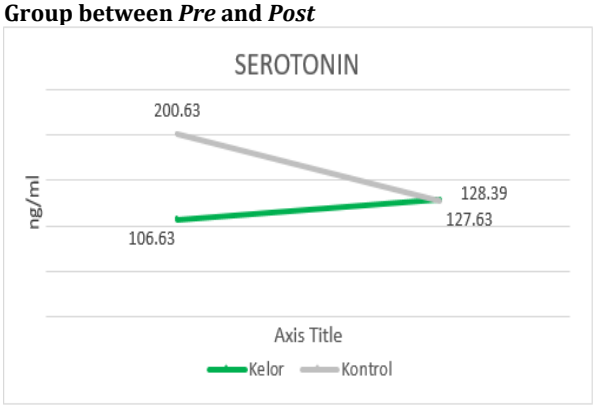

Figure 2. showed average changes in serotonin levels before and after Treatment NoPEMO showed an average (106.63±128.39) and the control group experienced an average decrease (200.63±127.63).

Discussion

The results of this study analysis showed that serotonin levels increased after being given nanoparticles of Moringa leaf extract, as well as the anxiety scale, showed a decrease. This is according to the literature that the decrease in normal values of *serotonin* can trigger the occurrence of anxiety disorders, and depression, and some patients with suicide attempts or ending their lives have *cerebrospinal* fluid levels containing low *serotonin* levels and low concentrations of *serotonin uptake*. [18th]

Moringa oleifera is a medicinal plant with antioxidant, anticonvulsant, anti-inflammatory, and neuroprotective properties. The results of research on Wistar showed that mo administration improves neuroplasticity, and cognitive behavioral function in laboratory animals modulates energy metabolism, and reduces oxidant stress. Moringa oleifera is proven to be developed further as a means to protect the brain from injuries caused by oxidative stress. [19.20] Moringa oleifera contains a lot of calcium. The results of research on the effects of vitamin D and calcium show that calcium affects the level of depression as well as a person's cognitive function. The level of depression is significantly correlated with the level of calcium in the blood and health status. F cognitive displacement showed a significant correlation with vitamin D levels in the blood.

The results showed that the level of anxiety of pregnant women with hypertension decreased after giving nanoparticles of Moringa leaf extract. The anxiety and depression that appear during pregnancy affect negative

psychological changes between the mother and the fetus. 20.21 Previous studies have shown that pregnancy anxiety levels will increase when they know there are risks or complications in pregnancy. [22] The results of the study of Robertson *et al* stated that depression and anxiety in early pregnancy, are associated with the risk of preeclampsia. 23.21 Anxiety conditions, will stimulate the hypothalamus to synthesize *Corticotropin Releasing Hormone* (CRH) as part of the biological response due to stress. CRH will stimulate the secretion of *Adreno Cortico Tropin Hormone* (ACTH) and serotonin that suppress the immune system, namely *immunoglobulin* G (IgG). [21,7,25,26]

Some research reveals that an imbalance in serotonin levels causes mood disorders, such as anxiety, anger, or depression. One of the causes is the lack of levels of the amino acid tryptophan in the body. [22] The amino acid tryptophan is one of the basic ingredients of the hormone serotonin that is not produced by the body itself but must instead be obtained from food. Serotonin is made from tryptophan produced by the body from the food consumed. Foods that contain serotonin include fish and nuts enriched with omega 3 fatty acids, soy, and dairy products. [23.24]

According to this study, several ways to increase serotonin in the body are not only by taking medications or supplements but can be obtained with non-pharmacological therapies, including acupuncture, acupressure, and herbal consumption containing calcium, and omega-3. [25.26] In addition, the way to increase serotonin hormone levels is to regulate diet, especially the sun where sunlight activates the production of the hormone serotonin so that its levels can increase. Alternative medicine for people experiencing another wrong mood disorder is exercise. Exercise by increasing motor activity and also stimulates the rate of activation of serotonin neurons. [26th]

Conclusion

Nanoparticles of moringa oleifera extract (NoPEMO) 500 mg/day significantly can lower anxiety levels, and increase serotonin levels in pregnant women with hypertension.

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