

## The Effect of Giving Moringa Honey on Stress and Cortisol Levels in Pregnant Women in Maros Regency

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**Abstract:** This study aims to examine the effect of giving Moringa Honey on Stress and Cortisol Levels in pregnant women. This study used a Randomized Controlled Trial With Pre and Post Double Blind, where the parties involved in the study such as researchers and respondents did not know the difference between MH (Moringa Honey) and RH (Regular Honey) given to respondents. The research was carried out in the working area of the Turikale Health Center and Lau Health Center, Maros Regency, with stress and cortisol levels checking at the Turikale Health Center from February to April 2020. This study was carried out for two months (8 weeks). The sampling technique used was purposive sampling. The sample is 40 pregnant women. 20 samples were given MH intervention (Moringa Honey) and 20 samples were given 15 ml/day RH. In addition, pregnant women are given blood-enhancing tablets (Fe) which are consumed by the mother before going to bed. This study was conducted for 8 weeks, saliva samples were taken to determine cortisol levels. Saliva samples were examined using the Enzyme-linked immunorbent assay (ELISA) technique and then statistically analyzed using SPSS version 25. Most of the respondents aged between 20-25 years (22.5%), had more than 1 children (45.0%), earned around 1-3 million (42.5%). The results showed a decrease in stress in the MH group from  $22.35 \pm 5.21$  to  $18.80 \pm 1.93$  and the RH group from  $19.35 \pm 3.42$  to  $21.40 \pm 2.79$ . The large difference in the changes in the two groups was seen to be significant with the value ( $p=0.001$  vs  $p=0.022$ ). There was a decrease in cortisol levels in the MH group from  $1.86 \pm 1.14$  to  $0.67 \pm 0.63$  and in the RH group from  $1.20 \pm 0.95$  to  $1.77 \pm 1.02$ , the difference was significantly seen in the cortisol levels of the two groups with value ( $p=0.001$  vs  $p=0.093$ ). As a result, it can be inferred that giving MH (Moringa Honey) to pregnant women has a greater impact on lowering stress and cortisol levels.

**Keywords:** Stress, Cortisol Levels, Moringa Honey, Pregnant Women.

### 1. Introduction

Pregnancy causes major physiological and psychological changes, which can occasionally lead to pathological abnormalities. Pregnancy-related psychological alterations might vary depending on the trimester of the pregnancy; for example, in the latter months of labor, the mother's emotions fluctuate rapidly and can become uncontrolled. Excessive anxiety, worry, and dread in pregnant women for no apparent cause might contribute to stress-related illnesses. Stress responses are usually triggered by negative thoughts and feelings of dread. Premature delivery, underweight, hyperactivity, and irritability can all be symptoms of chronic severe stress (Pieter & Lubis, 2011).

Pregnant women with psychological issues receive extra care and attention from health workers, including counseling, pregnancy tests, and treatment as a supplement to support and therapy for signs of abnormalities or pregnancy disorders. Pregnant women face a number of threats that are direct causes of mortality, including hemorrhage, infection, and eclampsia as a potential danger to the mother and children (Potentially dangerous for mother and baby). (Andi Hariati et al, 2020).

Research by Trebaticka & Durackova (2015), polyphenols in food have the potential to become drugs in the field of mental health after studying the entire mental health process. Members of the International Society for Research in Psychiatric Nutrition advocate diet and nutrition, which are both key determinants of physical and mental health. Based on research by Leone et al (2015) dried Moringa leaves are a great source of polyphenols. The range is from 2090 to 12,200 mg AEG/100 g DW or 1600 – 3400 mgTae/100 g DW.

Research conducted by Rakhman et al in 2020 using Moringa honey for in vitro tests found that Moringa honey that had been carried out in the Unhas laboratory illustrates that the carbohydrates and proteins contained in Moringa honey are more than healthy honey. There are several related studies regarding the administration of Moringa leaf extract / Moringa leaf flour or honey or royal jelly to reduce stress levels and cortisol levels in pregnant women, but the provision of Moringa Honey obtained from the results of feeding Moringa juice to certain bees so as to produce Moringa Honey has not ever happened today.

## **2.Objectives Of The Study**

In this study, researchers were interested in seeing the effect of giving Moringa honey on stress and cortisol levels in pregnant women with regular honey.

## **3.Research methodology**

This research was conducted in Maros Regency, which is approximately 33.40 km from the city of Makassar, the capital city of South Sulawesi Province, Indonesia. Maros has an area of 1619.11 km<sup>2</sup> and is inhabited by 353,121 people. Maros has 14 sub-districts and also has 14 Health Center. The Turikale Health Center and the Lau Health Center were selected for this study. All second trimester pregnant women aged 20-27 weeks who were registered at the Turikale Public Health Center and Lau Public Health Center starting February 2020 became the target population of the study.

### **3.1. Intervention materials**

MO leaves are purchased from the market. The researcher collaborated with one of the market sellers in the Antang area, Makassar City, South Sulawesi. MO leaves are imported from the Gowa Regency, South Sulawesi Province. The MO leaves sold are confirmed by the researchers to be fresh, freshly picked from the tree. The MO leaves were washed first and then blended until smooth. After the Moringa leaves are smooth, then mixed with 1 kg of sugar which has been dissolved in 500 ml of water. After all the ingredients are mixed, the Moringa juice is given to the bees that have been locked up in mosquito nets located at the Faculty of Forestry, Hasanuddin University. The honey produced by the bees is put in a bottle.

### **3.2. Experiment Design**

This randomized control trial (RCT) included randomly allocated participants into one of two groups. Eligibility criteria were gestational age 20 – 27 weeks, having a hemoglobin level of 9-10g/dl, parity one to three, and singleton pregnancy. Those who were eligible (n=42) were randomly allocated into two groups. Randomization sequences were made by hand and allocation to each group was carried out by field researchers, with mothers being asked to take small pieces of paper with the letters A or B from the tin. If the mother takes the paper with the letter A, she receives honey from bottle A and vice versa. The treatment given in letters A and B was only known by the main researcher (VH). The mother was given a bottle containing 100 ml of honey coded A or B according to the letter she took at the randomization stage.

The study started in February 2020 when all pregnant women in the second trimester who came to the Health Center were screened for eligibility in the study. Four field researchers (DS, RM, FM and FK) screened 80 mothers; 50 were eligible to participate and agreed to participate in this study. Pertinent written information was received from each mother. During the intervention, eight subjects dropped out. The first is due to family problems and the other refuses to consume honey. Thus, the total subjects in this study were 40; 20 in the Moringa Honey group and 20 in the healthy honey group. Data for these subjects were included in the analysis.

There are two interventions in this study, Moringa honey and healthy honey. Both interventions were put into the same vial with a capacity of 100 ml each. Mothers were instructed to drink 15 ml of honey in the morning during the 2-month intervention period. So, each mother in one group received 1 bottle of Moringa honey containing 100 ml consumed (15 ml/per day), while in the other group each mother received 1 bottle of healthy honey containing 100 ml consumed (15 ml/per day).

At the end of each week, adherence to the intervention was assessed by the field researcher by means of the honeycomb. The amount of honey consumed and the reason for the mother's refusal were written on a standard form. Field investigators send a short electronic message to the mother every morning to remind the mother to

take honey. Mothers were asked to respond to the messages, otherwise the field workers would call to encourage honey consumption. All mothers included in the analysis consumed all honey (100%).

### 3.3. Outcome variables

The main outcome variables, measured before and after the intervention, were stress and salivary cortisol levels. All measurements were carried out by field researchers. Maternal characteristics were assessed at baseline using a standardized questionnaire. This is related to the socioeconomic status of the family, including the education and occupation of the mother and father, monthly family income, number of family members, and exposure to cigarette smoke.

The level of stress in this study was measured using the Kessler Psychological Distress Scale (K10) by Kessler R: Professor of Health Care Policy from Harvard Medical School which consisted of 10 question items about symptoms of anxiety and depression experienced by a person in the last 4-week period to see the size stressed. Each question is given a score (score) between 1-5. Salivary cortisol levels were measured using the Salivary Cortisol Kit (Diagnostics Biochem, Canada). Mothers were given sputum to collect 2 ml of their saliva in the morning before breakfast. After that, the field researchers collected the sputum and brought it to a certain room before being taken to the laboratory at Hasanuddin University, Makassar. According to the standard, the normal value of cortisol in the morning is 0.272-1,348  $\mu$ /dl.

### 3.4. Statistical Analysis

Data were entered, cleaned and analyzed using SPSS statistical software version 25. Descriptive analysis was first performed for the main variables. Comparison between groups at baseline was assessed using the Chi-square test, quadratic test for categorical variables, and independent t-test for continuous variables. Changes in each group (before and after the intervention) were analyzed using the Wilcoxon test, while the differences between groups were analyzed using the Mann-Whitney test. The General Linear Model was used to perform ANOVA to assess differences in stress and cortisol levels.

### 3.5. Ethical Approval

Ethical approval for this research was granted by the Ethics Committee of the Faculty of Medicine, Hasanuddin University, Makassar, Indonesia, in May 2021 with protocol number UN4.14.1/TP.02.02/2021. Each mother gave written consent during study enrollment.

## 4. Results

Based on table 1 shows that the majority of respondents in the two vulnerable groups are aged 20-25 years with the number of respondents in the intervention group 9 (22.5%) and the control group amounting to 7 (17.5%), having more than 1 child, namely multigravida with the number of respondents at the intervention group was 18 (45.0%) and the control group was 12 (30.0%), most of the respondents with gestational age 20-23 weeks, the number of intervention respondents was 10 (25.0%) and control 12 (30.0%), housewives work with the number of respondents in the intervention group 17 (42.5%) and in the control group 20 (50.0%), the last education level was high school with the number of respondents in the intervention group 8 (20.0%) the control group 9 (22.5%), income earned mostly 1-3 million with the number of respondents in the intervention group 15 (37.5%) in the control group 17 (42.6%). The results of the statistical test of differences between the two groups at the beginning of the study showed that the two groups were significantly different ( $p > 0.05$ ), which indicated that the two groups had similarities for the characteristics of the variables of age, number of children, gestational age, occupation and education, income.

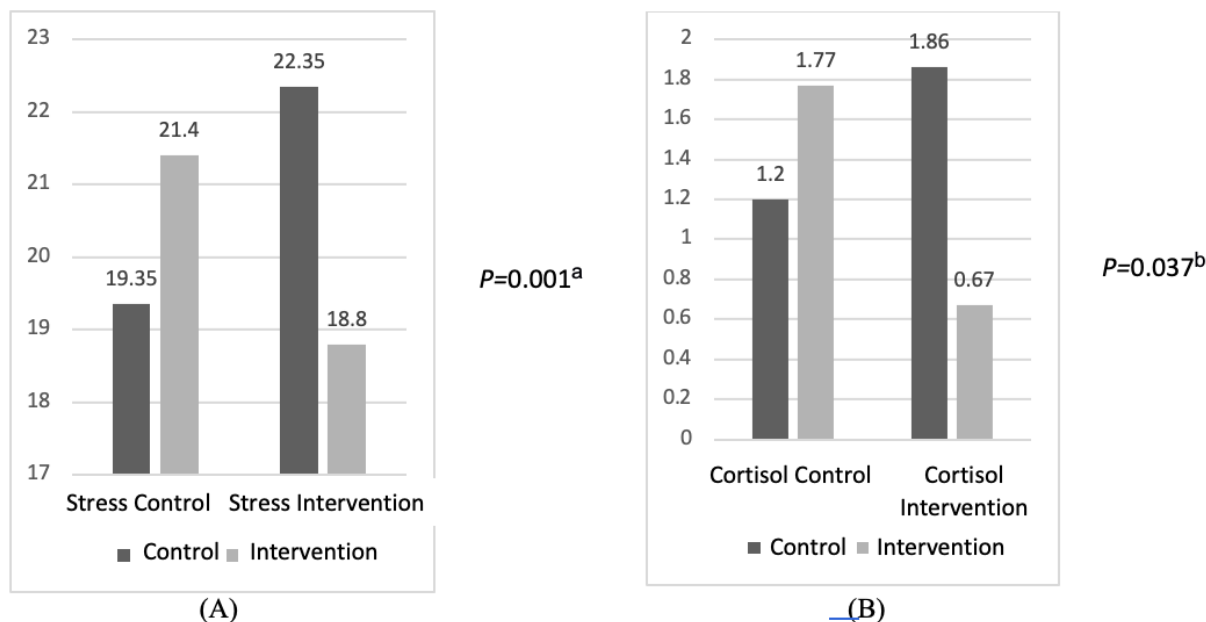
**Table 1.** Frequency Distribution of Respondents Characteristics

Characteristics	Control		Intervention		p value
	N	%	n	%	
<b>Age</b>					
20 – 25 years old	9	22.5	7	17.5	0.344

26 – 30years old	8	20.0	6	15.0	
31 -35years old	3	7.5	7	17.5	
<b>Parity</b>					
Primigravida	8	20.0	2	5.0	0.028
Multigravida	12	30.0	18	45.0	
<b>Education</b>					
Elementary School	3	7.5	7	17.5	0.495
Secondary School	6	15.0	4	10.0	
High/Vocational School	9	22.5	8	20.0	
Diploma	0	0	0	0	
Bachelor	2	5.0	1	2.5	
<b>Job</b>					
Housewife	20	50.0	17	42.5	0.072
Entrepreneur	0	0	3	7.5	
<b>Income</b>					
<1 million	3	7.5	4	10.0	0.531
1-3 million	17	42.5	15	37.5	
>3 million	0	0	1	2.5	

Picture. 1 Based on the results of the Mann-Whitney test analysis, it can be seen that the average stress in the MH intervention group decreased stress in the MH group from  $22.35 \pm 5.21$  to  $18.80 \pm 1.93$  with a statistical difference of  $4.55 \pm 4.81$  changes in the value  $p = 0.001$  where  $p$  value  $< 0.05$  which means there is a difference between before and after treatment. While the mean stress in the RH control group increased from  $19.35 \pm 3.42$  to  $21.40 \pm 2.79$  with a difference of  $2.15 \pm 3.81$  changes statistically  $p$  value = 0.022 where  $p$  value  $> 0.05$  which means did not differ much before and after treatment.

Based on the results of the Mann-Whitney test analysis, it was seen that the mean cortisol in the MH intervention group was  $1.86 \pm 1.14$ , there was a decrease in cortisol in the MH group from  $0.67 \pm 0.63$  with a difference of  $1.19 \pm 0.51$  statistical changes in  $p$  value = 0.001 where  $p$  value  $< 0.05$  which means there is a difference between before and after treatment. Meanwhile, the mean cortisol in the RH control group increased by  $1.20 \pm 0.95$  from  $1.77 \pm 1.02$  with a difference of change of  $0.57 \pm 0.07$  statistically, the  $p$  value = 0.093 where the  $p$  value  $> 0.05$  which means did not differ much before and after treatment.



**Figure 1.** Effects of Interventions in the MH and RH Groups towards Stress (A) and Cortisol (B)

### 5. Interpretation of the result

The purpose of this study was to examine the effect of giving Moringa honey on stress and cortisol levels in pregnant women. This study used Moringa honey given to pregnant women for 8 weeks at a dose of 15 ml/day every morning. Based on the results of the analysis of the Mann-Whitney test, the average stress and cortisol levels showed a significant difference between before and after treatment, both groups receiving Moringa honey and groups receiving regular honey.

The results of this study indicate that the number of pregnant women who are stressed decreases in the MH group after the intervention, while in the RH group the number of pregnant women who are stressed increases after the intervention, statistically significant ( $p > 0.05$ ), which means there is no difference between pregnant women who are stressed before and after the intervention. The results of this study are in line with research conducted by Suryanti et al. (2017) which states that the average level of stress in pregnant women who have been intervened by Moringa leaf extract is still within normal limits, that in the intervention of Moringa leaf flour is at a moderate level, while the stress level in the group receiving the intervention is moderate. Iron supplement intervention was much higher than in the two groups, namely the average was at the level of severe stress. Stress is a physiological, psychological and behavioral response of humans trying to adapt and regulate both internal and external stresses (Jhaquin, 2010). Stress is an uncomfortable condition (dysphoric) which is defined as an imbalance of pregnant women to feel able or resist various changes in the process of adaptation to pregnancy (Rukiyah et al., 2012).

Based on Table 2, the results of the Mann-Whitney test analysis show that the average stress in the MH intervention group decreased stress in the MH group from  $22.35 \pm 5.21$  to  $18.80 \pm 1.93$  with a difference of  $4.55 \pm 4.81$  statistically  $p$  value = 0.001 where  $p$  value  $< 0.05$  which means there is a difference between before and after treatment. While the mean stress in the RH control group increased from  $19.35 \pm 3.42$  to  $21.40 \pm 2.79$  with a difference of  $2.15 \pm 3.81$  changes statistically  $p$  value = 0.022 where  $p$  value  $> 0.05$  which means did not differ much before and after treatment.

The results of this study are in line with research conducted by Muis et al (2014) which showed that stress levels decreased significantly in the group given Moringa leaf extract ( $p = 0.001$ ) but not in the group not given Moringa leaf extract ( $p = 0.07$ ). Moringa leaf powder contains many nutrients and compounds needed by the body including polyphenols and GABA. The content of polyphenols in Moringa leaf powder is 2 times more than red wine. GABA (gamma-aminobutyric acid) is 100 times more than brown rice (Kusnadi, 2015).

Based on the results of the Mann-Whitney test analysis, it was seen that the mean cortisol in the MK intervention group was  $1.86 \pm 1.14$ , there was a decrease in cortisol in the MH group from  $0.67 \pm 0.63$  with a difference of  $1.19 \pm 0.51$  statistical changes in  $p$  value = 0.001 where  $p$  value  $< 0.05$  which means there is a difference between before and after treatment. While the mean cortisol in the RH control group increased by 1.20

$\pm 0.95$  from  $1.77 \pm 1.02$  with a difference of change of  $0.57 \pm 0.07$  statistically p value = 0.093 where p value > 0.05 which means did not differ much before and after treatment.

Moringa honey is an alternative for improving nutritional status, especially in anemic pregnant women. The nutritional content of Moringa honey includes protein (0.87%), carbohydrates (80.26%), polyphenols (0.06%), Flavonoids (289.82 Ppm), antioxidants (130.060 Ppm), vitamin C (278.62 Cps), Potassium (0, 07%), Beta Carotene (118.24 Ppm), Iron (175 Ppm), Calcium (998 Ppm), Sodium (65 Ppm), Zinc (12 Ppm) and Magnesium 163 Ppm). (Results of the Faculty of Mathematics and Natural Sciences Laboratory of Unhas, 2020). Toxicity test has been carried out on Moringa honey with a low toxicity category which is characterized by an LC50 value > 500, where the higher the LC50 value, the lower the toxicity level so that Moringa honey is safe for consumption by pregnant women.

Based on the results of the research conducted, the researchers assumed that this was because Moringa leaves contain high polyphenols that function as sedatives. The polyphenols found in Moringa leaves can reduce/overcome stress in pregnant women where it is known that the pregnancy process causes psychological changes in the form of feelings of depression, anxiety, fear, discomfort and so on. While ordinary honey only contains folic acid and Vitamin C.

## 6.Conclusion

Based on the data obtained in the study of Moringa honey and regular honey in reducing stress and cortisol levels in pregnant women in the working area of the Turikale Health Center and Lau Health Center, Maros Regency, we conclude that giving MH (Moringa Honey) to pregnant women can reduce stress and lower cortisol levels better than giving RH (Regular Honey). The results of this study are expected to use the provision of MH (Moringa Honey) to pregnant women in carrying out antenatal care services in the community with high levels of stress.

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