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Effect of *Moringa* leaves extract on occupational stress and nutritional status of pregnant women informal sector workers

Masyitha Muis^{1*}, Veni Hadju², Syamsiar Russeng¹, and M.Furqan Naiem¹

¹Occupational Health and Safety Department, Public Health Faculty, Hasanuddin University, Indonesia

²Nutrition Department, Public Health Faculty, Hasanuddin University, Indonesia

*Corresponding author

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A B S T R A C T

Moringa leaves are the leaves of the Moringa tree containing various macro and micro nutrients and active ingredients that act as antioxidants. We assess the effect of Moringa leaf extracts in pregnant women informal workers to the level of occupational stress and nutritional status include hemoglobin levels and Middle Upper Arm Circumference (MUAC). This study design was randomized, double-blind, controlled trials. Sample obtained from four health centers in the District Manggala, Makassar. They were divided randomly into two groups: the treatment group (TG) received the extract of Moringa leaves for two times 2 capsules @ 800mg every day (TG, n = 35) and control group (CG) received a placebo (CG, n = 33). Both groups continued to receive Fe tablet every day. The treatment was done for three months. Statistical analysis using paired and independent t-tests. Characteristics of the subjects before the intervention did not differ significantly except for the variables age, gravid, and hemoglobin (p = 0.037, p = 0.045, and p = 0.001, respectively). After the intervention, the level of stress visible decline significantly in TG (66.7 ± 17.9 to 57.4 ± 8.3 , p = 0.001) but not in CG (72.5 ± 22.2 to 77.8 ± 15.3 , p = 0.07). Significant differences seen big changes in the level of stress between the two groups (-12.3 ± 5.5 vs. 18.2 ± 17.6 , p = 0.001). Besides that, it looks good on TG MUAC increase (25.2 ± 2.7 to 26.2 ± 2.8 , p = 0.001) and CG (26.1 ± 2.8 to 26.5 ± 2.8 , p = 0.130) but not significant differences seen for MUAC changes between the two groups (0.3 ± 0.4 vs 0.19 ± 0.3 , p = 0.001). Hb levels in the intervention group there was no increase, TG (11.8 ± 0.94 to 11.77 ± 1.29 , p = 0.0909) but not in CG (11.57 ± 1.20 to 11.88 ± 1.50 , p = 0.337). Not significant difference seen big changes in hemoglobin levels between the two groups (-0.02 ± 1.32 vs. 0.30 ± 1.80 , p = 0.389). It is concluded that the leaf extract of Moringa in pregnant women informal workers can reduce stress and increase MUAC, but cannot increase hemoglobin levels.

Introduction

Physical occupational stress and psychological influence can disrupt during pregnancy. Occupational stress increases the risk of miscarriage, preterm labor, premature birth, low birth weight, and preeclampsia (Katz, 2012). Occupational stress experienced in the first 20 weeks of pregnancy associated with preeclampsia that can have serious effects can even lead to

death in the mother and baby (Collingwood, 2011). Anemic pregnant women in Indonesia are still a serious public health problem that is equal to 37.1%. In addition to anemia, malnutrition problem faced is an increase in the proportion of pregnant women aged 15–19 years with malnutrition from 31.3% in 2010 to 38.5% in 2013 (Agency for Health Research and

Development, 2013). Occupational stress and nutritional status of pregnant women need to get serious attention given to the implications of either maternal or baby, ie, the increase risk of degenerative diseases such as hypertension, coronary heart disease, and type 2 diabetes (Barker *et al.*, 2010; Bhutta *et al.*, 2008). Some nutrients are known to be increased needs during pregnancy is ferrum, vitamin C, vitamin A, and protein. Thus, we need a new breakthrough in the use of local food that can cope with the malnutrition problem. One of the foods that contain nutrients that are good for pregnant women are the leaves (*Moringa oleifera*). *Moringa* leaves contain elements of multi micronutrients that are needed by pregnant women such as: beta carotene, thiamin (B1), Riboflavin (B2), niacin (B3), calcium, ferrum, phosphorus, magnesium, zinc, vitamin C (Jonni *et al.*, 2008; Dhakar *et al.*, 2011). The use of *Moringa* leaves as a nutritional supplement widespread, as evidenced by the increasing number of reports of its use in various places both in experimental animals or humans. In pregnant women, administration of 25 grams of *Moringa* leaf powder in a week to cure anemia after six week treatment (Diatta, 2001).

Moringa leaves are reported to have used to overcome the problem of malnutrition, especially in children and mothers menyusui (Anjorin *et al.*, 2010). Countries such as Senegal, India, Benin and Zimbabwe has been using *Moringa* leaves as gizi (Fahey, 2005) deficiency control programs. In Thailand the leaves of *Moringa* is considered as a protein supplement daily is very good (Poolsak *et al.*, 2011). Other studies Arti *et al.*, (2005) and Sunday *et al.*, (2010) showed that the extract of *Moringa* leaves contain high phenolic content and antioxidant. The purpose of this study was to determine the effect of *Moringa* leaf extract

on the level of occupational stress, increased levels of hemoglobin and upper arm circumference (MUAC) of pregnant informal sector workers.

Materials and Method

Research site

This study was conducted in four areas of health center namely; Antang health center, Batua Health Center, Perumnas Antang health Health, and Tamangapa health centers in the Manggala District Municipality, Makassar, South Sulawesi.

Design and variables

Type of research is the design of a randomized controlled intervention with Double Blind where intervention will be carried out for 3 months with variables assessed were stress levels, hemoglobin levels and MUAC pregnant women.

Research subjects

Subjects were all pregnant women during their pregnancy were enrolled in 4 health centers in the region of the District administration namely Manggala Batua health centers (15 people), Tamangapa (33 people), Antang (16) and Perumnas Antang (8 people). Sample of 72 pregnant women who have met the criteria inlusi pregnant women informal sector workers, willing to accept the leaf extract of *Moringa* capsules for 3 months, single fetus, no other multivitamin and willing to sign informed consent has been issued by the medical ethics committee of the Faculty of Hasanuddin University Number : 1152/H4.8.4.5.31/PP.36-KOMETIK/2013.

There are 4 respondents who dropped out of the study because it moved away from the study site and do not obey the capsules intervention.

Data collection

Data were collected by means of interviews using a structured questionnaire to obtain data on the characteristics of pregnant women that data on age, education, occupation, income, and history of pregnancy, questioner stress diagnostic survey to assess the level of occupational stress, measurement of hemoglobin levels with Digital Meter Hb, MUAC measurement with MUAC tape. Data collection was performed twice, before and after the intervention. *Moringa* leaves are used in this study were taken from the *Moringa* tree growing in the region surrounding the Pinrang and then taken to the laboratory micronutrients Hasanuddin University Research Center activities.

Data analysis Bivariate analysis is used to assess the mean difference before and after

treatment in each group used a paired t test (paired t-test) when the data were normally distributed and the Wilcoxon test when data distribution was not normal. To see the difference in the mean change between the two groups used the unpaired t test (independent t-test) when the data were normally distributed and U Mann-Whitney test when the data distribution is not normal. Univariate and bivariate analyzes using SPSS.

Result and Discussion

Table 1 shows the characteristics of the sample where the majority of samples in both groups were in the age range 20-35 years, a history gravida 2 times, 1 time in labor history, and education level completed high school / MA.

Table.1 Distribution of general characteristics of pregnant women in the treatment group based Manggala Subdistrict, Makassar

Characteristics	Treatment group				P Value
	Intervention (n=35)		Control (n=33)		
	n	%	n	%	
Age (year)					
< 20	2	5,7	2	6,1	1,000 ^a
20 – 35	29	82,9	30	90,9	
> 35	4	11,4	1	3,0	
Gravid History					0,482 ^b
1	11	31,4	6	18,2	
2	12	34,3	16	48,5	
3	6	17,1	7	21,2	
>4	6	17,1	4	12,1	
Abortion History					1,000 ^a
0	29	82,9	30	90,9	
1	5	14,3	3	9,1	
2	1	2,9	0	0,0	
Parturition History					1,000 ^a
1	11	31,4	8	24,2	
2	16	45,7	15	45,5	
3	2	5,7	6	18,2	
> 4	4	11,4	2	6,1	
2	2	5,7	2	6,1	
Education					0,742 ^a
Elementary Graduated	5	14,3	4	12,1	
Junior High School Graduated	3	8,6	9	27,3	
Senior High School Graduated	24	68,6	17	51,5	
College Graduated	3	8,6	3	9,1	

Source : Primary Data, 2014; Kolmogorov-Smirnov = a, b = Chi-Square

Results of statistical tests on the differences in the two groups at the beginning of the study showed that the two groups did not differ significantly ($p > 0.05$) indicating that both groups had equal to the variable characteristics of age, gravida history, history of abortion, history of parturition and level of education.

Table 2 shows that occupational stress scores in the intervention group experienced a significant reduction ie with a score of

12.29 points ($p = 0.000$), whereas in the control group experienced an increase in occupational stress scores by 5.53 points ($p = 0.067$). The hemoglobin levels in the intervention group there was no increase Hb levels, but a decrease of 0.02 g / dL ($p = 0.909$), whereas in the control group increased by 0.30 g / dL, but this increase was not significant ($p = 0.337$). MUAC experienced a significant increase ($p = 0.000$) in both the intervention and control groups, respectively.

Table.2 Results of occupational stress measurement, hemoglobin levels and MUAC pregnant women before and after intervention by treatment group in the District Manggala, Makassar

Variable	Before X ± SD	After X ± SD	Paired t-Test	Δ (After- before) X ± SD	Mann-U Whitney
Occupational stress scores					
Intervention (35)	69,71 ± 17,88	57,43 ± 8,32	0,000	12,29 ± 18,02	0,000
Control (33)	72,46 ± 22,16	77,80 ± 15,34	0,067	5,53 ± 17,63	
Hb					
Intervention (35)	11,8 ± 0,94	11,77 ± 1,29	0,909	-0,02 ± 1,32	0,389*
Control (33)	11,57 ± 1,20	11,88 ± 1,50	0,337	0,30 ± 1,80	
MUAC					
Intervention (35)	25,19 ± 2,73	26,18 ± 2,76	0,000	0,98 ± 0,74	0,001
Control (33)	26,05 ± 2,83	26,50 ± 2,82	0,000	0,45 ± 0,49	

Source: Primary Data, 2014; * = Independent t-Test

This study found that the leaf extract of *Moringa* related to the reduction of occupational stress and increase the MUAC significantly ($p < 0.05$), but not significantly related to an increase in hemoglobin levels of pregnant women informal sector workers. Incidence of external stress factors will trigger the release of stress hormones, which in turn will increase the need for micronutrients / micronutrients the body and at the same time will also affect the physical condition and psychics body. Lack of vitamin B and C, and minerals such as calcium, magnesium and zinc may affect cognitive performance, especially in vulnerable groups such as adults and those

who work under pressure and lifestyle stress (Huskisson and Ruf, 2007).

A multicenter double-blind study in 307 adults, who are permanently exposed to occupational stress, multivitamin and mineral supplementation for 30 days gave a significant incensement in psychological status and fisik (Selishchev *et al.*, 1998). The combination of a multivitamin and mineral well received and can be used as part of a therapy program / treatment of symptoms associated with stress (Schlebusch *et al.*, 2000).

Pregnancy can mean a serious problem for many women to the status of informal workers due to low socioeconomic status, low intake of a balanced diet, illiteracy and ignorance, health consultations are not qualified as to the midwife, not doing antenatal check-ups to a qualified physician. Research shows that 60 percent of women working in the informal sector does not do antenatal check-ups. This is because, if the conduct antenatal check-ups for them means losing jobs daily and earned income is reduced, and the majority of births and abortions performed in the midwife (59 percent) (Kamala Kanta Mohapatra, 2012).

Moringa leaf extract in capsules for 3 months and supported by ferrum tablet consumption routine program, is expected to contribute to increased nutrient intake of pregnant women, including increased intake of food. Fahey revealed that the nutrient content of *Moringa* leaves are known at this time is not the slightest doubt will provide the health benefits that it was realized that the consumption of *Moringa* leaf powder be a good thing in the kelaparan10 conditions.

The results showed no significant increased hemoglobin levels in the intervention group and the control group. One of the results of research that this result is in line with research conducted by Idohou-Dossou *et al.* (2011) in Senegal found that consumption of *Moringa* leaves are not able to fix the ferrum reserves in anemic subjects. However, studies by Cavallini (2009) on 49 children who get food with a diet enriched with *Moringa* leaf powder 20g / day showed an increase in hemoglobin levels after consuming *Moringa* leaf powder. Increased prevalence of anemia in the intervention group also occur due to low nutrient intake, variation (completeness) foods also showed that more than 50% of pregnant women have a less varied diet (not complete), and

even many who skip a meal without consuming any especially at breakfast and dinner. Also suspected that the decrease socio-economic factors as the respondents in this study were pregnant women informal sector workers have an average family income is not high enough that if observed from a varied diet of pregnant women found to be more than 30% consume only 2 types of sources of nutrients the source of carbohydrate and protein (KH + P).

Consumption of vitamin C, low ferrum and high average consumption of phytate that cause disruption of Fe absorption. The incidence of anemia in addition affected by low ferrum intake, also due to lack of nutrient intake that is as absorbent (enhancers). One of the compounds that are important enhancers to increase ferrum absorption is the presence of vitamin C. The vitamin C in foods will increase the absorption of ferrum (Almatsier, 2003).

The results also showed that the consumption of Fe tablets in pregnant women still relies less where only 61.5% Fe tablets consumed per month in the intervention group, so that the average hemoglobin levels are still low. Less disobedience by respondents in the consumption of ferrum tablets is in line with research Rahmaniar (2011), which indicates that this ferrum tablet programs face many obstacles due to the lack of understanding of the benefits of ferrum tablet to anemia, the concern would be the risk of fetal maternal great, negligence and effects side felt by pregnant women from consuming ferrum tablet.

Giving *Moringa* in case of deficiency of nutrients in some studies has been shown to increase the nutritional status of the subject, including the research done by Zongo *et al.* (2013) in Burkina Faso shows that children

who are malnourished are given *Moringa* leaf powder has increased higher weight than those not given *Moringa* leaf powder. As well as research was conducted by Srikanth *et al.* (2014) in India, regarding the incensement of the nutritional status of children under nutrition that given *Moringa* leaf powder.

We conclude that administration of *Moringa* leaf extract can decrease levels of occupational stress and increase MUAC significantly in pregnant women informal sector workers but cannot increase Hb levels so necessary efforts to provide education to pregnant women about the importance of eating enough food during pregnancy and taking tablets Fe on a regular basis so they can increase hemoglobin levels during pregnancy.

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