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EFFECT OF CONSUMPTION OF TORBANGUN SOUP (*Coleus amboinicus Lour*) ON MICRONUTRIENT INTAKE OF THE BATAKNESE LACTATING WOMEN

(Pengaruh Konsumsi Sop Torbangun terhadap Asupan Gizi Mikro Wanita Batak yang sedang Menyusui)

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ABSTRAK. Defisiensi zat gizi mikro merupakan salah satu masalah utama yang banyak dialami ibu menyusui di negara sedang berkembang. Wanita Batak di Sumatera Utara yang sedang menyusui memiliki tradisi mengkonsumsi sop daun Torbangun selama 30 hari setelah melahirkan. Mereka berkeyakinan dengan mengkonsumsi sop daun Torbangun akan meningkatkan kesehatan dan meningkatkan produksi air susu ibu (ASI). Penelitian intervensi dengan metode paralel secara acak ini bertujuan untuk meneliti pengaruh konsumsi sop daun Torbangun selama 30 hari terhadap tingkat konsumsi gizi mikro ibu menyusui. Hasil penelitian menunjukkan bahwa suplementasi sop daun Torbangun meningkatkan konsumsi zat gizi mikro subjek penelitian. Konsumsi rata-rata zat gizi mikro (kalsium, magnesium, kalium dan besi) meningkat hingga melewati angka kecukupan gizi yang dianjurkan (AKG). Hasil penelitian ini menunjukkan bahwa sop daun Torbangun mampu meningkatkan status gizi mikro ibu menyusui.

Katakunci: coleus amboinicus, Bataknese, micronutrient

INTRODUCTION

During pregnancy and lactation, nutritional requirements change notably. During the period, the maternal diet must provide both macro-and micro nutrients in quantities that are sufficient for fetal growth and development, in addition to maintaining the mother's metabolism during the nine months of gestation (Kramer, 1987). After the birth, the period of maternal lactation also has specific requirements for the daily production of breast milk with high-energy value and substantial nutrient content (Mora & Nestel, 2000).

The Bataknese lactating women in Simalungun, North Sumatra, Indonesia have the tradition to consume Torbangun soup made from *Coleus amboinicus Lour* leaves (CA) during one month after giving birth (Damanik *et al.*, 2001). They believe that consumption of CA for one month after giving birth increases their breast milk production. The present study investigates the effects of consuming CA during 30 days post partum on maternal micronutrient status. The food and nutrient intake of the subjects before and during pregnancy and during the 2-month lactation period are described.

SUBJECTS AND METHODS

Subjects

The study was conducted in Simalungun Districts, North Sumatra Province, Indonesia. A total of 67 apparently healthy lactating mothers were included in this parallel, randomized intervention study consisted of 30-day supplementation and 30-day follow-up periods. Subjects were divided into three groups: Torbangun (CA), Moloco+B12 (Reference) and Fenugreek Groups. Subjects of the CA Group were provided with CA soup containing 150g CA leaves six days a week from Monday to Saturday for 30 days. The subjects of the Reference and Fenugreek Groups received Moloco+B12™ tablets, contained 20μg vitamin B12 and 15mg placental extract, and Fenugreek capsule, containing 500mg ground seeds of *Trigonella foenum-graecum*, respectively 3 times per day for 30 days as well. All subjects started taking the assigned soup or tablets on Day 2 after giving birth. They were instructed to maintain their usual food intake during the supplementation period.

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Methods

The assessments of dietary intake of the subjects were administered to record the dietary intake before pregnancy, during the pregnancy period and during the 2-month lactation period. Information on the intake of individual food items was obtained using the Food Frequency Questionnaire. The nutrient intake data are compared with the Indonesian Recommended Dietary Allowances (IRDA) (Muhilal *et al.* 1998). The presentation of the food and nutrient data are in three periods: before pregnancy, during pregnancy and during two months lactation.

RESULTS

Before the pregnancy period

The mean micronutrient (minerals and vitamins) intake before the pregnancy period of all subjects studied is shown in Table 1. No significant differences were observed among three intervention groups (p>0.05).

There were no significant differences noted in the mean micronutrient adequacy among three groups studied before the pregnancy period. The mean zinc intake of the CA and Fenugreek Groups was less than the IRDA intake of 15 mg of zinc per day. The lower intake of zinc was 86% and 92% of the IRDA level respectively (Table 2). Although the mean consumption of calcium, magnesium and iron of the three corresponding groups was higher than the IRDA, it was observed that some subjects acquired micronutrient deficiencies. In the CA Group, for example, 12 (52%) and 7 (30%) subjects consumed iron and magnesium less than the IRDA. Whereas in the Reference and Fenugreek Groups, 12 (54%) vs. 11 (50%), 5 (22%) vs. 6 (27%) and 3 (13%) vs. 3 (13%) subjects consumed calcium, iron and magnesium less than the IRDA, respectively.

Table 1. Micronutrient Intake of Subjects before the Pregnancy Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
Calcium (mg)	22	613 ± 304	23	593 ± 351	22	646 ± 234
Phosphorus (mg)	22	1244 ± 381	23	1127 ± 486	22	1296 ± 491
Magnesium (mg)	22	399 ± 142	23	354 ± 150	22	402 ± 148
Potassium (mg)	22	3039 ± 893	23	2799 ± 1217	22	3214 ± 1193
Iron (mg)	22	19 ± 8	23	15 ± 7	22	19 ± 8
Zinc (mg)	22	17 ± 19	23	13 ± 18	22	14 ± 12
Vitamin A (μg RE)	22	2705 ± 2001	23	2411 ± 2614	22	2944 ± 4030
Vitamin B (mg)	22	1 ± 0	23	1 ± 0	22	1 ± 0
Vitamin C (mg)	22	145 ± 54	23	138 ± 63	22	161 ± 63
Vitamin B-12 (μg)	22	11 ± 10	23	10 ± 13	22	14 ± 21

Table 2. Level of Micronutrient Intake Adequacy before the Pregnancy Period Compared to IRDA (%)

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
% IRDA calcium	22	103 ± 51	23	99 ± 58	22	108 ± 39
% IRDA phosphorus	22	280 ± 86	23	250 ± 108	22	288 ± 109
% IRDA magnesium	22	128 ± 80	23	102 ± 85	22	129 ± 84
% IRDA iron	22	134 ± 55	23	110 ± 48	22	133 ± 60
% IRDA zinc	22	117 ± 126	23	86 ± 123	22	92 ± 77
% IRDA vitamin A	22	546 ± 400	23	482 ± 523	22	589 ± 806
% IRDA vitamin B	22	112 ± 36	23	106 ± 40	22	111 ± 40
% IRDA vitamin C	22	243 ± 91	23	231 ± 105	22	268 ± 105
% IRDA vitamin B-12	22	1140 ± 1014	23	986 ± 1314	22	1373 ± 2098

The pregnancy period

The mean micronutrient intake during the pregnancy period of the three comparison groups is shown in Table 3. No significant differences were noted in the mean micronutrient intake among three groups studied expect for iron and vitamin C intake of the CA and Fenugreek Groups. The mean iron and vitamin C intake in the CA Group was considerably lower than in the Fenugreek Group (15 mg vs. 20 mg, 136 mg vs. 179 mg, respectively).

The micronutrient adequacy level of phosphorus, vitamin A, C and B12 of the three groups studied was higher than the corresponding IRDA (Table 4). It was observed that the mean vitamin C adequacy of the Fenugreek Group was considerably greater than for the CA Group (256% vs. 195%, $P<0.05$). While consumption of these micronutrients in the three corresponding groups was higher than the IRDA, the consumption of other micronutrient was deficient. The average calcium intake of all groups studied was about 71% of the corresponding IRDA, while iron and zinc intake were about 53% and 67% respectively. It was observed that the mean iron intake of the CA Group was significantly lower than of the Fenugreek Group (45% vs. 60%, $P<0.05$). The average vitamin B intake of all groups studied was also below the IRDA. It accounted for only 92% of the IRDA.

Lactation period

The micronutrient intake of the three groups studied during the first two-month lactation is shown in Table 5. It showed that the average of calcium, magnesium, potassium, and iron intake of the CA Group was significantly higher ($P<0.0001$) than the Reference and the Fenugreek Groups, and the consumption of the nutrients in this group showed a greater rise ($P<0.0001$) from before the pregnancy period. The average consumption of calcium, for example, rose from 593 mg before the pregnancy period to 1233 mg during the lactation period.

Table 3. Micronutrient Intake during the Pregnancy Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
Calcium (mg)	22	728 ± 236	23	654 ± 305	22	765 ± 263 *
Phosphorus (mg)	22	1276 ± 352	23	1173 ± 413	22	1335 ± 423
Magnesium (mg)	22	394 ± 120	23	354 ± 138	22	415 ± 155
Potassium (mg)	22	3112 ± 891	23	2870 ± 1078	22	3327 ± 1073
Iron (mg)	22	18 ± 6	23	15 ± 7 [a]	22	20 ± 9 [a]
Zinc (mg)	22	15 ± 19	23	9 ± 5	22	16 ± 13 *
Vitamin A (μg RE)	22	2427 ± 1549	23	1891 ± 1435	22	3087 ± 2886
Vitamin B (mg)	22	1 ± 0	23	1 ± 0	22	1 ± 0
Vitamin C (mg)	22	151 ± 53	23	136 ± 65 [a]	22	179 ± 77 [a]
Vitamin B-12 (μg)	22	10 ± 8	23	7 ± 7	22	13 ± 15

*Significant difference from before pregnancy (paired t-test): *, $P < 0.05$.*
Values with the same superscripts were significantly different (ANOVA): [a], $P < 0.05$.

Table 4. Level of Micronutrient Intake Adequacy during the Pregnancy Period Compared to IRDA (%)

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
% IRDA calcium	22	73 ± 24	23	65 ± 30	22	77 ± 26
% IRDA phosphorus	22	196 ± 54	23	181 ± 64	22	205 ± 65
% IRDA magnesium	22	96 ± 59	23	77 ± 69	22	107 ± 77
% IRDA iron	22	54 ± 17	23	45 ± 20 [a]	22	60 ± 26 [a]
% IRDA zinc	22	74 ± 93	23	46 ± 25	22	82 ± 64
% IRDA vitamin A	22	347 ± 221	23	270 ± 205	22	441 ± 412
% IRDA vitamin B	22	90 ± 25	23	91 ± 34	22	97 ± 30
% IRDA vitamin C	22	215 ± 76	23	195 ± 92 [a]	22	256 ± 111 [a]
% IRDA vitamin B-12	22	764 ± 648	23	536 ± 576	22	990 ± 1132

Values with the same superscripts were significantly different (ANOVA): [a], $P < 0.05$.

Table 5. Micronutrient Intake during the First Two-month Lactation Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
Calcium (mg)	22	534 ± 148 ^{b}	23	1233 ± 306 ^{bc} ¶	22	566 ± 247 ^{c}
Phosphorus (mg)	22	1033 ± 313 *	23	1049 ± 268	22	1040 ± 301 *
Magnesium (mg)	22	325 ± 100 ^{b} *	23	505 ± 108 ^{bc} ¶	22	330 ± 97 ^{c} *
Potassium (mg)	22	2378 ± 679 ^{b} *	23	4325 ± 980 ^{bc} ¶	22	2468 ± 908 ^{c} Ŧ
Iron (mg)	22	14 ± 4 ^{b}	23	24 ± 6 ^{bc} ¶	22	15 ± 7 ^{c}
Zinc (mg)	22	9 ± 4	23	13 ± 8	22	12 ± 11
Vitamin A (μg RE)	22	2423 ± 1915	23	1502 ± 1043	22	2112 ± 1499
Vitamin B (mg)	22	1 ± 0 ^{b} Ŧ	23	1 ± 0 ^{bc} *	22	1 ± 0 ^{c}
Vitamin C (mg)	22	106 ± 42 *	23	109 ± 41 *	22	112 ± 64 *
Vitamin B-12 (μg)	22	31 ± 12 ^{bc} ¶	23	4 ± 4 ^{b}	22	8 ± 5 Ŧ ^{c}

*Significant difference from before pregnancy (paired t-test): *, $P < 0.05$; Ŧ, $P < 0.01$; §, $P < 0.001$; ¶, $P < 0.0001$.*
Values with the same superscripts were significantly different (ANOVA): ^{b} and ^{c}, $P < 0.0001$.

Table 6. Level of Micronutrient Intake Adequacy during the Lactation Period Compared to IRDA (%)

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
% IRDA calcium	22	54 ± 15 ^{b}	23	122 ± 31 ^{bc}	22	57 ± 25 ^{c}
% IRDA phosphorus	22	140 ± 43	23	141 ± 37	22	139 ± 40
% IRDA magnesium	22	62 ± 50 ^{a}	23	152 ± 53 ^{a}	22	64 ± 48 ^{a}
% IRDA iron	22	90 ± 27 ^{b}	23	150 ± 35 ^{bc}	22	96 ± 42 ^{c}
% IRDA zinc	22	36 ± 15	23	53 ± 34	22	47 ± 44
% IRDA vitamin A	22	286 ± 225 ^{a}	23	177 ± 123 ^{a}	22	248 ± 176
% IRDA vitamin B	22	63 ± 18 ^{b}	23	89 ± 21 ^{bc}	22	63 ± 23 ^{c}
% IRDA vitamin C	22	125 ± 50	23	128 ± 48	22	132 ± 76
% IRDA vitamin B-12	22	2310 ± 991 ^{bc}	23	323 ± 286 ^{b}	22	595 ± 413 ^{c}

Values with the same superscripts were significantly different(ANOVA):^{a}, $P<0.05$; ^{b}and ^{c}, $P < 0.0001$.

The mean vitamin B12 intake in the Reference Group was considerably higher (*P<0.0001*) than in the CA and Fenugreek Groups. The vitamin B12 intake of this group increased significantly (*P<0.0001*) from before the pregnancy period. While the vitamin B12 intake exhibited a greater rise, the intake of phosphorus, magnesium, potassium, vitamin B and C declined considerably (*P<0.05*) from before the pregnancy period. Unlike the two other groups, the mean phosphorus, magnesium, potassium, vitamin C and vitamin B12 intake of the Fenugreek Group reduced considerably from that before the pregnancy period.

The alterations in micronutrient intake of the three corresponding groups during lactation were reflected in the percentage of IRDA level in micronutrient intake. Table 6 showed that the IRDA levels of calcium, magnesium and iron intake of the CA Group were significantly higher than for the Reference and Fenugreek Groups. As a consequence, the levels of calcium, magnesium and iron adequacy in this group was above the IRDA recommendations (122%, 152% and 150% respectively). While in the Reference and Fenugreek Groups, the IRDA levels of these micronutrient was below the recommendations (54%, 62% and 90% vs. 57%, 64% and 96%, respectively).

The mean IRDA level for vitamin B adequacy of all groups studied was less than the recommendations, accounting for 71%. However, it was observed that the IRDA level for the CA Group was considerably above (*P<0.0001*) the Reference and Fenugreek Groups. Because the mean vitamin B12 intake of the Reference Group elevated considerably from before the pregnancy period, the IRDA level of this vitamin in this group was significantly higher than the CA and Fenugreek Groups.

Overall, deficiencies in zinc and vitamin B intake were observed in the CA Group during the first 2-month lactation period. Whereas in the Reference and Fenugreek Groups, in addition to zinc and vitamin B deficiencies, the calcium and iron intake were also deficient.

DISCUSSION

In the present study, some subjects from all groups studied had already experienced micronutrient deficiencies before they became pregnant. During pregnancy, deficiencies in calcium, iron, zinc and vitamin B intake were observed in subjects from all groups studied. The average intakes of calcium, iron, zinc and vitamin B of all groups studied were less than the recommendations. The socioeconomic condition of the subjects studied might be part of the factors contributing to the existence of malnutrition in this population. Several studies have reported that low nutritional status and energy intake of the mother were associated with socioeconomic characteristics (Marjan, Taib & Khor, 1998; Norhayati *et al.*, 1997; Xilin *et al.*, 1998). As described previously (Damanik *et al.*, 2004), all subjects in the present study had low socioeconomic status and the amount of family income allocated for food expenditure was associated with the family income.

Findings from the present study showed that after consuming CA leaves for 30 days post-partum there were considerable changes in the micronutrient intake of the CA Group. The mean micronutrient intake in the CA Group was significantly higher than for the Reference and Fenugreek Groups. The intake of calcium, magnesium, potassium and iron exhibited a greater rise and as a result the levels of these micronutrient intakes were above the IRDA recommendations.

Calcium and magnesium are essential in the neonate for bone mineralization and growth. In addition to bone matrix formation, calcium is involved in the normal functioning of wide variety of tissues and physiologic processes including muscle contraction, nerve transmission, blood clotting, and it serves as a second messenger regulating the actions of many hormones (Greer, 1989). Magnesium is essential for a wide range of fundamental cellular reactions. It is involved in at least 300 enzymatic steps in intermediary metabolism. In the glycolytic cycle converting glucose to pyruvate, for example, there are seven key enzymes that require magnesium alone or associated with ATP or AMP (Shils, 1994). Iron is an essential nutrient that is vital to the maintenance of normal physiologic function. Iron is a component of, or cofactor for hundreds of proteins and enzymes (Beard *et al.*, 1996), and as a result, iron deficiency affects many metabolic and enzymatic processes including oxygen transport, oxidative metabolism and cellular growth (Bothwell, 1995; Lynch, 1997).

In the Reference Group, the micronutrient intake of vitamin B12 elevated considerably in contrast with the intake before the pregnancy period. The mean vitamin B12 intake of this group was significantly higher than for the CA and Fenugreek Groups. Other micronutrient intake levels of this group did not elevate compared to those levels before the pregnancy period. It was also noted that the IRDA levels of calcium and iron intake in this group were less than the recommendations (54% and 90% respectively). The micronutrient intake remained similar to these before the pregnancy period. As in the Reference Group, the adequacy levels of calcium and iron were lower than the recommendations (57% and 96%, respectively).

CONCLUSION

Findings from the present study show that micronutrient deficiencies were observed in some subjects from all groups studied either before the pregnancy period or during the first two-month lactation.

After receiving supplementation for 30 days post partum, variance in micronutrient intake was observed in the Reference and CA Groups, but not in the Fenugreek Group. In the CA Group, the mean intake of calcium, magnesium, potassium and iron increased significantly hence the level of these micronutrients intake were above the IRDA. In the Reference Group, the level of vitamin B12 intake was significantly higher than for the two other Groups since the vitamin B12 intake of this group elevated significantly during the lactation period. Overall, the consumption of the Torbangun soup for 30 days led to the increases in dietary intakes of calcium, magnesium, and iron. And as expected, the vitamin B-12 intake was increased significantly as a result of the Molocco+B12™ supplementation in the Reference Group.

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