FATTY ACID INTAKE OF THE BATAKNESE LACTATING WOMEN CONSUMING THE TORBANGUN SOUP (*Coleus amboinicus Lour*)

(Asupan Asam Lemak Wanita Batak Menyusui yang Mengkonsumsi Sop Torbangun)

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ABSTRAK. *Pemanfaatan tumbuhan yang berkhasiat untuk kesehatan ibu yang sedang menyusui banyak dijumpai di beberapa negara di kawasan Asia. Salah satu contohnya adalah pemanfaatan daun tumbuhan Torbangun (Coleus amboinicus* Lour*) di propinsi Sumatera Utara Indonesia oleh wanita menyusui selama 30 hari setelah melahirkan, yang diyakini bermanfaat men ingkatkan produksi air susu dan kesehatan ibu menyusui. Penelitian intervensi dengan metoda paralel secara acak ini bertujuan untuk meneliti pengaruh pemberian sop daun Torbangun selama 30 hari setelah melahirkan terhadap status asam lemak ibu menyusui. Hasil penelitian menunjukkan bahwa konsumsi sop daun Torbangun meningkatkan status asam lemak terkonjugasi (saturated) dan tidak terkonjugasi (unsaturated) subjek penelitian. Kandungan asam lemak ibu yang mengkonsumsi sop daun Torbangun lebih tinggi dibandingkan ibu yang menerima suplemen tablet Moloco+B12 atau Fenugreek. Peningkatan status asam lemak yang diperoleh dari sop Torbangun diduga mempengaruhi kuantitas dan kualitas air susu ibu yang dihasilkan.*

Kata kunci: coleus amboinicus, Bataknese, fatty acid

INTRODUCTION

The role of plants in human nutrition has attracted the interest of researchers from many fields. Numerous publications in both social and natural sciences have provided evidence on the past and present nutritional role of plants (Grivetti *et al.*, 1987; Grivetti & Ogle, 2000). An example of this is the traditional practice among the Bataknese lactating women in North Sumatra Province of Indonesia, of consuming the leaves of Torbangun (*Coleus amboinicus Lour*), in the form of soup, during the first month of lactation (Damanik *et al.*, 2001). They believe that this plant stimulates breast milk production. The effect of consuming the Torbangun soup on the micronutrient (mineral and vitamins) status of the Bataknese lactating mothers has been reported (Damanik, 2005). Consumption of Torbangun soup for 30 days led to the increases in micronutrient intakes of the subject mothers.

The present study investigates the effects of consuming Torbangun soup during 30 days post partum on macronutrient and fatty acids status of the lactating mothers. 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 study. Subjects were divided into three groups: Torbangun (CA), Moloco+B12 (Reference) and Fenugreek Groups. Subjects of the CA Group were provided with CA soup 6 days per week from Monday to Saturday for 30 days. The subjects of the Reference and Fenugreek Groups received Moloco+B12™ tablets and Fenugreek capsule, respectively 3 times per day for 30 days as well. Detailed amount and contain of the supplementations used in the study have been described previously. 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

Macronutrient Intake. The mean macronutrient (energy, protein, fat and carbohydrate) intake of all subjects studied before the pregnancy period is shown in Table 1.

The mean macronutrient intake among the three groups studied before the pregnancy period did not differing. The mean energy, protein, fat and carbohydrate intake of the CA Group was 2337 kcal, 78 g, 77 g and 345 g. The intake of the Reference and Fenugreek Groups were 2597 kcal vs. 2577 kcal, 88 g vs. 91 g, 92 g vs. 91 g and 368 g vs. 363 g, respectively. The values of these macronutrient intakes of all groups studied were found to be higher than the IRDA (Table 2).

Although not of significance, it was observed that some subjects from three groups studied had the macronutrient intake less than the IRDA. In the CA and Fenugreek Groups, 11 (47%) vs. 7 (31%), 4 (17%) vs. 2 (9%), 7 (30%) vs. 2 (9%) and 11 (47%) vs. 8 (36%) subjects consumed energy, protein, fat and carbohydrate respectively, less than the recommendations. Five (22%) and 6(27%) subjects of the Reference Group had the energy and carbohydrate intake less than the IRDA.

Fatty acids Intake. The mean fatty acids (saturated and unsaturated) consumption of the three corresponding groups is shown in Table 3.

The mean saturated and unsaturated fatty acid intake of the CA Group was 19.5 and 22.5, respectively. In the Reference and Fenugreek Groups the mean fatty acid intake was 19.3 and 18.4 vs. 22.5 and 21.5 respectively. No significant differences were noted in the mean fatty acid intake among three comparison groups before the pregnancy period.

The pregnancy period

Macronutrient Intake. The average macronutrient intake of the three corresponding groups during the pregnancy period is shown in Table 4. Mean energy, protein, fat and carbohydrate intake of the CA Group during pregnancy accounted for 2.277 kcal, 78 g, 75 g and 334 g, respectively. While in the Reference and Fenugreek Groups, it accounted for 2520 kcal vs. 2686 kcal, 90 g vs. 92 g, 92 g vs. 95 g and 348 g vs. 382 g, respectively.

Table 1. Energy and Macronutrient Intake of Subjects before The Pregnancy Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
Energy (kcal)	22	2597 ± 678	23	2337 ± 940	22	2577 ± 816
Protein (g)	22	88 ± 31	23	78 ± 31	22	91 ± 39
Fat (g)	22	92 ± 29	23	77 ± 36	22	91 ± 39
Carbohydrate (g)	22	368 ± 103	23	345 ± 137	22	363 ± 98

No significant differences were observed among three intervention groups (ANOVA).

Table 2. Level of Macronutrient Intake before The Pregnancy Period compared to IRDA (%)

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
% IRDA energy	22	126 ± 33	23	111 ± 45	22	123 ± 39
% IRDA protein	22	186 ± 65	23	163 ± 64	22	189 ± 80
% IRDA fat	22	185 ± 57	23	154 ± 72	22	181 ± 79
% IRDA carbohydrate	22	122 ± 35	23	112 ± 44	22	117 ± 32

No significant differences were observed among three intervention groups (ANOVA).

Table 3. Fatty Acid Intake before The Pregnancy Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
C8:0	22	0.0 ± 0.0	23	0.0 ± 0.0	22	0.0 ± 0.0
C10:0	22	0.0 ± 0.0	23	0.0 ± 0.0	22	0.0 ± 0.0
C12:0	22	1.6 ± 0.9	23	1.6 ± 0.9	22	2.1 ± 1.5
C14:0	22	10.5 ± 4.3	23	11.4 ± 4.1	22	11.6 ± 7.0
C16:0	22	58.3 ± 23.5	23	58.6 ± 21.4	22	68.5 ± 35.3
C18:0	22	24.1 ± 10.3	23	24.2 ± 9.8	22	28.0 ± 17.5
C20:0	22	2.1 ± 1.1	23	2.1 ± 0.9	22	2.2 ± 1.3
Total saturated	22	19.3 ± 8.0	23	19.5 ± 7.4	22	22.5 ± 12.5
C14:1	22	1.2 ± 0.6	23	1.1 ± 0.5	22	1.2 ± 0.8
C16:1	22	17.3 ± 7.2	23	16.4 ± 5.9	22	18.2 ± 9.8
C18:1	22	65.5 ± 36.2	23	62.6 ± 31.6	22	80.8 ± 44.4
C18:2	22	19.0 ± 11.4	23	17.7 ± 9.2	22	20.8 ± 11.3
C18:3	22	1.4 ± 1.0	23	1.3 ± 0.8	22	1.5 ± 0.9
C20:4	22	6.1 ± 3.3	23	5.1 ± 2.9	22	6.6 ± 5.2
Total unsaturated	22	18.4 ± 9.9	23	17.4 ± 8.5	22	21.5 ± 12.1

No significant differences were observed among three intervention groups (ANOVA).

Table 4. Energy and Macronutrient Intake of Subjects during The Pregnancy Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
Energy (kcal)	22	2520 ± 724	23	2277 ± 744	22	2686 ± 858
Protein (g)	22	90 ± 33	23	78 ± 27	22	92 ± 38
Fat (g)	22	92 ± 36	23	75 ± 30	22	95 ± 42
Carbohydrate (g)	22	348 ± 99	23	334 ± 107	22	382 ± 106

No significant differences from before pregnancy (paired t-test).

The macronutrient intake of the three groups studied was higher than the corresponding IRDA, except for the mean energy and carbohydrate intake in the CA Group. Table 5 shows that the mean energy and carbohydrate intake of this group was 95% and 96% respectively. No significant differences were noted among the three corresponding groups in the mean macronutrient intake from before the pregnancy period. Although the mean macronutrient intake of the Reference and Fenugreek Groups was higher than the IRDA, malnutrition remained persist in the population studied. It was observed that 10 (45%) vs. 8 (36%), 3 (13%) vs. 2 (9%), 3 (13%) vs. 1 (4%) and 12 (54%) vs. 9 (40) subjects of these groups had energy, protein, fat and carbohydrate intake, respectively less than the corresponding IRDA. Similarly, 13 (56%), 6 (26%), 6 (26%) and 13 (56%) subjects in the CA Group had the energy, protein, fat and carbohydrate intake, respectively less than the corresponding IRDA.

Fatty acids Intake. The mean fatty acid intake of the three corresponding groups during the pregnancy period is shown in Table 6.

The average saturated and unsaturated fatty acids of the CA Group was 18.2 and 16.6 respectively, while in the Reference and Fenugreek Groups they were 18.9 and 17.4 vs. 19.2 and 18.2 respectively. It was observed that the mean saturated fatty acid of C12:0 intake in the CA Group was considerably lower than the Reference Group (1.4 vs. 2.1 $P<0.05$). Overall, the mean fatty acid intake of the three comparison groups during the pregnancy period was not different from before the pregnancy period.

Table 5. Percentage of IRDA of Macronutrient Intake during The Pregnancy Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
% IRDA energy	22	106 ± 30	23	95 ± 31	22	113 ± 36
% IRDA protein	22	150 ± 54	23	130 ± 46	22	153 ± 63
% IRDA fat	22	163 ± 63	23	133 ± 53	22	168 ± 75
% IRDA carbohydrate	22	100 ± 28	23	96 ± 31	22	110 ± 31

No significant differences were observed among three intervention groups (ANOVA).

Table 6. Fatty Acids Intake during The Pregnancy Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
C8:0	22	0.0 ± 0.0	23	0.0 ± 0.0	22	0.0 ± 0.0
C10:0	22	0.0 ± 0.0	23	0.0 ± 0.0	22	0.0 ± 0.0
C12:0	22	2.1 ± 1.1 [a]	23	1.4 ± 0.8 [a]	22	1.8 ± 0.9
C14:0	22	10.7 ± 3.4	23	10.4 ± 3.9	22	10.1 ± 4.4
C16:0	22	55.7 ± 20.9	23	54.7 ± 19.6	22	58.0 ± 25.3
C18:0	22	24.2 ± 10.0	23	22.4 ± 8.7	22	24.4 ± 13.3
C20:0	22	2.1 ± 0.7	23	2.0 ± 0.9	22	1.9 ± 0.8
Total saturated	22	18.9 ± 7.2	23	18.2 ± 6.7	22	19.2 ± 8.9
C14:1	22	1.2 ± 0.4	23	1.1 ± 0.5	22	1.1 ± 0.7
C16:1	22	17.2 ± 7.1	23	15.5 ± 5.4	22	16.1 ± 6.7
C18:1	22	60.0 ± 30.5	23	60.7 ± 32.1	22	66.5 ± 31.8
C18:2	22	17.8 ± 11.1	23	16.3 ± 8.8	22	18.2 ± 8.8
C18:3	22	1.6 ± 0.8	23	1.3 ± 0.8	22	1.3 ± 0.6
C20:4	22	6.6 ± 3.2	23	4.6 ± 2.5	22	6.2 ± 6.1
Total unsaturated	22	17.4 ± 8.8	23	16.6 ± 8.3	22	18.2 ± 9.1

No significant difference from before pregnancy (paired t-test).
Values with the same superscripts were significantly different (ANOVA): [a] $P < 0.05$.

Lactation period

Macronutrient Intake. The mean macronutrient intake of the three corresponding groups during the first two-month lactation is shown in Table 7. Compared to before the pregnancy period, the mean macronutrient intake of the three corresponding groups during the lactation period decreased. The Mean carbohydrate intake in the CA and Reference Groups significantly decreased from 345 g to 283 g ($P<0.05$) and from 368 g to 275 g ($P<0.001$), respectively. While in the Fenugreek Group, not only carbohydrate but also the mean energy and protein intake significantly decreased from 363 g to 274 g ($P<0.001$), 2577 kcal to 2051 kcal ($P<0.05$), and from 91 g to 74 g ($P<0.05$) respectively. The decrease in macronutrient intake of all groups studied resulted in its IRDA levels being less than the recommendation. Table 8 showed that the mean IRDA level of the energy and carbohydrate intake was only 74% and 70% respectively. Statistical analysis showed that there were no significant differences noted in the mean macronutrient intake and the adequacy level among the three groups during the lactation period.

Fatty acids Intake. Fatty acid (saturated and unsaturated) intake of the three comparison groups studied is shown in Table 9.

As shown in Table 9, the increase in fatty acid consumption in the CA Group during the first two-month lactation is considerably higher ($P<0.0001$) than in the Reference and Fenugreek Groups. The mean saturated and unsaturated fatty acid intake of this group exhibited a greater rise from before the pregnancy period. The intake of saturated C8:0 and C10:0 elevated from 0 to 13 and from 0 to 9 ($P<0.0001$) respectively. The intake of

saturated C12:0 and C14:0 increased from 1.6 to 68.6 and from 11.4 to 20.2 ($P<0.0001$) respectively. The intake of saturated C16:0 and C18:0 increased from 58.6 to 63.6 and from 24.2 to 26.3 respectively. Although the increases of these fatty acids were not significantly different from before the pregnancy period, it was observed that the intake of C16:0 of the CA Group was considerably higher ($P<0.01$) than the Reference and Fenugreek Groups. The intake of unsaturated C18:2 and C18:3 rose significantly from 17.7 to 24.8 ($P<0.01$) and from 1.3 to 4.7 ($P<0.0001$) respectively. There are no increases observed in the fatty acid consumption in the Reference and Fenugreek Groups from before the pregnancy period to the lactation period.

Table 7. Energy and Macronutrient Intake during the Lactation Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
Energy (kcal)	22	2075 ± 501	23	2016 ± 516	22	2051 ± 599 Ŧ
Protein (g)	22	72 ± 27	23	67 ± 17	22	74 ± 20 *
Fat (g)	22	80 ± 30	23	70 ± 23	22	78 ± 26
Carbohydrate (g)	22	275 ± 51 §	23	283 ± 73 *	22	274 ± 90 §

*Significant difference from before pregnancy (paired t-test): *, $P < 0.05$; Ŧ, $P < 0.01$; §, $P < 0.001$.*

Table 8. IRDA Level of Macronutrient Intake during the Lactation Period (%)

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
% IRDA energy	22	76 ± 20	23	73 ± 20	22	73 ± 21
% IRDA protein	22	114 ± 43	23	107 ± 27	22	115 ± 31
% IRDA fat	22	123 ± 45	23	107 ± 35	22	118 ± 40
% IRDA carbohydrate	22	70 ± 17	23	72 ± 21	22	68 ± 22

No significant differences were observed among three intervention groups (ANOVA).

Table 9. Fatty Acid Intake during the Lactation Period

Parameters	Reference Group		CA Group		Fenugreek Group	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
C8:0	22	0.0 ± 0.0 ^{b}	23	13.0 ± 2.8 ^{bc} ¶	22	0.0 ± 0.0 ^{c}
C10:0	22	0.0 ± 0.0 ^{b}	23	9.8 ± 2.1	22	0.0 ± 0.0 ^{c} Ŧ
C12:0	22	1.7 ± 2.3 ^{b}	23	68.6 ± 14.2 ^{bc} ¶	22	1.6 ± 1.0 ^{c}
C14:0	22	9.6 ± 5.7 ^{b}	23	20.2 ± 4.0 ^{bc} ¶	22	9.8 ± 4.3 ^{c}
C16:0	22	45.9 ± 23.5 ^{d} *	23	63.6 ± 13.9 ^{ad}	22	50.9 ± 20.1 ^{a} *
C18:0	22	20.0 ± 12.2 ^{a}	23	26.3 ± 5.9 ^{ac}	22	20.2 ± 8.7 ^{e} *
C20:0	22	1.9 ± 1.0	23	2.0 ± 0.9	22	2.0 ± 0.9
Total Saturated	22	15.8 ± 8.9	23	29.1 ± 6.2	22	16.9 ± 7.0
C14:1	22	1.0 ± 0.5	23	1.0 ± 0.4	22	1.1 ± 0.5
C16:1	22	14.4 ± 8.0	23	16.0 ± 4.3	22	15.3 ± 5.9
C18:1	22	45.0 ± 26.3 Ŧ	23	49.9 ± 19.8	22	55.1 ± 28.0 Ŧ
C18:2	22	14.0 ± 8.7 ^{b} *	23	24.8 ± 6.6 ^{bc} Ŧ	22	14.1 ± 7.0 ^{c} Ŧ
C18:3	22	1.4 ± 1.0 ^{b}	23	4.7 ± 0.9 ^{bc} ¶	22	1.4 ± 0.8 ^{c}
C20:4	22	5.0 ± 4.3	23	3.7 ± 1.9	22	5.2 ± 2.7
Total unsaturated	22	13.5 ± 8.1	23	16.7 ± 5.6	22	15.4 ± 7.5

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

DISCUSSION

The present findings confirmed previous reports reporting 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).

The findings showed that after consuming CA leaves for 30 days post-partum there were considerable changes in the fatty acid intake of the CA Group. The mean intake of saturated (C8:0, C10:0, C12:0, C14:0) and unsaturated (C18:2, C18:3) fatty acids of the CA Group were also higher than of the Reference and Fenugreek Groups.

It has been shown in several studies that the composition of the fat consumed by the mother will influence the fatty acid composition of milk (Chen *et al.*, 1997; Chulei *et al.*, 1995; Kneebone *et al.*, 1985). In a study of fatty acid composition in breast milk amongst women of Chinese, Indian and Malay ethnicity in Malaysia, it was observed that the Indian and Malay subjects, who frequently consumed coconut milk, had higher levels of saturated fatty acids, while the higher linoleic acid contents were reported for their Chinese counterparts, who used vegetable oil in cooking (Kneebone *et al.*, 1985).

Based on findings from these previous studies, it might be predicted that the fatty acid (saturated and unsaturated) contents of breast milk in the CA Group would be higher than the Reference and Fenugreek Group. The saturated fatty acid content in human milk is known to be a potential source of energy (Barnes *et al*, 1974). The saturated fatty acids have also been reported to have anti protozoan, antibacterial, and antiviral activity, specifically against lipid-enveloped viruses (Isaacs & Thormar, 1991; Thormar *et al.*, 1987). In contrast to saturated fatty acids, which can be endogenously synthesized de novo, unsaturated fatty acids (especially essential polyunsaturated fatty acids) can not be synthesized by mammals and must be supplied with the diet (Honstra, 2000). Polyunsaturated fatty acids (especially long-chain polyunsaturated fatty acids) play an important role as membrane constituents, with marked perinatal accumulation in membrane-rich tissue such as the brain and retina (Honstra, 2000).

In the Reference Group, there was no elevation in the fatty acid intake observed in this group by comparison with before the pregnancy period. In the Fenugreek Group, on the other hand, there were no increases in fatty acid intake noted compared to before the pregnancy period. The fatty acids intake remained similar to these before the pregnancy period. As in the Reference Group, the calcium and iron intakes were lower than the IRDA (57% and 96%, respectively).

CONCLUSION

After receiving supplementation for 30 days post partum, variance in fatty acid intake were observed in the Reference and CA Groups, but not in the Fenugreek Group. In the CA Group, the mean consumption of saturated (C8:0, C10:0, C12:0, C14:0) and unsaturated (C18:2, C18:3) fatty acids in this group were higher than for the Reference and Fenugreek Groups. Overall, the consumption of Torbangun soup for 30 days led to the increases in dietary intakes of saturated (C8:0, C10:0, C12:0, C14:0) and polyunsaturated (C18:2, C18:3) fatty acids.

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