

**Chlorella supplementation reduces the risk of anemia, proteinuria and edema in pregnant women***Plant Foods for Human Nutrition* Vol.65 No.1

The requirements for energy and various nutrients in pregnant women are particularly high because of increased maternal metabolic rate and fetal demands. Deficiency of these nutrients causes various disorders in both mothers and infants. In particular, requirement of folate, which is a water-soluble B group vitamin, is not easily fulfilled through diet alone, thus, folate supplement is recommended for women of childbearing age in many countries. Perinatal folate status is critical for preventing neural tube defects (NTDs), which are one of the most serious and common structural congenital anomalies. In addition, folate plays important roles for maintenance of normal function of hematopoietic system. With regard to treatment of anemia in pregnant women, the supplementation of iron plus folate is more effective than iron supplementation alone. The results of the intervention study of Chlorella supplement in pregnant women was published in *Plant Foods for Human Nutrition*.

**[Objective]**

Chlorella contains large quantities of vitamins and minerals, such as folate, vitamin B-12 and iron, that are required during pregnancy. Thus, the aim of the study is evaluate the preventive effects of Chlorella supplementation on pregnancy anemia and pregnancy induced hypertension (PIH), which is common and potentially dangerous disorder in human pregnancy.

**[Subjects and Methods]**

The subjects for the present study were recruited from pregnant women who visited Saiseikai Nara Hospital (Nara, Japan) for prenatal care. A total of 70 primiparous women were placed into the control group (n=38) or the Chlorella group (n=32). The subjects in the Chlorella group were supplemented daily from 12th-18th wk of gestation until delivery with 30 tablets (6 g) of Chlorella supplement. Blood test (red blood cell count, hemoglobin concentration and hematocrit), urinalysis (urine protein, urine glucose, pH and specific gravity), sphygmomanometry and diagnosis of leg edema were done once at the end of each trimester (mean±SD: 10.2 ± 1.1, 24.1 ± 1.1 and 36.1 ± 0.8 wk of gestation, respectively). The protocol was approved by the Institutional Review Board of Saiseikai Nara Hospital. Written informed consent was obtained from each participant.

**[Results]**

All of the data at the first trimester (before the start of Chlorella supplementation) were not significantly differences between the groups. Anemic status of subject was defined as < 11 g/dL of hemoglobin concentration, which is based on World Health Organization (WHO) recommendation

for pregnant women. Based on the WHO cut-off value for hemoglobin, the proportion of anemic subjects in the Chlorella group were significantly lower compared with the control group at the second and third trimesters (Table 1). Additionally, in the Chlorella group, the incidences of proteinuria and edema, signs of PIH, were significantly lower during the third trimester (Tables 2 and 3). These results suggest that Chlorella supplementation would have preventive effects on anemia, proteinuria and edema in pregnancy. Chlorella may be useful as a resource of micronutrients, such as folate, vitamin B-12 and iron, for pregnant women.

Table 1 Effects of Chlorella supplementation on hemoglobin concentration in pregnant women

Hemoglobin	Control group (n=38)			Chlorella group (n=32)		
	1st trimester	2nd trimester	3rd trimester	1st trimester	2nd trimester	3rd trimester
< 11 g/dL	2 (5.3%) <sup>1</sup>	14 (36.8%)	23 (60.5%)	0 (0%)	4 (12.5%)*	10 (31.2%)*

<sup>1</sup>Number of subjects, with % in parentheses. \* $P < 0.05$  ( $\chi^2$  test).

Table 2 Effects of Chlorella supplementation on the incidence of proteinuria in pregnant women

Proteinuria	Control group (n=38)			Chlorella group (n=32)		
	1st trimester	2nd trimester	3rd trimester	1st trimester	2nd trimester	3rd trimester
	2 (5.3%) <sup>1</sup>	4 (10.5%)	9 (23.7%)	0 (0%)	2 (6.3%)	2 (6.3%)*

<sup>1</sup>Number of subjects, with % in parentheses. \* $P < 0.05$  ( $\chi^2$  test).

Table 3 Effects of Chlorella supplementation on the incidence of leg edema in pregnant women

Leg edema	Control group (n=38)			Chlorella group (n=32)		
	1st trimester	2nd trimester	3rd trimester	1st trimester	2nd trimester	3rd trimester
	0 (0%) <sup>1</sup>	7 (18.4%)	17 (44.7%)	0 (0%)	2 (6.3%)	3 (9.4%)*

<sup>1</sup>Number of subjects, with % in parentheses. \* $P < 0.05$  ( $\chi^2$  test).

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