

Description: Mortality rates in infants and young children of Thailand are very high. What part thiamine deficiency plays in this is not clear. The ICNND survey in 1960 established that thiamine intakes among civilians throughout the country are marginal by currently available standards and that approximately half of the civilian population studied had thiamine excretion below "acceptable" levels. Only a few clinical manifestations of beri-beri were observed. The ICNND survey has no adequate information regarding thiamine nutrition of infants, pregnant and lactating women. The same survey showed that individuals could have no detectable excretory level (with the method used throughout this study), yet have no clinical evidence of beri-beri. It is not known whether under prolonged stress the clinical picture would change. Thiamine levels in blood and urine as well as an oral thiamine load test are both inadequate as diagnostic procedures and the recent development of erythrocyte transketolase activity as a diagnostic test needs further study. Thiamine nutrition survey in pregnant and lactating women and their infants were conducted in Chiangmai, Ubol, Songkhla and Bangkok. The general procedure followed during the course of the study consisted of two parts:

(1) A general physical examination and brief medical history with special emphasis on signs and symptoms of nutrition deficiency

(2) Determination of transketolase activity, serum protein, hemoglobin and hematocrit in the blood, and thiamine content in the urine and milk.

Progress: The survey part of the study has been completed. The number of subjects from the four provinces is shown in Table I. Clinical findings are shown in Table II. No typical findings of beri-beri were found. However, two women in Chiangmai, two in Bangkok and one in Songkhla demonstrated no ankle or knee reflexes. Suggestive findings of riboflavin deficiency were found more frequently in Chiangmai and Songkhla. Thyroid enlargement was demonstrated in about 20% of subjects in Chiangmai and Ubol.

Low serum protein (less than 6 gm%) is observed more often in Ubol and Chiangmai (see Table III) and anemia is found more often in Ubol, Chiangmai and Songkhla respectively, as compared to Bangkok.

Thiamine nutrition in infants, pregnant, and lactating women and controls from 4 areas are shown in Table VI and VII. In general, erythrocyte transketolase activity and urinary thiamine excretion seem to agree in other groups except in lactating women from Chiangmai and infants from Ubol. Thirty-six percent of nursing women from Chiangmai are Thiamine-deficient, based upon urinary thiamine excretion, but only 10 per cent are deficient according to erythrocyte transketolase activity.

The result of thiamine content in human milk from nursing mothers between 1 to 7 months is shown in Table VIII. Milk from Songkhla has the highest Thiamine content, 14.9 ± 0.83 ug/100 ml. and the difference is significant when compared

to milk from the other three areas ($P < 0.01$). Thiamine content of milk from Chiangmai is more or less the same as from Bangkok and Ubol ($P < 0.05$), but the value of Ubol's milk is significantly higher than that of Bangkok ($P=0.03$).

Summary and Conclusion: Thiamine nutrition in pregnant and lactating women and their infants was evaluated by physical examination, thiamine content in urine and milk, erythrocyte transketolase activity, as well as general nutritional status as determined by clinical findings, serum protein level, hemoglobin and hematocrit values. Attempts have been made to correlate the clinical status, erythrocyte transketolase activity and thiamine content in urine and milk as well as to find the best biochemical test to detect sub-clinical thiamine deficiency.

Study was carried out in Chiangmai, Ubol, Songkhla and Bangkok. About 50 to 60 each of pregnant women, lactating women and their infants were studied by a brief medical history and physical examination. Blood was drawn for determination of hemoglobin, hematocrit and erythrocyte transketolase activity. Urine and milk from lactating mothers (under 7 months) were tested for thiamine content. Data indicate that a lower serum protein, hemoglobin and hematocrit are observed in Ubol and Chiangmai compared to those in Songkhla and Bangkok. Thiamine content of human milk from Songkhla is significantly higher than the other three areas ($P < 0.01$). No conclusion, can be drawn at present because urinary thiamine determination has not yet been completed.

Table 1

NUMBER OF SUBJECTS STUDIED

Province	Pregnants (6 mos. and over) Age 15-45 years	Lactating (7 mos. and under) Age 15-45 years	Infants Age 7 mos and Under	Control (non-pregnant and non-lactating) Age 15-45 years	Total
Chiangmai	53	52	50	42	197
Ubol	70	70	53	54	247
Songkhla	53	55	55	50	213
Bangkok	30	33	29	54	143

Table II

CLINICAL FINDINGS

	Chiangmai	Ubol	Songkhla	Bangkok
a. <u>Pregnant and Lactating</u>				
Loss of ankle and knee reflexes	2	0	1	2
Papillary atrophy of tongue	8	2	7	1
Angular lesions	4	1	1	2
Angular lesions with papillary atrophy	2	0	1	0
Enlarged Thyroid	39	49	5	0
Thyrotoxicosis	0	1	0	0
Follicular hyperkeratosis	0	0	1	0
b. <u>Infant</u>				
Malnutrition	2	0	0	0

Table III
SERUM PROTEIN

Description Age	Pregnants 15-45				Lactating 15-45				Infants 7 mos. and under				Controls 15-45			
	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
Provinces	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
No. of subjects	52	64	54	23	49	64	54	29	6	49	29	21				
% DISTRIBUTION																
gm Protein/100 ml Serum	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
< 6.0 Deficient *	28.8	68.8	1.8	13.0	6.1	7.8							66.7	98.0	75.9	13.2
6.0-6.39 Low *	40.4	20.3		4.3	10.2	9.4							33.3	2.0	6.9	19.0
6.40-6.99 Acceptable *	30.8	10.9	33.3	30.4	55.1	34.4	3.7	10.3							6.9	23.8
> 7.0 High *			64.8	52.2	28.6	48.4	97.3	89.7							10.3	23.8
Average gm%	6.1	5.6	7.1	7.1	6.6	7.0	8.1	7.9	5.3	4.5	5.5	6.3				

Normal = 5.6 Chiengmai = C Ubol = U Songkhla = S Bangkok = B

* Criteria utilized based upon ICNND survey for the Union of Burma, 1961

Table IV
HEMOGLOBIN

Description Age	Pregnants 15-45				Lactating 15-45				Infants 7 Mos and under				Controls 15-45			
	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
Provinces	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
No. of subjects	53	70	53	30	52	70	55	53	50	53	55	29	42	54	50	54
% DISTRIBUTION																
gm Hb/100 ml blood	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
4-5.6 Severe anemia*		4.3	7.5	3.3		5.7	1.8		6.0	9.4	7.3	13.8		1.9	4.0	
6-7.9 severe anemia*	3.8	13.9	18.9	10.0	3.8	7.1	1.8		18.0	28.3	20	6.9	4.8	9.3	14.0	
8-9.9 anemia *	51.1	52.9	35.8	40.0	19.2	32.9	16.4	12.9	62.0	49.1	32.7	34.5	2.4	24.1	38.0	14.8
10-11.9 deficient *	43.5	24.3	24.5	40.0	46.2	37.1	47.3	51.5	12.0	11.3	25.5	38	57.1	55.6	36.0	63.0
12-13.9 low*	1.9	5.7	13.2	6.6	28.8	12.9	32.7	33.0	2.0	1.9	7.3		33.3	9.3	4.0	22.2
14-14.9 acceptable*					1.9	2.9	1.8				5.6		2.4		4.0	
15 high *								3.3			3.6	6.9				
Average Hb gm%	9.9	9.3	9.2	9.8	11.1	9.9	11.3	11.8	8.6	9.2	9.4	9.5	11.4	10.2	11.5	11.3

Chiengmai = C Ubol = U Songkhla = S Bangkok = B

* Criteria utilized based upon ICNND survey for the Union of Burma 1961

Table V
HEMATOCRITS

Description Age	Pregnants 15-45 6 mos and over				Lactating 15-45 7 mos.				Infants 7 mos and under				Controls 15-45			
	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
No. of subjects	53	71	53	30	53	68	56	33	49	58	55	29	42	54	51	54
% DISTRIBUTION																
Hematocrit %	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
15 Severe anemia *			2.3	3.3			1.8			3.4	7.3					
16-20 Severe anemia *		4.2	2.3			4.4				8.6	3.6	6.1		1.9	2.0	
21-25 Severe anemia *	1.6	11.3	17.0	3.3		7.4	1.8		1.6	22.4	7.3	18.4	2.4		2.0	3.7
26-30 Anemia *	35.8	43.7	30.2	16.7	11.3	19.1	5.4		35.8	50.0	40	57.1	2.4	11.1	3.9	14.8
31-35 Deficient *	43.4	39.4	37.7	36.7	37.7	39.7	26.8	15.2	43.4	15.5	21.8	12.2	33.3	46.3	25.5	29.6
36-41 Low *	18.9	1.4	11.3	36.7	47.2	27.9	62.5	69.7	18.9		14.5	6.1	59.5	37.0	58.8	51.9
42-44 Acceptable *				3.3		1.9	1.8	12.1			3.6		2.4		7.8	
45 High *					1.9	1.6		3			1.8			3.7		
Average Hct. %	31.8	29.2	30.0	33.1	35.7	32.3	35.7	38.3	27.6	26.2	29.6	31.9	36.3	34.5	36.4	34.6

Chiengmai = C Ubol = U Songkhla = S Bangkok = B

* Criteria utilized based upon ICNND survey for the Union of Burma 1961

Table VI
ERYTHROCYTE TRANSKETOLASE ACTIVITY

Description Age (yrs)	Pregnant 15-45				Lactating 15-45				Infants 7 mos and under				Controls 15-45			
	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
No. of subjects	44	71	53	30	42	44	52	35	16	60	36	17	37	45	44	42
% DISTRIBUTION																
% Stimulation of ETK by TPP <i>in vitro</i>	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
> 20 Deficient *	36.4	18.3	9.4	10	9.5	13.7	11.6	17.2	12.5	30	5.6	0	8.1	26.7	6.8	38.2
16-20 Low *	4.5	11.3	7.6	10	4.8	18.2	5.8	5.7	6.3	6.7	2.8	0	8.1	15.6	4.6	7.2
< 15 Satisfactory*	59.1	70.4	83.0	80	85.7	68.1	82.6	77.1	81.2	63.3	91.6	100	83.8	57.8	88.6	54.6

Chiengmai = C Ubol = U Songkhla = S Bangkok = B

* Criteria utilized based upon ICNND survey for the Union of Burma, 1961

Table VII
URINE THIAMINE

Description Age (yrs)	Pregnant 15-45				Lactating 15-45				Infants 7 mos and under				Controls 15-45			
	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
Provinces																
No. of subjects	44	65			45	67			36	62			21	22		
% DISTRIBUTION																
$\mu\text{g B}_1/\text{gm Creatinine}$	C	U	S	B	C	U	S	B	C	U	S	B	C	U	S	B
< 27 Deficient *	18.2	4.6			35.6	10.4			5.5	6.5			14.3	16.7		
27-65 Low*	34.1	12.3			26.7	28.4			11.1	6.5			28.6	58.3		
> 66 and up Satisfactory	63.6	83.1			37.8	61.2			83.4	87.5			67.1	25.0		

Chiengmai = C Ubol = U Songkhla = S Bangkok = B

* Criteria utilized based upon ICNND survey for the Union of Burma, 1961

Table VIII
THIAMINE CONTENT OF HUMAN MILK IN THAILAND

Provinces	Number of Samples	Thiamine $\mu\text{g}/100 \text{ ml.}$
Chiengmai	50	10.2 \pm 0.65
Ubol	56	11.9 \pm 0.63
Songkhla	55	14.9 \pm 0.83
Bangkok	20	9.3 \pm 0.99

* Mean \pm S. E.

Chiengmai VS Ubol	P >	0.05	non-significant
Chiengmai VS Bangkok	P >	0.05	non-significant
Chiengmai VS Songkhla	P <<	0.01	highly significant
Songkhla VS Ubol	P <	0.01	highly significant
Songkhla VS Bangkok	P <<<	0.01	highly significant
Ubol VS Bangkok	P <	0.05	significant