

SERUM SODIUM AND POTASSIUM LEVELS WITH DIETARY EVALUATION OF NON-TOXEMIC AND TOXEMIC FILIPINO PREGNANT WOMEN*

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The study of serum sodium and potassium levels in Filipinos was started by one of us in 1951 (1). In "normal" adult students, serum sodium varied from 137.4—156.5 m Eq/L, with a mean of 147, and serum potassium ranged from 3.9—5.5 m Eq/L with a mean of 4.7.

The present study was undertaken mainly for the purpose of determining sodium and potassium levels in Filipino pregnant women of both non-toxemic and toxemic groups. Simultaneously, complete dietary histories of the subjects were taken, particularly with regards to the use of salt and salty food seasonings, in an attempt to correlate these findings with the serum sodium level and to elicit any possible distinct differences in dietary pattern between the two groups.

Although numerous extensive and intensive studies have been made in recent years in an effort to establish the definite role of nutrition in the development of toxemias of pregnancy, not much headway has so far been accomplished. Most of the investigators, however, are agreed that malnutrition plays an important part in susceptibility to toxemia among pregnant women, but no direct relationship between a particular nutrient or nutrients and toxemia has as yet been agreed upon. As a matter of fact, the mass of evidence from animal and human studies on the relationship of maternal nutrition and reproductive performance has so far been at best contradictory. It is hoped that, eventually, with more studies on this controversial

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subject, there will evolve a pattern which will serve to pinpoint the key to the puzzle.

The relation of dietary salt to certain diseases was noted even as far back as at the end of the 15th century when John of Gaddesden (2) commented on the value of salt restriction in the treatment of heart disease. Although medical literature abounded in the past century with reports commending this procedure for patients with heart disease, it was only in the present century that its value in pregnant women threatened with eclampsia was suggested. J.O. Arnold (3) recommended salt restriction in these patients in 1934, while K. de Shoo (4) reported in 1937 that he was almost able to eliminate eclampsia from his patients in Utrecht, Holland, by placing them on a low salt regime in the second half of pregnancy. He implicated sodium as the cause of eclampsia. Numerous similar reports on the favorable influence of the limitation of sodium on the course of pregnancy and labor have since appeared.

One article in 1958 that caught our interest was the radically opposing report of Robinson (5) concerning her study of 2077 pregnant women wherein there was a lower incidence of toxemia, edema, antepartum hemorrhage and perinatal death in the group advised to increase their salt intake as against the group advised to decrease it. The women with early toxemia who were treated with extra salt improved, their recovery being quicker and more complete when larger doses of salt were given. Recurrence occurred when salt intake was lowered. Though we wanted to repeat this study among Filipino pregnant women, we felt that there was first a need for the establishment of baselines—hence the present study.

METHODS

Pregnant patients admitted to the obstetrical service of the Philippine General Hospital for delivery or as toxemic cases were taken as subjects. A toxemic patient was so-called when she had one or more of the following signs:

- (1) Hypertension: diagnosed when there was a sudden increase of at least 15 mm. in the systolic or 10 mm.

in diastolic blood pressure over that of a previous normal reading; if there was no previous reading available, a blood pressure of 130 mm. systolic or over and 90 mm. diastolic or over, when found after the 24th week of gestation was classified as toxemia.

(2) Albuminuria of (+) or more.

(3) Edema which must involve the upper extremities or the face.

(4) Convulsions and/or coma.

A total of 200 patients were covered but only 99 non-toxic and 97 toxic cases are being reported since the rest were either discharged before histories could be taken or the blood samples obtained were insufficient for examination.

A blood sample was obtained by finger-prick, usually within 6 hours after admission before treatment was administered, except in some toxic cases where magnesium sulfate had been given intramuscularly or, in a few, intravenously upon admission. The blood sample was analyzed for sodium and potassium using a modification (6) of the ultramicro methods published by Natelson and Sobel.

Since it was impossible to estimate actual intakes of sodium using the recall method of dietary history, a method was devised covering eating habits of the patient with special emphasis on the use of salt and salty seasonings such as *toyo*, *patis*, *vetsin* and *bagoong*. The diet recorded was the usual dietary pattern of the patient and not any special diet recently initiated during pregnancy. Thus, for instance, salt restriction undertaken just before admission because of an already rising blood pressure was not recorded. A sodium score (see Appendix) was devised based on giving the numerical values of 0, 1, 2, and 3 to gradations of intake from "never" to "always" or from "very little" to "plenty" of these various materials. The total sodium score of a patient was the sum of the figures covering each material. During the dietary interview, the amount and kind of foods usually taken at each meal and as snacks were recorded. From the record, the average daily intake of calories, carbohydrates, proteins, and fats was then calculated for each group of patients.

RESULTS

The subjects in the non-toxic group ranged in age from 16 to 41 years and averaged 27 years, while those in the toxic group ranged from 18 to 46 years and averaged 29 years. The mean serum sodium and potassium levels in both groups are shown in Table I. Although the difference in the serum sodium level between the non-toxic group and the toxic group appears slight, the rise in the toxic group was found to be statistically significant, it being—5.6 which is significant even at 0.1 per cent level. However, the difference in serum potassium levels between the two groups was not found to be statistically significant at the 5 per cent level of significance.

TABLE I — MEAN SERUM AND POTASSIUM in mEq.

	<u>Mean Serum Sodium</u>	<u>Mean Serum Potassium</u>
Non-toxic	140.70 \pm 4.27 (S.D.)	4.2 \pm 0.64 (S.D.)
Toxic	144.85 \pm 6.5 (S.D.)	3.92 \pm 0.60 (S.D.)

Sodium scores that were obtained ranged from 3 to 33. The minimum possible sodium score that an individual may obtain was 0 (indicating extremely low intake of salt) while the maximum possible was 42. The average sodium scores for each of the two groups studied showed no significant difference (See Table II) although the score of the non-toxic group (11.0) was slightly higher than that of the toxic group (10.5). There was no correlation between the sodium score of the non-toxic group and the serum sodium of the group, while the corresponding values for the toxic group showed a poor correlation, the coefficient of correlation being 0.2342 with 0.102 standard error of the coefficient.

Incidentally, mention may be made of the average intake of 263 randomly selected households surveyed within the Metropolitan Manila region (Manila, Quezon City, Pasay and five suburban Rizal municipalities). These households averaged a daily per capita intake of 3.01 gm. sodium as estimated from their three-day record of intake of salt, *toyo*, *patis*, *bagoong* and *netsein* (7). The record covered all seasonings used for cooking and at table.

In another study by one of us, sample daily diets (excluding seasoning added at table) were analyzed. The day's meals, ready to be served, were found to have a sodium content of 1.25 to 5.83 gm. with a daily mean of 3.43 ± 1.115 S.D. (8).

The other dietary findings are shown in Table II. Comparing these findings of both groups with the recommendations for Filipino pregnant women as given in "Table II Recommended Daily Food Allowance by Sex, Group Activity and Age Group" of the former Institute of Nutrition (now the Food & Nutrition Research Center), we find that the total calories recommended fell about midway between the caloric intake of the non-toxemic (which was lower) and that of the toxemic (which was higher). The carbohydrate intakes of both groups exceeded the recommended allowance, while their protein (especially the animal protein) and their fat intakes were much lower than recommended. None of the caloric or nutrient findings showed any significant difference between the non-toxemic and the toxemic groups nor any apparent correlation with the serum sodium levels. Exception to this was the total protein intake of the non-toxemic group which showed a correlation with the serum sodium of the group, the coefficient of correlation being $+ 0.972$ with 0.101 standard error of the coefficient.

TABLE II—DAILY RECOMMENDED ALLOWANCES AND MEAN DIETARY FINDINGS AMONG PREGNANT FILIPINO WOMEN

	Recommended Allowances	Mean Dietary Findings	
		Non-Toxemic	Toxemic
Sodium score		11.04 ± 4.67 (S.D.)	10.51 ± 3.98 (S.D.)
Calories	2345	2250.0 ± 719 (S.D.)	2430 ± 894 (S.D.)
Carbohydrates (gm.)	312	383.0 ± 133 (S.D.)	418 ± 170 (S.D.)
Total Proteins (g.m.)	87	65.0 ± 26 (S.D.)	67 ± 47 (S.D.)
Animal Proteins (gm.)	52.1	30.0 ± 17.5 (S.D.)	29 ± 18 (S.D.)
Vegetable Proteins (gm.)	35	35.0 ± 13.1 (S.D.)	38 ± 17 (S.D.)
Fats (gm.)	81	51.0 ± 27 (S.D.)	53 ± 30 (S.D.)

The relatively large standard deviations obtained in the dietary findings are to be expected and are comparable with other similar studies. Two studies (9, 10), one on a group of obese pregnant women using the dietary history as a tool for determining food intake, gave practically the same standard deviations in their dietary data. Despite these findings, Trulson (11) in her assessment of methods for obtaining data for clinical work observed that "the long-range interview of usual food practices which will reveal previous as well as present eating patterns is the method of choice for clinical studies."

SUMMARY

The serum sodium and serum potassium of 99 non-toxemic and 97 toxemic Filipino pregnant women were determined and correlated with their food habit, regarding the use of salt and salty seasonings and with their intakes of calories, carbohydrates, proteins, and fats, data on which was taken by the recall method. There was a statistically significant higher mean serum sodium in the toxemic group. Serum potassium levels and dietary findings showed no significant differences between the two groups, nor any correlation between the serum sodium levels and the dietary findings, except with the total protein intake of the non-toxemic group which gave a positive correlation with the serum sodium of the group. Dietary findings are compared with recommended allowances for Filipino pregnant women.

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APPENDIX A

Dietary History of Sodium Intake

Usual Food Habits	Score	Usual Food Habits	Score
1. Amount of salt used in cooking.		Patis	
Very little	0	Never or rarely	0
Just enough	1	Sometimes	1
On the salty side	2	Often	2
Plenty	3	Always	3
2. Frequency of use of seasonings in cooking.		Bagoong	
Toyo		Never or rarely	0
Never or rarely	0	Sometimes	1
Sometimes	1	Often	2
Often	2	Always	3
Always	3	4. If she eats food she does not cook, does she find it	
Patis		Salty to her taste	0
Never or rarely	0	Salted just right	1
Sometimes	1	Necessary to add salt, patis, toyo to it after tasting it.	2
Often	2	Necessary to add salt, patis, toyo to it even without tasting it.	3
Always	3	5. Frequency of taking the following medicine:	
Bagoong		Sodium bicarbonate	
Never or rarely	0	Never or rarely	0
Sometimes	1	Sometimes	1
Often	2	Often	2
Always	3	Always	3
Vetsin (Monosodium glutamate)		Sodium salicylate	
Never or rarely	0	Never or rarely	0
Sometimes	1	Sometimes	1
Often	2	Often	2
Always	3	Always	3
Soda		Sodium sucaryl	
Never or rarely	0	Never or rarely	0
Sometimes	1	Sometimes	1
Often	2	Often	2
Always	3	Always	3
3. Frequency of adding seasoning, at table.			
Salt			
Never or rarely	0		
Sometimes	1		
Often	2		
Always	3		
Toyo			
Never or rarely	0		
Sometimes	1		
Often	2		
Always	3		
		Total Score	—