HYPERURICAEMIA AND GOUT IN THE MARIANA ISLANDS*

BY

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Fisher (1959) and Decker and Lane (1959), Decker (1962), and Decker, Lane and Reynolds (1962) called attention to the high prevalence of gout and hyperuricaemia in Filipinos, and Lennane, Rose, and Isdale (1960) pointed out the high frequency of gout in the Maori of New Zealand. This report describes two other ethnic groups from the Pacific both with high prevalences of hyperuricaemia and gout.

Material and Methods

Serum samples were obtained on individuals aged 40 years and above during surveys for amyotrophic lateral sclerosis in the Mariana Islands of the Central Pacific by the National Institute of Neurological Diseases and Blindness. The samples cannot be considered entirely random since the completion rate for this phase of the survey was only about 50 per cent. The findings are probably representative, however, since the respondents were unselected in so far as their uric acid levels are concerned.

The individuals came from the villages of Merizo and Umatic on Guam, and the islands of Saipan, Tinian, and Rota, all in the Marianas. A total of 390 samples were obtained, 335 on Chamorros who are the native inhabitants and 55 on Carolinians who migrated to the area within the past 100 years. In addition forty samples were obtained from Carolinians living on the island of Truk in the central Caroline Islands.

The bloods were separated within 2 to 3 hours of collection, and the sera frozen until analysed. Uric acids were determined in duplicate using the enzymatic-spectrophotometric method as described by Liddle, Seegmiller, and Laster (1959).

Results

The mean uric acid values of the Chamorros were 6.23 mg. per cent. in the males and 5.10 mg. per

cent. in the females and of the Carolinians 7.27 and 5.70 mg. per cent. in males and females respectively (Table I). The differences between the Chamorros and Carolinians are significant (males $P < 0.01$, females $P < 0.05$). In an effort to ascertain if the high uric acid values of the Carolinians were attributable to ethnic or environmental causes, blood samples were tested from forty Carolinians living on the island of Truk in the Central Caroline Islands. Unfortunately only thirteen were of the age group studied in the Mariana Islands; the nine males had a mean uric acid value of 6.5 mg. per cent. and the four females of 5.9 mg. per cent.

TABLE I
MEAN URIC ACID VALUES IN CHAMORROS AND
CAROLINIANS IN THE MARIANA ISLANDS

Ethnic Group	Males			Females		
	Number	Uric acid		Number	Uric acid	
		Mean	s.d. (mg. per cent.)		Mean	s.d. (mg. per cent.)
Chamorro	160	6.23	1.51	175	5.10	1.41
Carolinian	26	7.27	1.67	29	5.70	1.01
P		<0.01			<0.05	

The numbers are too small to draw any definite conclusions, but suggest that the natives of the Caroline Islands have high uric acid levels in their home islands. Hence the factors responsible for the hyperuricaemia are not unique to either island group.

Height and weight were available for fifty males and 46 females from Rota. The mean uric acid level was higher in the larger individuals of either sex whether judged by height, weight, or body surface than in smaller individuals (Table II, opposite). The nature of the relationship between size and uric acid levels is not known but it would appear that, when comparing different population groups, appropriate adjustments should be made for differences in body size as well as for those in sex and age.

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TABLE II
MEAN URIC ACID VALUE RELATED TO SIZE OF
INDIVIDUAL IN 50 MALE AND 46 FEMALE
CHAMORROS FROM ROTA

Sex		Male	Female
Mean Uric Acid (mg. per cent.)		5.36	4.33
Height	Less than mean	5.43	4.04
	Greater than mean	5.65	4.52
	P	<0.5	<0.1
Weight	Less than mean	5.23	4.11
	Greater than mean	5.83	4.68
	P	<0.05	<0.05
Body Surface	Less than mean	5.09	4.17
	Greater than mean	5.67	4.66
	P	<0.2	<0.2

The distribution of the uric acids was bimodal, as shown in Fig. 1. The cumulative frequencies were plotted on probability paper and two straight lines obtained. The intersection of the lines indicate the uric acid level for optimal separation of the two components. The percentage in the upper and lower fractions can be read directly, and the means and standard deviations estimated graphically.

Fig. 1.—Distribution of uric acid levels in 160 Chamorro males.

Using these methods the Chamorro males (Fig. 2) showed the break between the upper and lower components to occur at 6.8 mg. per cent. of uric acid, the mean of the lower component being 5.8 ± 0.9 mg. per cent. and that of the upper component 7.8 ± 1.0 mg. per cent. Similar analysis of the other sex and ethnic groups examined indicates that the difference between the uric acid values of Chamorros and Carolinians is due to an increase in the means of the two components rather than to an increased percentage of individuals in the upper component (Table III).

It was found that 71 (21.2 per cent.) of the Chamorros and eighteen (32.7 per cent.) of the Carolinians had uric acid values of 7 mg. per cent. or more in males and 6 mg. per cent. or more in females, and these were hence considered to have hyperuricaemia. A total of 47 of the 57 Chamorros included in the National Institute of Neurological Diseases and Blindness survey of Umatc on Guam

Fig. 2.—Cumulative frequency of uric acid levels in 160 Chamorro males.

TABLE III
SEPARATION OF URIC ACID VALUES (MG. PER CENT.)
IN CHAMORROS AND CAROLINIANS INTO TWO
COMPONENTS

Ethnic Group	Sex	Lower Component		Break	Upper Component	
		Mean	%		Mean	%
Chamorro	Male	5.5	76	6.8	7.8	24
Carolinian		6.4	75	7.5	8.7	25
Chamorro	Female	4.7	81	6.1	7.0	19
Carolinian		5.2	80	6.1	6.9	20

were examined by one of us (TAB); five males and twelve females had hyperuricaemia, and of these three males and one female had definite gout according to ARA Criteria (Kellgren, 1962). In addition, 22 of 41 individuals with hyperuricaemia on Saipan were examined; one of eleven Chamorros and three of eleven Carolinians had definite gout.

Both serum uric acid and blood sugar following a glucose load were determined in 93 individuals, and 31 of them had hyperglycaemia. The mean uric acid value in the hyperglycaemics was 5.86 mg. per cent. which was not significantly greater than the 5.39 mg. per cent. in those with normal blood sugar values ($t = 1.13$, $P = 0.20$).

Herman (1958) and Ishmael, Payne, Owens, and Honick (1964) have reported an association between gout and diabetes. In view of the relation of obesity and hyperuricaemia, and the relation of obesity and diabetes, the association of diabetes and gout may be fortuitous.

Since, as mentioned in the introduction, this survey was carried out in connexion with a survey for neurological disorders, it is appropriate to report that fourteen patients with amyotrophic lateral sclerosis were included in this study. Two of these patients had hyperuricaemia which is not significantly different from expectation if there were no association at all.

Summary

Uric acid values were determined on 335 Chamorros and 55 Carolinians living in the Mariana Islands of the central Pacific. Both, but especially the Carolinians, showed high mean uric acid values and a high frequency of hyperuricaemia and gout.

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L'hyperuricémie et la goutte chez les habitants des îles Mariannes

RÉSUMÉ

On détermina les valeurs de l'acide urique chez 335 Chamorros et 55 Caroliniens habitants des îles Mariannes du Pacifique central. Chez les deux, mais surtout chez les Caroliniens, on trouva le taux moyen d'acide urique élevé, ainsi qu'une grande fréquence de l'hyperuricémie et de la goutte.

La hiperuricemia y la gota en las islas Marianas

SUMARIO

Se determinaron las cifras del ácido úrico en 335 Chamorros y 55 Carolinianos viviendo en las islas Marianas del Pacífico central. Tanto los unos como los otros, pero los Carolinianos en particular, acusaron cifras medias de ácido úrico altas, así como una gran frecuencia de la hiperuricemia y de la gota.