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A POPULATION STUDY OF LEVELS OF SERUM URIC ACID
---The mean value and normal range---

(uric acid/population survey/etology)

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An epidemiological study has been done yearly in Daiwa Village, Shimane Prefecture,since 1978. In the survey, the serum uric acid (SUA) levels were measured and the distribution was examined. The SUA levels were related to sex and age.

Normal subjects were seen in 520 of 571 males (91.1%) and 629 of 669 females (94%). In normal males, the mean SUA level was 5.2 mg/dl (standard deviation; SD ± 1.1 mg/dl, while in the females, the mean was 3.7 mg/dl(± 0.8 mg/dl). The values were always lower than that in males, with a significant difference. In the male, under 30 and their 30s, the level of SUA were significantly higher than seen in other decades. The levels of SUA of females gradually decreased and then increased and the values in those over 70 years of age were higher than in the other decades. The results seen in females are similar to the previous findings, but the level of SUA in each decade in the males differed somewhat from previous data.

According to increase in the number of patients with gout, measurement of serum uric acid (SUA) levels has been on increase. The levels of SUA indicates the correlation between abnormalities of metabolism of uric acid and that other compounds such as sugars and lipids. In addition, such is a good indicator of the general health in a particular population.

Definite criteria were not available for a subjects with asymptomatic hyperuricemia, so the fixation of a normal value of SUA level in a well-defined population has been necessary. In

Japan, such studies have been made in some districts (4) (7). We carried out a survey of SUA level in Daiwa Village, a farming village in the mountain area in Shimane Prefecture.

MATERIALS AND METHODS

Examinations have been conducted in Daiwa Village in Shimane Prefecture, yearly since 1978. In July, 1982, 1240 persons, 571 males and 669 females, were examined. The distribution according to 1240 individuals is shown in Table I. Most subjects of both

Table I. DISTRIBUTION ACCORDING TO AGE AND SEX

Age	-29	30-39	40-49	50-59	60-69	70-79	80-	Total
Men	44	73	101	154	110	78	11	571
Women	20	71	138	189	154	83	14	669

sexes were in the 5th decade. Blood samples were centrifuged and refrigerated at -20°c, and SUA level was determined by the uricase-peroxidase coupling method, using a dye, 4-amino-antipyrine, N-ethyl, N-3-methyl-phenyl, N-acethyl ethylene-diamine (EMAE) (1). Normal range was determined according to the Hoffman method (2), using the sera of patients from out-patient department of Shimane Medical University, namely 3.4-8.0 mg/dl in men and 2.3-6.1 mg/dl in women.

RESULTS

In the males, 520 of 570 (91%) showed levels in the normal range and the mean value $\pm$ SD of SUA was 5.2 $\pm$ 1.1 mg/dl (Table II). Those with levels below 3.3 mg/dl numbered 34 (6.0%), and levels over 8.1 mg/dl were seen in 17 (3.0%). These were classed as abnormal. In the females, 629 persons (94%) could be classed in the normal range from 2.3 to 6.1 mg/dl and the mean $\pm$ SD of SUA was 3.7 $\pm$ 0.8 mg/dl. The number and percentage below 2.2 mg/dl was 23 (3.4%), and levels over 6.2 mg/dl numbered 17 (2.4%).

The distribution of SUA levels according to the sexes is

Table II. THE MEAN VALUE AND STANDARD DEVIATION OF SUA ACCORDING TO THE CASE NUMBER, INCIDENCE MEAN VALUE AND STANDARD DEVIATION

a) Men

SUA(mg/dl)	-3.3	3.4-8.0	8.1-	Total
Number	34	520	17	571
Incidence(%)	6.0	91.0	3.0	100
Mean ± SD		5.2 ± 1.1		

b) Women

SUA(mg/dl)	-2.2	2.3-6.1	6.2-	Total
Number	23	629	17	669
Incidence(%)	3.5	94.0	2.5	100
Mean ± SD		3.7 ± 0.8		

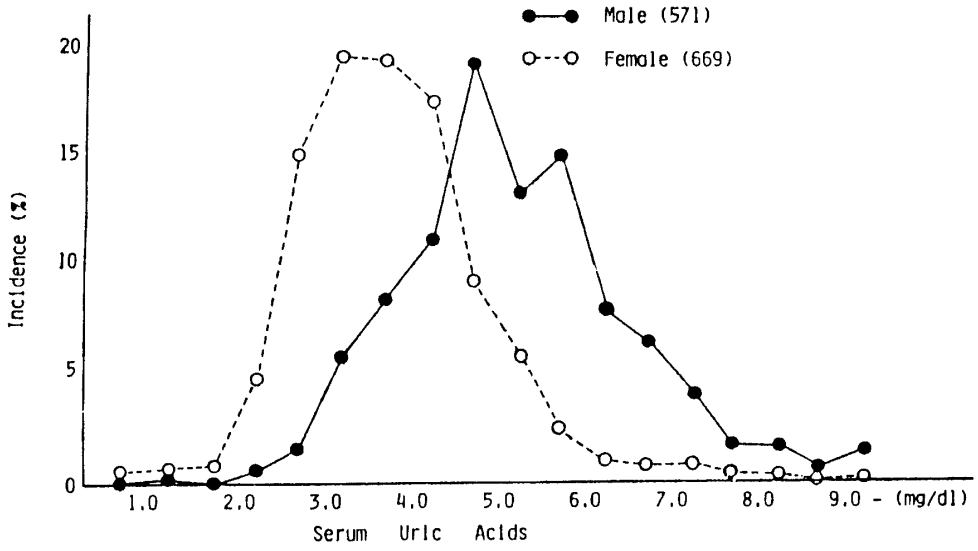

Fig. 1. Distribution of SUA level according to the sex.

shown in Fig. 1. In the males, the figure was biphasic and the peak was found around 4.5 to 4.9 mg/dl and 3.0 to 3.9 mg/dl. On the other hand, in the females, the distribution pattern was monophasic, and the peak ranged from 3.0 to 3.9 mg/dl.

Fig. 2 shows the distribution of the mean SUA levels in those classed within the normal range, by sex and age. In the males, the mean SUA level was highest in the group in their 20s (5.9 ± 1.3mg/dl). The second highest was seen in those in their 30s (5.6 ± 1.3 mg/dl). Although not indicated in Fig. 1, the mean SUA of these 2 groups were higher than in other age groups,

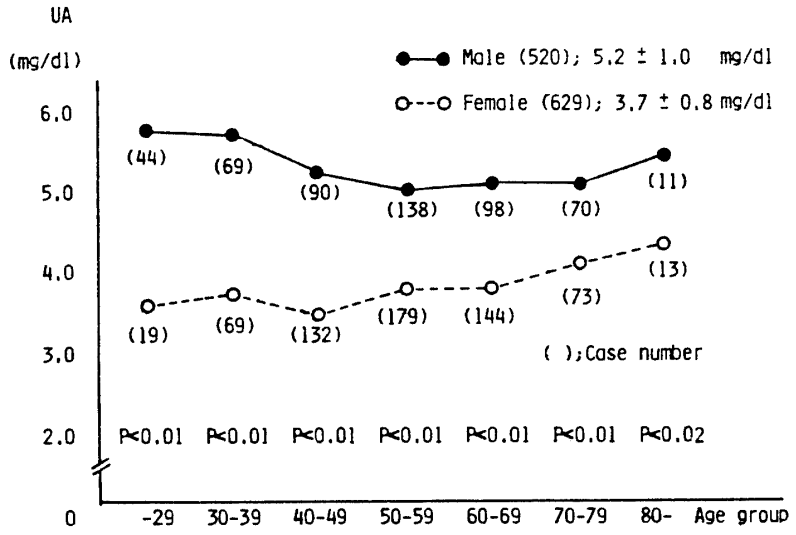

Fig. 2. Distribution of mean SUA level of normal group according to age and sex.

and such was statistically significant ($p < 0.01$). In the females, in their 70s (4.1 ± 0.8 mg/dl) and in those over 80 (4.3 ± 0.7 mg/dl), the SUA levels were high. The level of SUA of each decade up to the 7th was lower than that seen in those in the 7th decades ($p < 0.02$).

Fig. 2 also shows the mean SUA level, in each decade. The mean SUA level of females was significantly lower than that on males in each decade.

DISCUSSION

The level of SUA varies with sex, race and environmental factors etc. In general, sex difference in the levels of SUA are not evident until puberty, after which these levels in women are lower than in men by 0.5 to 2.0 mg/dl (3-7). The mean levels of SUA in females was lower than that in the meals in our study and the difference was 1.0 to 2.1 mg/dl, such being much same as in previous reports (3)(7). The level of SUA in females gradually increased with age, therefore the sex difference in SUA gradually decreased. The sex differences were significant even in those over 70 years of age. This tendency was obscure in those postmenopausal stage (3-5). The reason for sex differences in SUA remains unclear, however estrogens and progesterones may accelate the secretion of uric acid from urinary tubules (7). In humans, the level of SUA is highest in teen-agers and it has been

reported that the level of SUA after puberty did not differ to any great extent (3). One group reported that the level of SUA gradually decreases after puberty (5)(7).

In a previous study, Nishioka pointed out that age, height, body weight, ingestion of alcohol, smoking, blood pressure, metabolites including nitrogen and the maternal level of SUA were all important factors related to levels of SUA (5).

Yoshimura found that the mean of SUA in Sumo wrestlers who consume a high caloric high protein diet was 6.5 mg/dl, that is subnormal level. This would suggest that diet is also an important factor relating to level of SUA (9).

We found that 34 of]240 persons had a hyperuricemia although these had not been any episode of arthritis. These patients had an asymptomatic gout probably (10).

Hypouricemia may result from the liver disease, drug influence and unknown factors (5). All these patients are being followed on a regular basis. We are going to analyze the association between SUA levels and such factors as dietary custum smoking and past history more precisely in further report.

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