

Incidence of Diabetes Mellitus among the Population of Farming and Fishing Villages (Summarized Report)

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For the past ten years a survey on diabetes mellitus has been carried out among the population of farming and fishing villages of Yamaguchi prefecture and a preliminary report on this survey was reported previously¹⁾. The summarized results of this survey limiting on fishermen and farmers will be described in this paper.

1. Subjects

A total of 1,326 men and 1,747 women above forty years of age including inhabitants of farming and fishing villages were examined.

2. Method

First examination: Blood and urine samples were examined between 2 and 3 hours after a breakfast containing more than 100 gm of carbohydrate. Glucosuria was detected by Testape (Eli Lilly & Co.) and glucose concentrations of venous blood serum were estimated by the Somogyi's method. Subjects who were found to have blood sugar of more than 120 mg/dl and/or glucosuria were subjected to the second examination.

Second examination: At the second and third hour after a breakfast containing more than 120 gm of carbohydrate, sugar in blood and urine was measured. Criteria for the diagnosis by this examination were as follows: *Diabetes mellitus* (above 120 mg/dl of blood sugar both at the second and third hour), *questionable diabetes mellitus* (one of the specimens above 120 mg/dl plus glucosuria), *normal* (both specimens below 120 mg/dl).

Third examination: Another examination was performed on the cases in whom the result of the second examination was questionable for a definite diagnosis. Blood sugar was assayed on fasting and one, two and three hours after an oral

administration of 50 mg of glucose. The result was regarded to be positive when the blood sugar was above the following levels: 120 mg/dl on fasting, 180 mg/dl at one hour, 120 mg/dl at two and/or three hours.

RESULTS AND DISCUSSION

1) Age- and Sex-wise Distribution

The incidence of diabetes mellitus was 8.3 per cent among 1,326 males above forty years of age, and it was 4.2 per cent among 1,747 females. Diabetics were encountered more frequently among males than females, and more frequently in elders in both sexes (Table 1).

Table 1. Age- and Sex-wise Distribution of Diabetes mellitus

		40-49 years of age	50-59 years of age	60-69 years of age	70-79 years of age	80 years of age or above	Total
Number of Subjects	Male	332	433	399	152	10	1,326
	Female	587	585	407	159	9	1,747
	Total	919	1,018	806	311	19	3,073
Diabetes mellitus	Male	14(4.2)	27(6.2)	42(10.5)	26(17.1)	1(10.0)	110(8.3)
	Female	13(2.2)	25(4.3)	26(6.4)	8(5.0)	1(11.1)	73(4.2)
	Total	27(2.9)	52(5.1)	68(8.4)	34(10.9)	2(10.5)	183(5.9)
Questionable Diabetes mellitus	Male	19(5.7)	33(7.6)	35(8.8)	16(10.5)	1(10.0)	104(7.8)
	Female	17(2.9)	18(3.1)	28(6.9)	8(5.0)	0(0.0)	71(4.1)
	Total	36(3.9)	51(5.0)	63(7.8)	24(7.7)	1(5.3)	175(5.7)

Parenthesized figures show percentages.

The age-wise incidence of diabetes mellitus among fishermen and farmers in Yamaguchi prefecture was less than that reported in 1,962 as a preliminary Japanese statistics in general occupations.²⁾ (Table 2).

Table 2 Age-wise Distribution of Diabetes Mellitus Among Males (Comparison with the Japanese Statistics in General Occupations)

		40-49 years of age	50-59 years of age	60-69 years of age	Total
Fishermen and Farmers in Yamaguchi Prefecture	Number of Subjects	332	433	399	1,164
	Diabetes mellitus	14(4.2)	27(6.2)	42(10.5)	83(7.1)
	Questionable Diabetes	19(5.7)	33(7.6)	35(8.8)	87(7.5)
Japanese Statistics in General Occupations	Number of Subjects	1,805	1,230	136	3,171
	Diabetes mellitus	118(6.5)	105(8.5)	19(14.0)	242(7.6)
	Questionable Diabetes	103(5.7)	108(8.8)	16(11.8)	227(7.2)

Parenthesized figures show percentage.

2) Correlation with Hypertension

The incidence of diabetics was 11.0 per cent among the subjects with hypertension (above 150 mm Hg, systolic) and 4.5 per cent among those with normal tension (Table 3).

Table 3. Correlation between Diabetes Mellitus and Some Physiological and Biochemical Factors

	Number of subjects	Classification of subjects	Diabetes mellitus
Blood pressure	2,946	{Above 150 mm Hg 800	88 (11.0%)
		{Below 149 mm Hg 2,146	96 (4.5%)
Serum cholesterol	1,595	{Above 200 mg/dl 962	62 (6.4%)
		{Below 199 mg/dl 633	22 (3.6%)
Obesity	3,023	{Obese 1,640	94 (5.7)
		{Non-obese 1,383	65 (4.7)
Hereditary background	3,060	{With 74	8 (10.8%)
		{Without 2,996	189 (6.3%)
Electrocardiogram	969	{Abnormal 228	19 (8.3%)
		{Normal 741	45 (6.0%)
Albuminuria	973	{Positive 121	9 (7.4%)
		{Negative 852	55 (6.4%)

The incidence of hypertension was 47.8 per cent among diabetics and 25.7 per cent among non-diabetics (Table 4).

Table 4. Correlation between Diabetes Mellitus and Some Physiological and Biochemical Factors

	Classification of subjects	Incidence of hypertension, etc.
Incidence of hypertension (above 150 mm Hg, systolic)	{Diabetics 184	88 (47.8%)
	{Non-diabetics 2,762	712 (25.7%)
Incidence of hypercholesterolemia (above 200 mg/dl)	{Diabetics 84	62 (73.8%)
	{Non-diabetics 1,511	900 (59.6%)
Incidence of obesity	{Diabetics 159	94 (59.1%)
	{Non-diabetics 2,864	1,546 (54.0%)
Incidence of hereditary background	{Diabetics 197	8 (4.1%)
	{Non-diabetics 2,863	66 (2.3%)
Incidence of abnormal electrocardiogram	{Diabetics 64	19 (29.7%)
	{Non-diabetics 905	209 (23.0%)
Incidence of albuminuria	{Diabetics 64	9 (14.1%)
	{Non-diabetics 909	112 (12.3%)

Hence, diabetics were encountered more frequently among the subjects with hypertension than in the normotensive, and hypertension was also found more frequently in diabetics than in non-diabetics.

3) Correlation with Serum Cholesterol

The incidence of diabetics was 6.4 per cent among the subjects with hypercholesterolemia (above 200 mg/dl) and 3.4 per cent among those with normal serum cholesterol level (Table 3).

The incidence of hypercholesterolemia was 73.8 per cent among diabetics and 59.6 per cent among non-diabetics (Table 4).

Hence, diabetics were encountered more frequently among the subjects with hypercholesterolemia than in the normals, and hypercholesterolemia was also found more frequently in diabetics than in non-diabetics.

4) Correlation with Obesity

The criterion for obesity was a body weight (in Kg) which was larger than the height (in cm) minus 110 (for the height above 160 cm) or minus 105 (for the height below 159 cm).

The incidence of diabetics was 5.7 per cent among the obese and 4.7 per cent among the normals (Table 3).

The subjects with obesity was encountered in 59.1 per cent among diabetics and 54.0 per cent among non-diabetics (Table 4).

Diabetics were encountered somewhat frequently among the obese and obesity was found somewhat frequently in diabetics than in non-diabetics.

5) Hereditary Relationship

Those who have diabetic relatives within the first and second degrees of kinship were considered to have a hereditary background.

Diabetics were encountered in 10.8 per cent among the subjects with such background and in 6.3 per cent among those without it (Table 3).

The subjects with hereditary background were found in 4.1 per cent among diabetics and in 2.3 per cent among non-diabetics (Table 4).

Hence, diabetics were encountered more frequently among the population with a hereditary background than those without it, and a hereditary background was found more frequently among the detected diabetics.

6) Correlation with Electrocardiogram

The criterion for abnormal findings in electrocardiogram was myocardial infarct, coronary insufficiency, myocardial ischemia, left ventricular hypertrophy, auricular fibrillation, complete branch block and auro-ventricular block.

Diabetics were encountered in 29.7 per cent among the subjects with abnormal electrocardiogram and in 23.0 per cent those without it (Table 3).

The subjects with abnormal electrocardiogram were found in 8.3 per cent of diabetics and in 6.1 per cent of non-diabetics (Table 4).

Diabetics were thus encountered more frequently among the subjects with abnormal electrocardiogram than in the normals, and abnormal electrocardiogram was also found more frequently in diabetics than in non-diabetics.

7) Correlation with Albuminuria

Diabetics were found in 7.4 per cent among the subjects with albuminuria and in 6.4 per cent among those without it (Table 3).

The subjects with albuminuria were encountered in 14.1 per cent of diabetics and in 12.3 per cent of non-diabetics (Table 4).

Namely, diabetics were found more frequently among the subjects with albuminuria than those without it, and albuminuria was also found more frequently in diabetics than in non-diabetics.

8) Correlation with Ophthalmoscopic Changes.

Ophthalmoscopic findings were represented by Keith-Wagner's classification.

The subjects with ophthalmoscopic abnormalities was encountered in 38.6 per cent and in 25.6 per cent of non-diabetics (Table 5).

Table 5. Correlation between Diabetes Mellitus and Ophthalmoscopic Changes

Keith-Wagner's classification	Non-diabetics	Questionable diabetics	Diabetics
Normal	869 (74.4%)	50 (59.5%)	59 (61.4%)
Degree I	135 (11.7%)	18 (21.4%)	12 (12.5%)
Degree II	119 (10.3%)	16 (19.0%)	20 (20.8%)
Degree III	30 (2.6%)	0 (0.0%)	4 (4.1%)
Degree IV	2 (0.1%)	0 (0.0%)	1 (1.0%)

SUMMARY

A survey of diabetes mellitus was undertaken among the population of farming and fishing villages.

Among 1,326 men and 1,747 women above forty years ages, the incidence of diabetes mellitus detected was as follows: 4.2 per cent in men of ages 40 to 49, 6.2 per cent in 50 to 59, 10.5 per cent in 60 to 69, 17.1 per cent in 70 to 79 and 10.0 per cent above 80; 2.2 per cent in women of ages 40 to 49, 4.3 per cent in 50 to 59, 6.4 per cent in 60 to 69, 5.0 per cent in 70 to 79 and 11.1 per cent above 80.

These results indicate that diabetes is found more frequently in males and also in elders. The incidence of diabetes mellitus among fishermen and farmers in Yamaguchi prefecture was less than the averaged incidence in Japan.

Diabetics were encountered more frequently among the subjects with

hypertension, hypercholesterolemia, albuminuria, obesity, hereditary background, electrocardiographic abnormalities and ophthalmoscopic abnormalities than in the normals.

Hypertension, hypercholesterolemia, albuminuria, obesity, hereditary background, electrocardiographic abnormalities and ophthalmoscopic abnormalities were also found more frequently in the detected diabetics than in non-diabetics.

REFERENCES

- 1) Mizuta, M., et al: *Bull. Yamaguchi Med. School.*, 9: 25, 1962.
- 2) Kobayashi, Y.: *The 16th General Assem. of the Japan Med. Congress*, 1963.