

Incidence of Diabetes Mellitus Among the Population of Farming and Fishing Villages

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For the past four years a survey on diabetes mellitus has been carried out among the population of farming and fishing villages of Yamaguchi prefecture. The results of this survey will be described in this paper.

I. Subjects

A total of 1200 men and 1208 women above forty years of age including inhabitants of farming and fishing villages and employees of factories were examined.

II. 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 Tes-Tape (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. (The level of 120 mg/dl of serum glucose was considered to be equivalent to 110 mg/dl of glucose in the whole blood.)

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 2nd and 3rd 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 gm 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 7.3% among 1200 males above forty years of age, and it was 3.8% among 1208 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	427	373	287	105	8	1200
	Female	402	411	279	111	3	1208
	Total	829	784	566	216	11	2408
Diabetes mellitus (DM)	Male	14 (3.3)	19 (5.1)	34 (11.8)	19 (18.1)	1 (12.5)	87 (7.3)
	Female	7 (1.7)	11 (2.7)	13 (4.7)	5 (4.5)	0 (0)	46 (3.8)
	Total	21	30	47	24	1	133
Questionable Diabetes (D-?)	Male	10 (2.3)	21 (5.6)	15 (5.2)	4 (3.8)	0 (0)	40 (3.3)
	Female	3 (0.7)	5 (1.2)	10 (3.6)	3 (2.7)	0 (0)	21 (1.7)
	Total	13	26	25	7	0	61

Parenthesized figures show percentages.

2) Occupation-wise Distribution

In order to elucidate the occupation-wise distribution of diabetes, the detected diabetics except for those without occupation (chiefly in advanced ages) were classified according to their occupations (Table 2). The order of frequencies was as follows: merchants>farmers>fishermen=public officials>industrial clerks=industrial labourers.

Table 2 Occupation-wise Distribution of Diabetes (among males above 40 years of age)

Occupation	Number of subjects	Diabetes mellitus(DM)	Questionable diabetes(D-?)	(DM)+(D-?)
Merchant (in fishing and farming villages)	170	24 (14.1)	9 (5.3)	33 (19.4)
Farmer	492	34 (6.9)	18 (3.7)	52 (10.6)
Fisherman	102	5 (4.9)	4 (3.9)	9 (8.8)
Public official (in fishing and farming villages)	70	3 (4.3)	1 (1.4)	4 (5.7)
Industrial clerk	68	1 (1.5)	1 (1.5)	2 (2.9)
Industrial labourer	238	3 (1.3)	2 (0.8)	5 (2.1)

Parenthesized figures show percentages.

Owing to the fact that this statistics was based on a varried age composition, a similar analysis of incidence was made on the subjects between 40 to 59 years of age, and the result showed a similar tendency (Table 3).

Table 3 Occupation-wise Distribution of Diabetes (among males aged 40 to 59 years)

Occupation	Number of subjects	Diabetes mellitus(DM)	Questionable diabetes(D-?)	(DM)+(D-?)
Merchant (in fishing and farming villages)	113	12(10.6)	4(3.5)	16(14.1)
Farmer	245	12(4.9)	11(4.5)	23(9.4)
Fisherman	76	3(3.9)	2(2.6)	5(6.6)
Public official (in fishing and farming villages)	53	2(3.8)	1(1.9)	3(5.7)
Industrial clerk*	68	1(1.5)	1(1.5)	2(2.9)
Industrial labourer*	237	3(1.3)	1(0.4)	4(1.7)

Parenthesized figures show percentage.

* These groups were composed of the subjects aged 40 to 55 years.

A similar statistics on age and occupation of merchants, farmers and fishermen in which large numbers of subjects could be included showed a tendency that merchants were afflicted with diabetes most frequently in every group of ten years of age (Table 4).

Table 4 Age- and Occupation-wise Distribution of Diabetes (among males)

Occupation		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
Merchant in fishing and farming villages	Number of subjects	57	56	42	13	1
	Diabetes mellitus	3(5.3)	9(16.1)	10(23.8)	2(15.4)	0(0)
	Questionable diabetes	1(1.8)	4(7.1)	5(11.9)	0(0)	0(0)
Farmer	Number of subjects	89	156	177	69	4
	Diabetes mellitus	3(3.4)	9(5.8)	13(7.4)	8(11.6)	1(25.0)
	Questionable diabetes	6(6.7)	5(3.2)	6(3.4)	1(1.4)	0(0)
Fisherman	Number of subjects	33	43	26	2	0
	Diabetes mellitus	2(6.1)	1(2.3)	2(7.7)	0(0)	0(—)
	Questionable diabetes	0(0)	2(4.7)	2(7.7)	0(0)	0(—)

Parenthesized figures show percentages.

3) Correlation with Hypertension

The incidence of diabetics was 10.9% among the subjects with hypertension (above 150 mm Hg systolic) and 4.6% among those with normal tension (Table 5). The incidence of hypertension was 41.6% among diabetics, and 22.0% among non-diabetics (Table 6).

Table 5 Correlation of Diabetes with Blood Pressure, Serum Total Cholesterol, Obesity and Hereditary Background

	Number of subjects	Classification of subjects		Diabetes mellitus
Blood pressure	1976	{Above 150 mm Hg	459	50 (10.9%)
		{Below 149 mm Hg	1517	70 (4.6%)
Serum total cholesterol	1595	{Above 200 mg/dl	962	62 (6.4%)
		{Below 199 mg/dl	633	22 (3.5%)
Skin-fold (Obesity)	2010	{Above 15 mm	478	14 (2.9%)
		{Below 14 mm	1532	58 (3.8%)
Obesity (Weight, height)	2099	{Obese	1169	58 (4.9%)
		{Non-obese	930	39 (4.2%)
Hereditary background	2099	{With	52	8 (15.4%)
		{Without	2047	125 (6.1%)

Table 6 Correlation of Diabetes with Hypertension, Hypercholesterolemia, Obesity and Hereditary Background

	Classification of subjects		Incidence of hypertension, etc.
Incidence of hypertension (above 150 mm Hg)	{Diabetics	120	50 (41.6%)
	{Non-diabetics	1856	409 (22.0%)
Incidence of Hypercholesterolemia (above 200 mg/dl)	{Diabetics	84	62 (73.5%)
	{Non-diabetics	1511	900 (59.6%)
Incidence of obesity (above 15 mm of skin-fold)	{Diabetics	72	14 (19.5%)
	{Non-diabetics	1938	464 (23.9%)
Incidence of obesity (Weight, height)	{Diabetics	97	58 (59.8%)
	{Non-diabetics	2002	1111 (45.4%)
Incidence of hereditary background	{Diabetics	133	8 (6.0%)
	{Non-diabetics	1966	44 (2.2%)

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.

4) Correlation with Serum Total Cholesterol

The incidence of diabetics was 6.4% among the subjects with hypercholesterolemia (above 200 mg/dl) and 3.5% among those with normal serum cholesterol (Table 5). The incidence of hypercholesterolemia was 73.5% among diabetics and 59.6% among non-diabetics (Table 6).

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

Serum cholesterol was assayed by the Kitamura's method¹⁾.

5) Correlation with Obesity

a) The first criterion for obesity was a skin-fold of 15 mm or more on the middle line of the lower abdomen. Diabetics were found in 2.9% of the subjects with obesity and in 3.8% of non-obese subjects (Table 5). Obesity was encountered in 19.6% among diabetics and in 23.6% among non-diabetics (Table 6).

b) The second 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). Diabetics were found in 4.9% among the obese and in 4.2% among the normals on this criterion (Table 5). Obesity was encountered in 59.8% of diabetics and 45.5% of non-diabetics (Table 6). Namely, there was no increased rate of diabetes among the obese.

6) Hereditary Relationship

Those who have diabetic relatives within the first, second and third degrees of kinship were considered to have a hereditary background. Diabetics were encountered in 15.4% among the subjects with such background and in 6.1% among those without it (Table 5). The subjects with hereditary background were found in 6.0% of diabetics and in 2.2% of non-diabetics (Table 6). Namely, diabetics were encountered more frequently among the population with a hereditary background than those without it, and a hereditary background was encountered more frequently among the detected diabetics.

SUMMARY AND CONCLUSION

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

Among 1200 men and 1208 women above forty years of ages, the incidence of diabetes mellitus detected was as follows: 3.3% in men of ages 40 to 49, 5.1% in 50 to 59, 4.7% in 60 to 69, 4.5% in 70 to 79 and 0% above 80; 1.7% in women of ages 40 to 49, 5.7% in 50 to 59, 4.7% in 60 to 69 and 4.7% in 70 to 79. These results indicate that diabetes mellitus is found more frequently in men and also in elders.

Among male subjects of ages 40 to 59, occupation-wise distribution of diabetics

were 10.6% in 113 merchants, 4.9% in 245 farmers, and 3.9% in 76 fishermen.

Diabetics were encountered more frequently among the subjects with hypertension, hypercholesterolemia and among those with hereditary relationship with diabetes than in the normals. Hypertension, hypercholesterolemia and hereditary diabetic family background were also found more frequently in the detected diabetics than in non-diabetics.

There was no increased rate of diabetes detection among the obese.

REFERENCE

- 1) Kitamura, M.: *J. Clin. Path. (in Japanese)*, **6**: 200, 1958.