Trends in the Epidemiology of Patients with Diabetes in Japan

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Abstract

A comparison of the results of the National Diabetes Survey between 1997 and 2007 in Japan showed that the percentage of "people strongly suspected of having diabetes" (diabetes) increased from 9.9% to 15.3% in males and from 7.1% to 7.3% in females, and the percentage of "people for whom the possibility of diabetes cannot be precluded" (prediabetes) increased from 8.0% to 14.0% in males and from 7.9% to 15.9% in females. The increase in the percentage of "people for whom the possibility of diabetes cannot be precluded" was remarkably large. In absolute numbers, "people strongly suspected of having diabetes" increased from approximately 6.9 million to 8.9 million and "people for whom the possibility of diabetes cannot be precluded" increased from approximately 6.8 million to 13.2 million during the same period.

The incidence rate of type 2 diabetes in children (per 100,000 person-years) was higher among junior high school students (6.73) than among elementary school students (0.75), and 80% of diabetic children were obese. Sixty percent of diabetic children had diabetic relative(s) within the relation of first or second degree.

The incidence rate of type 1 diabetes in children, ranging from approximately 1.5 to 2.5 (per 100,000 person-years), was low in international comparison.

Key words Diabetes, Prevalence rate, Incidence rate

Type 2 Diabetes in Adults

National Diabetes Surveys

In Japan, the National Diabetes Surveys in 1997 and 2002 and the National Health and Nutrition Survey in 2007 reported the number and percentage of "people strongly suspected of having diabetes" (diabetes) defined by HbA1c≥6.1% or a self-report of being on pharmacotherapy for diabetes and those of "people for whom the possibility of diabetes cannot be precluded" (prediabetes) defined by 5.6%≤HbA1c<6.1% among people aged 20 years or more. These surveys, solely depending on the two parameters of HbA1c and the history of diabetes, did not perform 75 g oral glucose tolerance tests (OGTT) or examine fasting plasma glucose levels. Although these surveys did not use the criteria of the Japan Diabetes Society for the diagnosis of diabetes, they are useful for tracking the trends in the percentage and number of screening-positive individuals.

The comparison of the percentage of screening-positive individuals between 1997 and 2007 showed that the percentage of "people strongly suspected of having diabetes" increased from 9.9% to 15.3% in males and from 7.1% to 7.3% in females, and the percentage of "people for whom the possibility of diabetes cannot be precluded" increased from 8.0% to 14.0% in males and from 7.9% to 15.9% in females.[1,2] The increase in the percentage of "people for whom the possibility of diabetes cannot be precluded" was remarkably

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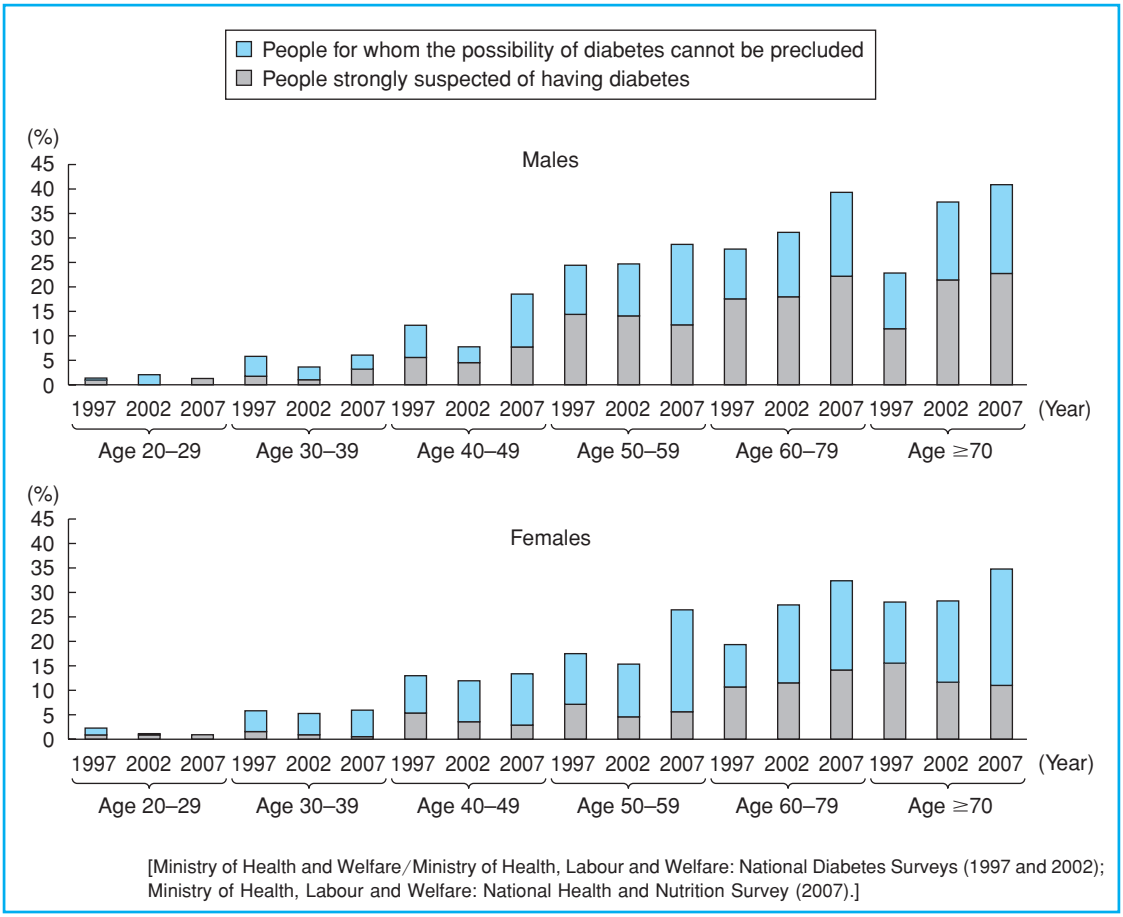
large. The breakdown by sex and age group shows that the percentage of screening-positive individuals increases in elderly people (**Fig. 1**).

Reflecting the increases of elderly people in the Japanese general population, the estimated total number of those based on the population data has also been increasing year by year (**Fig. 2**). In a comparison between 1997 and 2007, the number of "people strongly suspected of having diabetes" increased from approximately 6.9 million to 8.9 million, and the number of "people for whom the possibility of diabetes cannot be precluded" increased from approximately 6.8 million to 13.2 million. The sum of these two showed a striking increase from approximately 13.7 million to 22.1 million. Because a great majority of people with diabetes in Japan are those with type 2 diabetes, this number (the sum of "people strongly suspected of having diabetes" and "people for whom the possibility of diabetes cannot be precluded") may be regarded as a rough estimate of the number of people suspected of having type 2 diabetes. Due to the recent increase in obese people in a super-aging society, Japan is inevitably going to see a further increase in the number of people with diabetes, particularly in elderly people.

Prevalence rate based on the WHO criteria

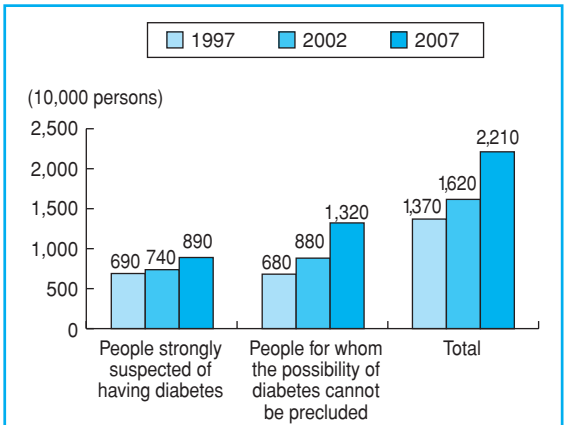
In 1997, the study group of the Ministry of Health, Labour and Welfare (MHLW) of Japan compiled the results of epidemiological surveys conducted in 10 population groups in 7 areas nationwide during the period from 1975 to 1993. All subjects aged 40 to 64 except for those undergoing medical care for diabetes received 75 g



[Ministry of Health and Welfare/Ministry of Health, Labour and Welfare: National Diabetes Surveys (1997 and 2002); Ministry of Health, Labour and Welfare: National Health and Nutrition Survey (2007).]

Fig. 1 Percentage of "people strongly suspected of having diabetes" (diabetes) and "people for whom the possibility of diabetes cannot be precluded" (prediabetes) by sex and age group in Japan

OGTT, and diabetes and impaired glucose tolerance (IGT) were determined according to the WHO criteria (1985). The prevalence rate of diabetes was 7.14% among males and 4.50% among females, and the prevalence rate of IGT was 14.31% among males and 15.56% among females.[3] This report also demonstrated the presence of large regional difference in the prevalence rates of diabetes and IGT. As for the trends in prevalence rate, the report on the analysis of 40 epidemiological surveys conducted in Japan from 1964 to 1992 concluded that the prevalence rate of diabetes increased from 1.8–10.8% among males and 0.8–4.03% among females in 1964–1979 to 4.2–13.1% among males and 2.6–12.9% among females in 1990–1992.[4] However, these surveys do not allow comparison with the above-mentioned National Diabetes Survey and National Health and Nutrition Survey because of the difference in the diagnostic criteria.

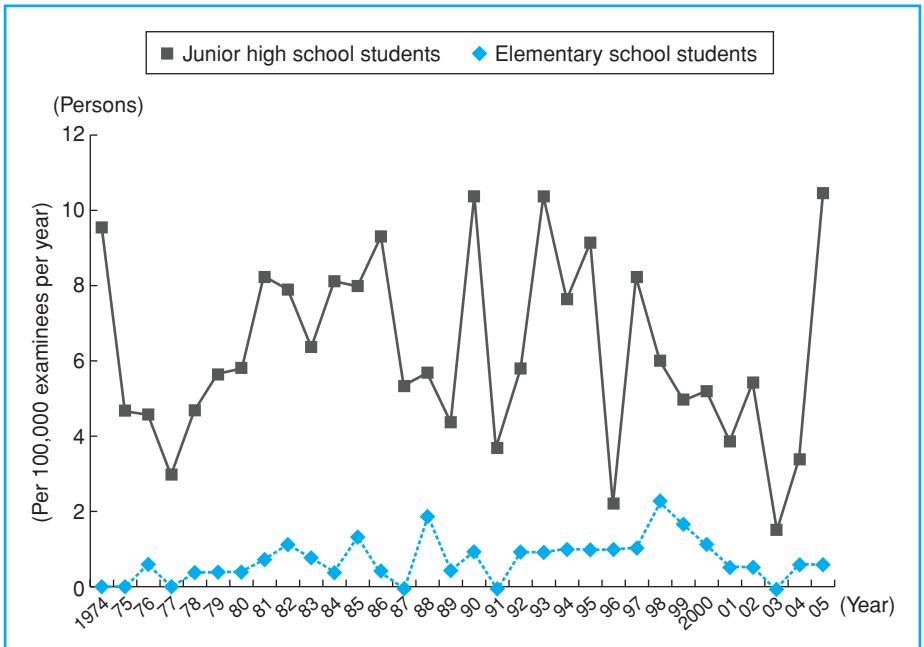


[Ministry of Health and Welfare/Ministry of Health, Labour and Welfare: National Diabetes Surveys (1997 and 2002); Ministry of Health, Labour and Welfare: National Health and Nutrition Survey (2007).]

Fig. 2 Number of "people strongly suspected of having diabetes" (diabetes) and "people for whom the possibility of diabetes cannot be precluded" (prediabetes) in Japan

Type 2 Diabetes in Children

The trends in the incidence rate of type 2 diabetes among elementary school (6 to 12 years old) and junior high school students (12 to 15 years old) have been investigated since the beginning of urine glucose screening at schools



[Reproduced form Urakami T: Nippon Rinsho. 2008;66 (suppl. 4):21–25.]

Fig. 3 Trends in the incidence rate of type 2 diabetes among elementary school and junior high school students in Tokyo

in 1974 in Tokyo.[5,6] The subjects with positive results for glucose in the morning urine were retested, and those being positive on both tests received OGTT. In total, 243 individuals were diagnosed as having type 2 diabetes during the 32 years up to the year 2005, and the incidence rate was 2.62 (per 100,000 person-years). The incidence rate was higher among junior high school students than elementary school students (6.73 vs. 0.75), and 83.7% of children with diabetes were found to be obese. The male/female ratio was 1:1.2 (not statistically significant).

It was also found that 56.5% of children with diabetes had a family history of type 2 diabetes among relatives in the first or second degree. The incidence rate in the period from 1974 to 2005, assessed at 5-year intervals, reached a peak in 1981–1985 and thereafter tended to decrease in recent years. This is considered to reflect the recent success of lifestyle modification aiming at the prevention of childhood obesity, which achieved a change in the prevalence of obesity among junior high school students from an increase to a decreasing tendency. However, we need to watch future trends with caution, as the incidence rate among junior high school students, which remained less than 10 (per 100,000 persons) after 1993, exceeded 10 in 2005 (**Fig. 3**).

Surveys in Yokohama City and Niigata City also reported that the percentage of children with type 2 diabetes changed from a long-standing increase to a decreasing tendency after 2000.[6] Considering the regional difference in the prevalence rate of type 2 diabetes in adults,[3] it is probable that the rate among children may also involve regional difference. Further surveys are required to confirm whether or not the tendencies observed in Tokyo, Yokohama, and Niigata are applicable to the whole country and whether or not the reported decrease is real.

Type 1 Diabetes in Children

Type 1 diabetes predominantly develops in childhood, and adult cases often present difficulty in determining the onset. For these reasons, epidemiological surveys on type 1 diabetes are mostly targeted at children.

Number of patients and prevalence rate

In Japan, the number of children with type 1 diabetes at the age of 20 or less is estimated to be approximately 3,300–4,600 according to the number of patients registered nationwide in the Medical Aid for Specific Chronic Disease of Children in 2000–2005. Approximately 60% of these patients are female.[7] The number of registered children with diabetes, including type 1 and type 2, decreased from 5,700–6,800 in 1990–1995[8] to 4,700–5,900 in 2000–2005,[7] showing a drop by 1,000 in 10 years. The prevalence rate of type 1 diabetes in children is reported to be approximately 1.0[9] and 1.53[10] per 10,000 persons.

Incidence rate

Type 1 diabetes developing in childhood is characterized by the sudden appearance of symptoms accompanied by remarkable hyperglycemia, and this makes it possible to determine the onset more clearly than type 2 diabetes. For this reason, the incidence rate is usually used instead of prevalence rate. In addition, determining the incidence rate is important to identify risk factors for type 1 diabetes.

Several studies have reported the incidence rate (per 100,000 person-years) in children under age 15. It was 2.1–2.6 in the 1998–2001 national survey,[11] 1.5 (1.2 in boys and 1.8 in girls) in the 1986–1990 national survey,[12] 1.63 (1.45 in boys and 1.81 in girls) in Hokkaido in 1973–1992,[13] and 2.2 in Hokkaido, 1.4 in Chiba, and 1.4 in Okinawa in 1990–1993.[14]

A lack of regional difference was demonstrated by the data for 1985–1989, in which the incidence rates were 2.07 in Hokkaido, 1.65 in Tokyo, 1.66 in Yokohama, 1.78 in Osaka, and 1.93 in Kagoshima.[15] According to these data, the incidence rate of type 1 diabetes in children in Japan is approximately 1.5–2.5 (per 100,000 person-years), which is remarkably lower than the rates in some countries with higher incidence rates, e.g., 40.9 in Finland, 37.8 in Sardinia, Italy, and 30.0 in Sweden.[14] The peak of the incidence rate is observed during adolescence, at age 12 for boys (incidence rate 2.1) and age 11 for girls (3.5).[12]

Type 1 Diabetes in Adults

Type 1 diabetes in adults has been reported extremely rarely in Japan up to the present. The Ehime Study analyzed the GAD autoantibodies in 4,980 diabetic patients with age of onset >20 years, and found that 3.8% of patients were positive. Of

the positive individuals, 38.3% were already in a state of insulin deficient (serum C-peptide at 2 hours postprandial or 6 minutes after 1-mg glucagon loading <1.0 ng/mL).[16] In addition, Japanese medical researchers have proposed and been paying attention to two disease entities called slowly progressive type 1 diabetes (SPIDDM) and fulminant type 1 diabetes as subtypes of type 1 diabetes, which usually develop in adulthood.

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