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The Prevalence of NIDDM and IGT and Related Factors Among Residents in Some Areas of Hubei Province, China

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The epidemiological survey of prevalence of NIDDM (non-insulin dependent diabetes mellitus) and IGT(impaired glucose tolerance) was conducted among 9450 residents aged 25 ~ 70 in some areas of Hubei Province, China. The results show that NIDDM and IGT prevalences are 2.62% and 4.48%, respectively. There is no significant difference between male and female ($P > 0.05$). The NIDDM prevalence in cities is slightly higher than that in countryside, but the difference is not significant ($P > 0.05$). However, the IGT prevalence in city is significantly higher than that in countryside ($P < 0.01$). The prevalence of both NIDDM and IGT is increasing along with the age of the population. It is also significantly related to the family history of NIDDM, hypertension, and high body mass index (BMI). By using stepwise logistic regression to analyse the risk factors of NIDDM, age ($OR = 1.86$), BMI($OR = 2.69$), family history ($OR = 2.84$) and hypertension ($OR = 2.23$) entered the model (significance level is $\alpha = 0.05$).

INTRODUCTION

Diabetes mellitus is one of the universal health problems affecting human beings of all. It has become one of the main causes of death, disability and high medical costs. To investigate the prevalence and risk factors of NIDDM and to search into the reliable basis of prevention and treatment, we have carried out a survey from July, 1994 to March, 1995 in some areas of Hubei Province.

The Resource of Data and Methods

The method of sampling. Stratified-random-cluster-sampling method was adopted. A total of 9450 residents aged 25 ~ 70 were surveyed. They were residents of the cities of Yichang, Shiyan, and Qianjiang, as well as the rural areas of Zaoyang County and the East-west Lake area of Wuhan in Hubei Province.

Screening method. With the instrument of One Touch Ⅱ we measured blood glucose from finger tip 2 h after 100g rice-meal. At the same time we also measured the height, weight, waist and hip girth, and blood pressure. Their family history of NIDDM and hypertension, physical exertion and mental pressure was collected according to the questionnaire.

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Reexamination for Reconfirming of Diagnosis

To confirm the diagnosis, oral glucose tolerance test (OGTT) was done by determining the blood plasma glucose levels on an empty stomach and 2 h after drinking water with 75g glucose for all the suspicious cases. The oxidase method was used and reagents were provided by Bejing "Zhongsheng" Company, and TC, TG and INS were measured, using IRA (immunization radiation absorbed) method and reagents provided by West China Medical University. The criteria used to define NIDDM were blood plasma glucose $\geqslant$7.8 mmol/L on an empty stomach or/and $\geqslant$11.1 mmol/L 2 h after drinking 75g glucose water. For IGT, the blood glucose level was $<$7.8 mmol/L on an empty stomach, and between 7.8 and 11.1 mmol/L 2 h after drinking 75g glucose water (WHO, 1985). A total of 1024 cases were tested with OGTT, 34.48% of them were negative.

Data Handling and Analysis

Data were handled and analyzed with FoxBASE + and SAS software on IBMPC/AT computer.

RESULTS

Constituent Ratio of Sex and Age

Among the 9450 individuals selected, males and females were of 50.68% and 49.92%, respectively. The percentages of age groups of 25 ~, 35 ~, 45 ~, 55 ~, 65 ~ 70 were 27.64%, 30.66%, 24.03%, 13.67% and 4.00% respectively.

NIDDM Prevalence

The total NIDDM prevalence was 2.86% for males and 2.38% for females (Table 1). No significant sex difference was observed. The prevalence was higher in older people. Thus, the rate for the groups aged 25-34 and 35-44 was below or around 1%, but for males and females it was about 8% for these age.

TABLE 1

The Prevalence (%) of NIDDM

Age Group	Male			Female			Total		
	N	DM	Rate	N	DM	Rate	N	DM	Rate
25 ~	1282	2	0.16	1330	10	0.75	2612	12	0.46
35 ~	1297	13	1.00	1660	18	1.13	2897	31	1.07
45 ~	1198	62	5.18	1070	38	3.54	2271	100	4.40
55 ~	761	41	5.39	531	35	6.59	1292	76	5.88
65 ~ 70	252	19	7.54	126	19	8.47	378	29	7.67
Total	4790	137	2.86	5660	111	2.38	9450	248	2.62
Standardized rate*			2.72			2.94			

Note. N stands for number of person observed; DM stands for number of NIDDM patient.

* Standardized rate is calculated with direct standardized method [Yang, 1992].

IGT Prevalence

The total prevalence rate of IGT was 4.48%. There was no significant difference between males and females. There also was an obvious trend of higher IGT rate among older individuals (Table 2). The IGT rate was 1.71 times higher than the NIDDM rate. It is obvious that there is more IGT patients among residents. The IGT patients are the key persons for the second-stage prevention.

TABLE 2

The IGT Prevalence (%)

Age Group	Male			Female			Total		
	N	IGT	Rate	N	IGT	Rate	N	IGT	Rate
25 ~	1282	13	1.01	1330	17	1.28	2612	30	1.15
35 ~	1297	34	2.62	1660	65	4.06	2897	79	2.73
45 ~	1198	74	6.18	1070	87	8.11	2271	161	7.09
55 ~	761	52	6.83	531	37	6.97	1297	89	6.89
65 ~ 70	252	27	11.79	126	17	14.41	378	44	12.68
Total	4790	200	4.18	5660	223	4.79	9450	423	4.48
Standardized rate			4.25			5.31			

Note. IGT stands for the number of patient of IGT. Others are the same with the notes in Table 1.

NIDDM and IGT Rates in Cities and Rural Areas

The crude rate and standardized rate of NIDDM in cities were slightly higher than those in rural areas, but the difference was not significant ($P > 0.05$). From the rates in the oldest age group (65-70), we can see that the rate in cities was obviously higher than that in rural areas (Table 3).

TABLE 3

Comparison of NIDDM and IGT Rates (%) Between City and Countryside

Age Group	City					Countryside				
	N	DM	P(DM)	IGT	P(IGT)	N	DM	P(DM)	IGT	P(IGT)
25 ~	1233	4	0.32	21	1.70	1376	5	0.36	8	0.58
35 ~	1781	22	1.24	67	3.76	1116	10	0.90	26	2.33
45 ~	1592	78	4.90	112	7.04	679	26	3.83	29	4.27
55 ~	840	50	5.95	91	10.83	452	26	5.75	26	5.75
65 ~ 70	179	16	8.94	18	10.05	198	11	5.56	25	12.63
Total	5625	170	3.02	309	5.49	3824	78	2.04	114	2.98
Standardized rate*			3.01		5.25**			2.36		3.66

Note. P(DM) and P(IGT) are the rates of NIDDM and IGT, ** ($P < 0.01$). Others are the same with the notes in Tables 1 and 2.

The crude rate and standardized rates of IGT in cities were distinctly higher than those in rural areas ($P < 0.01$). The rates of many age groups in cities were higher than those in rural areas (Table 3).

Comparison of NIDDM and IGT Rates Between the Persons With and Without DM Family History

The rates of NIDDM and IGT among those having a family history of NIDDM were much higher than those in the group without such a family history ($P < 0.01$) (Table 4).

TABLE 4

Comparison of NIDDM and IGT Rates (%) Between the Individuals With and Without NIDDM Family History

Age Group	Without DM Family History					With DM Family History				
	N	DM	P(DM)	IGT	P(IGT)	N	DM	P(DM)	IGT	P(IGT)
25 ~	2506	13	0.519	21	0.838	106	2	1.887	3	2.830
35 ~	2780	31	1.115	72	2.590	117	7	5.983	7	5.983
45 ~	2202	73	3.315	140	6.358	69	7	10.140	5	7.246
55 ~	1260	78	6.190	128	10.160	32	4	12.500	4	12.500
65 ~ 70	368	31	8.424	41	11.140	10	2	20.000	2	20.000
Total	9116	226	2.479	402	4.410	334	22	6.587	21	6.287
Standardized rate			2.465		4.388			7.302**		6.867**

The notes are the same with those in Table 3.

NIDDM and IGT Prevalence in Different BMI Groups

The rates of NIDDM and IGT among those with a BMI $\geqslant 25$ were much higher than those with a BMI < 25 ($P < 0.01$). The standardized rates of the former group were 1.8 times and 1.9 times higher than the latter respectively (Table 5).

TABLE 5

Comparison of the NIDDM and IGT Rates (%) in Different BMI Groups

Age Group	BMI < 25					BMI $\geqslant$ 25				
	N	DM	P(DM)	IGT	P(IGT)	N	DM	P(DM)	IGT	P(IGT)
25 ~	2190	10	0.457	14	0.639	422	3	0.711	12	2.844
35 ~	2111	16	0.758	49	2.321	786	23	2.926	34	4.326
45 ~	1359	43	3.164	61	4.489	912	33	3.618	81	8.882
55 ~	750	35	4.667	61	8.133	542	51	9.410	69	12.730
65 ~ 70	238	17	7.143	20	8.403	140	17	12.140	22	15.710
Total	6648	121	1.820	205	3.084	2802	127	4.532	218	7.780
Standardized rate			2.043		3.415			3.735**		6.616**

Note. BMI (body mass index, BMI = body weight (kg)/(body height(m))^2. Others are the same with the notes in Table 4.

NIDDM and IGT Rates in the Groups With and Without Hypertension

The NIDDM and IGT rates among individuals with hypertension were significantly higher than those without hypertension (Table 6).

TABLE 6

Comparison of the NIDDM and IGT Rate (%) Between Individuals With and Without Hypertension

Age Group	Without Hypertension					With Hypertension				
	N	DM	P(DM)	IGT	P(IGT)	N	DM	P(DM)	IGT	P(IGT)
25 ~	2358	12	0.509	20	0.848	51	1	1.961	3	5.882
35 ~	2481	34	1.370	60	2.418	184	7	3.804	16	8.696
45 ~	1727	57	3.301	104	6.022	340	20	5.882	29	8.529
55 ~	861	55	6.388	78	9.059	305	28	9.180	33	10.820
65 ~ 70	239	22	9.205	29	12.130	127	12	9.449	16	12.600
Total	7666	180	2.348	291	3.796	1007	68	6.753	97	9.633
Standardized rate			2.596		4.144			4.748**		8.325*

Stepwise Logistic Regression Model Analysis for NIDDM-Related Factors

Stepwise logistic regression model was adopted for analysis of NIDDM-related factors. At a significant level for keeping the factor in the model set at $\alpha = 0.05$, four related factors entered the model. They were age ($OR = 1.86$), BMI($OR = 2.69$), NIDDM family history (2.84) and hypertension ($OR = 2.23$) (Table 7).

TABLE 7

Stepwise Logistic Regression Model for Analysis of NIDDM Related Factors

Factors	*OR*	Standard Error	*P* Value	95% Confidence Interval
Age	1.86	0.17	0.0002	1.47 ~ 2.32
BMI	2.69	0.21	0.0001	1.94 ~ 3.29
Family history	2.84	0.56	0.0011	2.18 ~ 3.51
Hypertension	2.23	0.33	0.0340	1.86 ~ 2.81

Note. Original value of age and BMI, 1 and 0 value of family history and hypertension for calculation of the model.

DISCUSSION

The Prevalence Rates of NIDDM and IGT

In this survey, the NIDDM prevalence is 2.62%, which is higher than the rate (1.6%) in Daqing City in 1986 among 110 thousand residents aged 25 and elder (Hu *et al*, 1993). The higher rate found in this survey may be related to the higher living standards, the reduction of physical exertion, and the change of dietary composition.

The Relationship Between the NIDDM Rate and Age

The results indicate that higher rates were associated with old age of males, as well as females, especially for the group aged 45 and elder. It has been suggested that NIDDM is a disease of retrogradation with unclear etiology, but it has been also suggested that it might be related to a decrease of physical activity among elder persons, which might affect the number, density and affinity of insulin receptor (Davidson, 1979).

The Relation Between the NIDDM Rates and Family History of Diabetes Mellitus

This study indicating higher rates of NIDDM and IGT among those with family history of diabetes mellitus is consistent with the results found in the past (WHO, 1980), which showed that the persons with family history of diabetes mellitus are at high risk.

Connection Between BMI and NIDDM

There is an obvious connection between BMI and NIDDM, the higher BMI, the higher the rates of NIDDM and IGT. It has been reported (Zhang, Xiang and Huang, 1991) that the BMI of NIDDM patients is significantly higher than that of non-NIDDM persons, in the group of BMI > 24 there are 31% of persons with elevated blood insulin. Furthermore there exist connections between BMI and levels of TG, HDL-c and insulin. It is suggested that high BMI causes high density of blood lipids, abnormal tolerance of glucose, high level of blood insulin, all of which may induce IGT and NIDDM, and correspond to the "X-syndrome" proposed by Reaven.

Correlation Between NIDDM and Hypertension

The present survey indicates that the rates of NIDDM and IGT are higher among those with hypertension. He *et al*. (1994) found the positive correlation between blood insulin and diastolic pressure after dispelling the factors of age and obesity. Hypertension patients should pay more attention to blood glucose and insulin level.

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