Main Report

1
Introduction

Background

The Epidemiology and Disease Control Division of the Ministry of Health conducts periodic, population-based national cross-sectional health surveys to monitor the prevalence of major non-communicable diseases and their risk factors. The last two National Health Surveys were conducted in 1992 and 1998.

The National Health Surveys are an integral part of the surveillance of non-communicable diseases in Singapore and provide valuable inputs for the planning and evaluation of health promotion programmes and health care services. These surveys also help the Ministry to monitor its progress towards achievement of long-term targets for control of major non-communicable diseases and their risk factors that have been set for 2010.

Main Objectives

The main objectives of the National Health Survey 2004 were:

1. To determine the current prevalence of major non-communicable diseases and their associated risk factors; and

2. To chart progress in achieving the 2010 targets set for these diseases by the Ministry of Health.

Specific Objectives

The specific objectives of the National Health Survey 2004 were:

1. To define the prevalence and associated risk factors for diabetes mellitus and hypertension;

2. To describe the distribution and determinants of risk factors including cigarette smoking, physical inactivity, obesity, high blood cholesterol and alcohol consumption;

3. To study trends in risk factor levels ascertained in this survey compared with the 1992 and 1998 surveys; and

4. To study the knowledge, attitudes and practices of our population with regard to screening for breast and cervical cancer.

Survey Report

This report presents the main findings from the National Health Survey 2004, based on a random sample of 4,168 Singaporeans aged between 18 and 74 years.

The prevalence data on diabetes mellitus, hypertension, cigarette smoking, physical activity, obesity, hypercholesterolaemia (total-, LDL- and HDL-cholesterol) and alcohol consumption are presented. The data was stratified by gender, ethnic group and age. Comparisons were made with corresponding findings from the 1992 and 1998 surveys.

In addition, data on the proportion of undiagnosed diabetics and hypertensives as well as the proportion of known diabetics and hypertensives who were adequately treated is presented. The profiles of women who participated in the various modes of screening for breast and cervical cancer are also reported.

More detailed analysis of the data from the survey will be published subsequently in medical journals.

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Diabetes Mellitus

Introduction

Diabetes mellitus represents a group of metabolic disorders characterized by high blood sugar (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both. Diabetes mellitus can lead to death and disability through long-term complications including blindness, kidney failure, coronary heart disease and stroke. Type II diabetes is the more common form of diabetes, occurring mainly in older adults and is associated with obesity. In 2004, diabetes was the 8th leading cause of death in Singapore with 3.0% of all deaths being attributable to diabetes alone.

Definition

The WHO Diagnostic Classification criteria for the Oral Glucose Tolerance Test *(WHO 1994, WHO Consultation 1999)* were used for the National Health Survey 2004. The 2-hour plasma glucose concentration provided the basis for diagnostic classification for diabetes mellitus and impaired glucose tolerance. Table 2.1

Table 2.1: Diagnostic values for the oral glucose tolerance test

Classification	2-hour plasma glucose concentration	
	mmol/l	mg/dl
Normal	< 7.8	< 140
Impaired glucose tolerance	7.8 - < 11.1	140 - < 200
Diabetes mellitus	≥ 11.1	≥ 200

Method Used

After an overnight fast of at least 10 hours, subjects had blood taken by venepuncture to determine their fasting plasma glucose levels. In addition, those with a previous history of diabetes had blood taken to determine their glycated haemoglobin (HbA_{1c}) levels. Non-diabetic subjects and diabetic subjects who were not on medication were then given a 296 ml drink with 75 g of glucose (Trutol). Two hours after the glucose load, a second blood sample was taken by venepuncture to determine the plasma glucose level.

All blood specimens for plasma glucose measurement were collected in fluoride/oxalate tubes and centrifuged on-site to separate out the plasma, which was then placed in separate tubes for daily despatch to the Biochemistry Laboratory in Singapore General Hospital for analysis on the same day.

Plasma glucose levels were measured using the Roche Modular DP analyser with the enzymatic colorimetric method, while HbA_{1c} levels were determined by the Bio-Rad Variant Express analyser applying the principles of boronate affinity high performance liquid chromatography (HPLC).

Glucose Tolerance Status

The survey showed that 8.2% of Singapore residents aged 18 to 69 years had diabetes and 12.0% had impaired glucose tolerance. Table 2.2

Table 2.2: Glucose tolerance status (%) of Singapore residents aged 18-69 years, by gender, 2004

Glucose Tolerance Status	Males	Females	Total
Normal	80.0	79.5	79.8
Impaired glucose tolerance	11.1	12.9	12.0
Diabetes mellitus	8.9	7.6	8.2

Prevalence of Diabetes Mellitus

A higher proportion of males (8.9%) were diabetic compared to females (7.6%). Indians had the highest prevalence of diabetes among the ethnic groups (15.3% compared to 11.0% in Malays and 7.1% in Chinese). Diabetes prevalence increased sharply with age; from 0.5% among those aged 18 to 29 years to 7.9% of adults in the 40-49 year age group and 28.7% in those aged 60 to 69 years. Graph 2.1; Table 2.3

Graph 2.1: Crude prevalence (%) of diabetes mellitus among Singapore residents aged 18-69 years, by gender and ethnic group, 2004
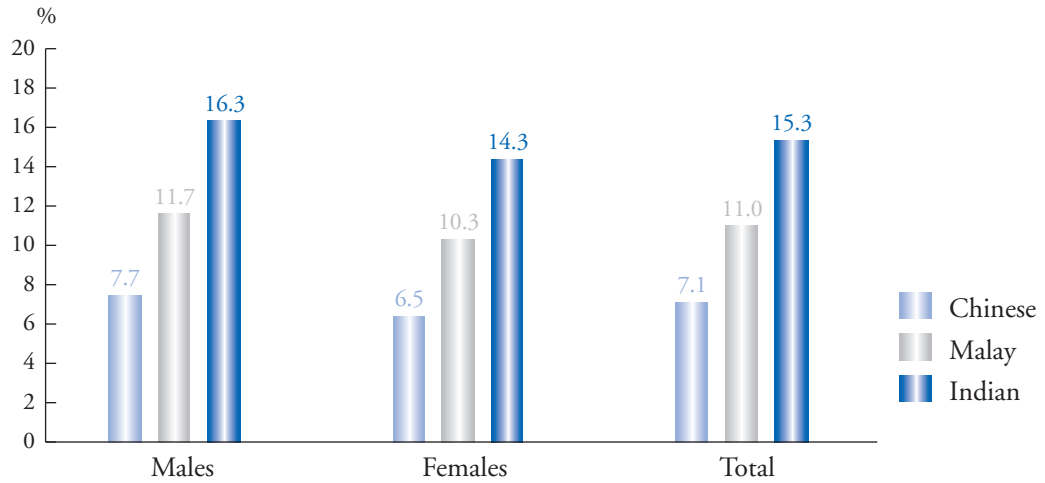

Table 2.3: Age-specific prevalence (%) of diabetes mellitus, by gender, 2004

Age (years)	Males	Females	Total
18-29	0.2	0.8	0.5
30-39	2.7	2.1	2.4
40-49	9.7	6.0	7.9
50-59	17.6	15.9	16.7
60-69	28.9	28.5	28.7
18-69	8.9	7.6	8.2

Trends in Diabetes Mellitus

The prevalence of diabetes among adults aged 18 to 69 years fell from 9.0% in 1998 to 8.2% in 2004. The change in the age-standardised rates between the two years was significant. One of the main contributing factors to this decline was the 2.0 percentage-point (%-pt) drop in diabetes prevalence among females. Between 1998 and 2004, the proportion of Chinese female and Malay female diabetics declined by 1.9 and 4.0 %-pt respectively, but that of Indian female diabetics dropped by 0.6 %-pt. Table 2.4

Table 2.4: Prevalence (%) of diabetes mellitus, by gender and ethnic group, 1992, 1998 and 2004

Gender / Ethnic group	Crude prevalence			Age-standardised prevalence (95% Confidence Interval)			Difference in age-standardised prevalence	
	1992	1998	2004	1992	1998	2004	['98-'92]	['04-'98]
Total	**8.6**	**9.0**	**8.2**	**10.0** (9.0, 11.0)	**9.5** (8.7, 10.4)	**7.8** (7.0, 8.6)	**-0.5**	**-1.7***
Gender								
Males	8.9	8.5	8.9	10.2 (8.7, 11.7)	9.1 (7.9, 10.4)	8.4 (7.1, 9.7)	-1.1	-0.7
Females	8.3	9.6	7.6	9.8 (8.5, 11.2)	9.9 (8.8, 11.1)	7.2 (6.1, 8.3)	0.1	-2.7**
Ethnic group								
Chinese	8.1	8.0	7.1	9.3 (8.1, 10.5)	8.3 (7.3, 9.2)	6.4 (5.5, 7.4)	-1.0	-1.9*
Malay	9.3	11.3	11.0	12.1 (9.6, 14.6)	13.0 (10.7, 15.2)	11.4 (9.2, 13.6)	0.9	-1.6
Indian	12.9	15.8	15.3	14.1 (11.3, 16.9)	17.2 (14.3, 20.1)	15.9 (13.0, 18.9)	3.1	-1.3

* $0.001 < p < 0.01$
** $p < 0.001$

Prevalence of Undiagnosed Diabetes

The survey found that 49.4% of Singapore residents who had diabetes mellitus had not been previously diagnosed. In 1998, the proportion of undiagnosed diabetics was 62.1%.

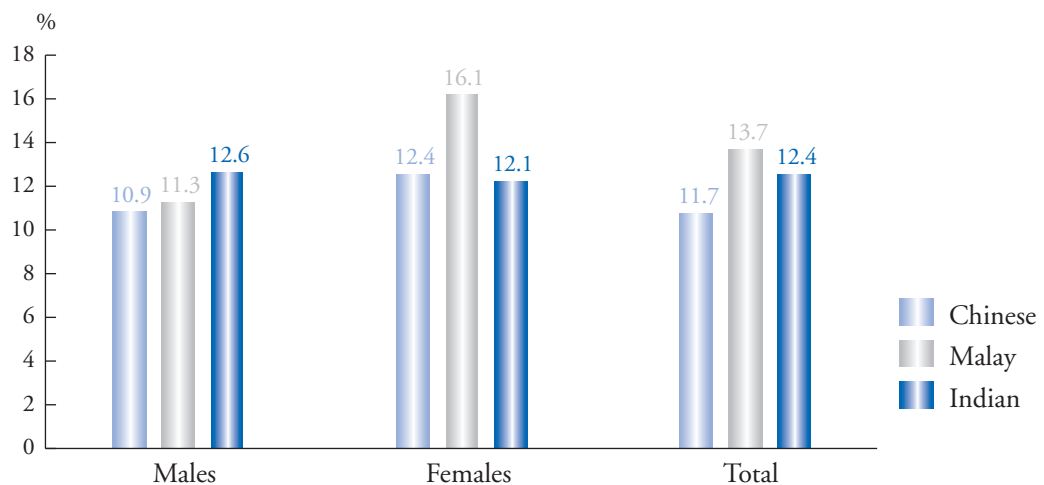51.3% of female diabetics and 47.7% of male diabetics were unaware of their diabetes status. The proportion of undiagnosed diabetics was higher for Malays (55.6%) and Chinese (50.4%), compared with Indians (38.0%). The mean fasting plasma glucose level in the newly diagnosed diabetics was 8.0 mmol/l in 2004, compared with 8.2 mmol/l in 1998. The mean 2-hour plasma glucose level was 15.4 mmol/l in 2004, compared with 15.9 mmol/l in 1998.

Prevalence of Impaired Glucose Tolerance

Persons with Impaired Glucose Tolerance (IGT) are at high risk of developing diabetes and need regular medical follow-up. These persons may develop complications associated with diabetes such as coronary heart disease and stroke even before onset of clinical diabetes. A recent study has shown that in Singapore, people with IGT have 4.8 times higher risk of developing diabetes compared to people with normal glucose tolerance[1].

The survey found that 12.0% of Singapore residents aged 18 to 69 years had IGT, compared with 15.0% in 1998. The prevalence of IGT was higher in females (12.9%) than in males (11.1%). Among the ethnic groups, the prevalence was highest in Malays (13.7%), followed by Indians (12.4%) and Chinese (11.7%). Graph 2.2

Graph 2.2: Crude prevalence (%) of IGT among Singapore residents aged 18-69 years, by gender and ethnic group, 2004

Control of Diabetes in Known Diabetics

Research has proven that good control of blood sugar level is the best way to prevent or delay complications of the diabetes. The Glycated Haemoglobin or the HbA_{1c} test measures the amount of sugar that is attached to the haemoglobin in red blood cells. This test shows the average blood sugar for the past few months (120 days)

and unlike the regular blood sugar test, it is not affected by short-term changes. The HbA_{1c} value has been shown to predict the risk for development of many of the chronic microvascular complications in diabetes.

[1] Chew W, Wong SM, Chew SK. Diabetes incidence difference between adults with and without IGT in Singapore IGT follow up study, 1992-2000.

The Ministry of Health Clinical Practice Guidelines on Diabetes (1999) recommended optimal glucose control (HbA$_{1C}$ 6.5–7.0%) for the majority of patients with diabetes. Suboptimal glucose control (HbA$_{1C}$ 7.1-8.0%) may be the target in special subsets of patients who are vulnerable to injury from the increased risk of severe hypoglycaemia associated with optimal glucose control. HbA$_{1C}$ greater than 8.0% is regarded unacceptable, requiring reassessment and readjustment of therapy.

The survey showed that 27.6% of known diabetics had unacceptable blood sugar control in 2004, lower than the proportion of 53.2% in 1998. The proportion with unacceptable blood sugar control among those on drug treatment was 28.7% in 2004, lower than the 55.7% level found in 1998. The mean HbA$_{1C}$ among all known diabetics was 7.6% in contrast to 8.5% in 1998.

Indian diabetics (36.8%) had the highest proportion of cases with unacceptable blood sugar control, followed by Malay (31.1%) and Chinese diabetics (24.2%).