REPORT ON CARDIOVASCULAR DISEASES IN CHINA (2007)

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Explanation for the Report Editing

1. The report was edited by the working group composed of young and middle-aged specialists. The contents regarding the cardiovascular risk factors (hypertension, cigarette smoking, blood-lipid disorder, metabolic syndrome, overweight and obesity, diet and nutrition, deficiency of physical activity) and the epidemic Situation of cardiovascular disease were edited by the working group.

2. The contents regarding coronary heart disease, cerebral stroke, chronic kidney disease, cardiovascular surgery and arrhythmia were edited by the clinical specialists. And the contents regarding the case report of community hypertension prevention and control were edited by the specialists on community prevention and control. The contents regarding the health economics were edited by the specialists from National Health Economics Institute, Ministry of Health.

3. The editing principle and the first draft were reviewed by calling three plenary meetings of the editing specialists. The report was then finalized after having been reviewed by the core group for three times.

4. The report was edited by draw on the experience of the statistical method of reporting of cardiac disease and cerebral stroke in America.

5. The relevant data that were released before December 31 2007 should have been included in this report. If there is any missing or mistake, please contact and provide the editorial committee with the detailed data.

6. Abbreviations:

Cardiovascular Disease: CVD
Ischemic Heart Disease: IHD
Heart Failure: HF
Total cholesterol: TC
Triglyceride: TG
Low-Density Lipoprotein Cholesterol: LDL-C
High -Density Lipoprotein Cholesterol: HDL-C
Acute Myocardial Infarction: AMI
Chronic Kidney Disease: CKD
End-stage Renal Disease: ESRD
Glomerular Filtration Rate: GFR
Blood Pressure: BP
Heart Rate: HR
Body Mass Index: BMI
Relative Risk: RR
Population Attributable Risk Percent: PARP
Confidence Interval: 95%CI
Angiotensin Converting Enzyme Inhibitor: ACEI
Coronary Artery Bypass Grafting: CABG
Percutaneous Coronary Intervention: PCI
International Normalized Ratio: INR

Outline of the Report on Cardiovascular Diseases in China, 2007

Report on Cardiovascular Diseases in China in 2007 is the 3rd part of the authoritative report on the prevalence and major advances in prevention/treatment research of cardiovascular diseases (CVD) in China. It provides valuable references and evidences for the layout of national health policies and prevention/treatment of CVD. This report covers the prevalence, mortality and critical risk factors of CVD in China, as well as significant progress of clinical studies and typical examples of community-based prevention and treatment.

Detailed information, with regard to the Summary of the Report on Cardiovascular Diseases in China in 2007, is described as follows.

1. Cardiovascular Diseases Become a Major Public Health Problem in China

In the last 3 decades of Reform and Opening, the economy in China developed rapidly, and the general health status of the civilians was improved greatly. However, the prevalence of CVD increased persistently and presented a trend in increase of young patients . The high incidence, high disability and high mortality of CVD become a major public health problem in China

It is estimated that the current number of patients with CVD is at least 230 million in China, which means 2 in every 10 adults are afflicted with CVD. 2 million, or more, individuals are affected with new-onset stroke each year, and the prevalence rate of stroke patients is estimated to be greater than 7 millions. The corresponding data for new-onset and prevalent myocardial infarction are annually more than 500 thousand and 2 million patients, respectively.

About 3 million patients died of CVD per year, i.e. 8 400 per day, or 1 per 10.5 seconds. One in every three deaths are attributed to CVD.

2. Risk Factors of CVD Remain Increase

The major risk factors of CVD in China include hypertension, smoking, hypercholesterolemia, overweight/obesity, diabetes mellitus (DM), etc., which remain climbing up.

(1) Hypertension

According to the Chinese National Nutrition and Health Survey in 2002, Ministry of Health, the prevalence rate of hypertension was 18.8%, increased by approximately 31% compared with that in 1991. It is supposed that more than 200-million Chinese population have high blood pressure (BP). The epidemiological trends of hypertension in China manifest the following characteristics:

- The prevalence rate of hypertension in urban areas is higher than that in rural areas, but the difference is diminishing.
- The prevalence rate of hypertension in male group aged less than 45 is higher than that in female , while it is just the reverse over 45 years of age.
- The prevalence rate of hypertension in Northern China is higher than that in Southern China.
- The highest prevalence rate of hypertension occurs in the Tibet, while the lowest one in the Miao ethnic

minority.

● The detectable rate of high-normal BP (120～139/80～89mmHg) among Chinese population is 34%. High-normal BP has potential for hypertension development.

● The prevalence rate of isolated systolic hypertension is around 6.0% in China, which indicates that it may affect as much as 50 million individuals.

● The rates of awareness, treatment and control of hypertension are 30%, 25% and 6% in Chinese population, respectively. Although these figures have improved fairly compared with that in 1991, but they are still at lower levels.

● Hypertension in juveniles: The BP level of juveniles with the age of 7～18 was documented in the National Students; Fitness and Health Survey, Ministry of Education. In comparison with the data in 1991, the detectable rate of elevated systolic BP (SBP) in 1995 increased by 42.5% in urban boys and 45.5% in urban girls, correspondingly, it increased by 23.7% for boys and 31.0% for girls in rural areas, respectively. The highest detectable rate of elevated SBP occurred in the children of Han nationality in Northern China (2.1%～3.4%), while the lowest rate was in the Southwest region of China (0.2%～0.6%). A cohort study with 18-year follow-up on juvenile hypertension in Beijing, during the 7th 5-year Plan, revealed that total of 42.9% individuals developed over hypertension among the juveniles with high baseline BP.

(2) Cigarette Smoking

According to a national survey in 2002 in China, the rate of cigarette smoking in the population aged 15 and over was 35.8%(66.0% for men and 3.1% for women). It is estimated that the active smokers was 350 million (including15 million of juvenile smokers aged 13～18 years, and passive smokers nationwide reached 540 million . Of great importance is that there was a trend in increase of smoking rate among the juvenile population aged 15～24. Cigarette smoking is one of the most threatening risk factors not only for the morbidity and mortality of CVD but also for the tumors and respiratory diseases in the Chinese population.

The cohort studies from multiple provinces and cities showed that, in comparison with non-smokers, the risk of acute coronary heart disease and acute ischemic stroke was 1.75-fold and 1.37-fold in active smokers, respectively. A collaborative cohort study by Chinese and American investigators demonstrated a 59%～100% increase in the risk of CVD onset among active smokers.

(3) Dyslipidaemia

● According to the Chinese National Nutrition and Health Survey in 2002, the prevalence rate of dyslipidaemia was 18.6%. Supposedly, the existing patients with dyslipidaemia were almost 200 millions, in which hypercholesterolemia accounts for 2.9%, hypertriglycerolemia 11.9%, and low high-density lipoprotein cholesterol (HDL-C) 3.9%. The prevalence rate of hypercholesterolemia was higher in urban areas than that in rural areas, and was higher for men than that for women under the age of 45, while it is just the reverse over 45 years old.

● The Chinese-American cohort studies and domestic multiple studies of provinces and cities demonstrated a rise of the risk of CVD onset, following the elevation of plasma total cholesterol levels.

● *Guidelines on Prevention and Treatment of Dyslipidemia in Chinese Adults* was published in 2007. This guideline put forward the cutoffs and risk stratification of dyslipidemia, which are suitable for the Chinese population and provide crucial references and guiding principles for the prevention and treatment of dyslipidemia.

● According to a population-based sampling survey in 10 provinces and cities of mainland China from 2000 to 2001, the rates of awareness, treatment and control of hypercholesterolemia were 21.3%, 11.3% and 11.6% for men, and14.0%, 18.1% and 9.5% for women, respectively.

● An investigation for children in Beijing in 2007 revealed that the prevalence rate of dyslipidemia (plasma total cholesterol 5.20mmol/L or triglycerol [TG] 1.70mmol/L) in obese children was as high as 30%.

(4) Overweight/Obesity

● The prevalence rate of overweight/obesity in Chinese residents has been increasing persistently in the last 30 years. According to the National Nutrition and Health Survey in 2002, the prevalence rate of overweight was 17.6% and the rate of obesity was 5.6%. In comparison with the data in 1992, the figures were raised 38.6% and 80.6%, respectively. The total existing patients of both overweight and obesity is estimated to be 240 millions .

● The study outcomes from 9 provinces/cities and others in China indicated that the prevalence of hypertension was increased with the gain of body mass index (BMI) or enlargement of waist circumference.

(5) Physical Inactivity

Physical inactivity is strongly associated with the occurrence of overweight/obesity, hypertension, and DM, and it is also correlated with the total death and the death risk of CVD.

Only 34% of residents in big cities engage in sufficient physical activities, which indicate the existence of physical inactivity among most of urban residents .

(6) Diet and Nutrition

● According to the Chinese National Nutrition and Health Survey in 2002, about 86g of daily fat intake occurred in the urban residents and 73g of fat intake in the rural residents. 35% of fat-based energy intake was in the urban residents,, which was higher than the dietary recommendation of <30%.

● The average dietary salt intake in China was 15.9g per day in 2002, which greatly exceeded the salt-intake recommendation of 5g per day by WHO.

● Domestic research suggests that dietary interventions with lower-salt intake, potassium supplement or substitute for salt will reduce BP level modestly. Sufficient protein supplement can also result a minor reduction of BP level.

(7) Metabolic Syndrome

● An investigation in 2002 showed that crude prevalence of metabolic syndrome was 6.6% among Chinese population aged over 15 (according to the criteria of Chinese Medical Association Diabetes Branch). The prevalence was higher in urban areas than that in rural areas.

● The metabolic syndrome increases the hazards of coronary artery disease (CAD) and stroke.

3. Progress in Population-oriented Prevention/Treatment and Clinical Research

(1) Coronary Artery Disease (CAD)

● The crude death rate of CAD in 2006 was 57.1/105 in urban areas and 33.7/105 in rural areas in China.

● The leading risk factors of CVD include hypertension, cigarette smoking, hypercholesterolemia, overweight/obesity, DM, etc.

● Registry of Percutaneous Coronary Intervention (PCI): in Mainland China 112 580 cases of PCI were registered in 2006, which increased more than 16 000 cases of PCI in comparison with that in 2005.

● Subgroup analysis of China Coronary Secondary Prevention Study (CCSPS) indicated that Xuezhikang

was effective and safe for the treatment of myocardial infarction in the elderly, and could dramatically reduce cardiovascular events in patients with type 2 DM or CAD.

(2) Stroke

● Intervention outcomes of Health Education and Health Promotion Project, which was implemented in three communities of Beijing, Shanghai and Changsha from 1991 to 2000, demonstrated that in the intervention group, the hazards of all-type stroke, ischemic stroke and hemorrhagic stroke were decreased by 11.4%, 13.2% and 7.2%, respectively.

● The risk factors of stroke include hypertension, dyslipidemia, atrial fibrillation, DM and so on.

● Secondary Prevention of Stroke

A 6-year randomized controlled clinical trial of antihypertensive treatment implied that the fall of BP level of patients with cerebrovascular disease can obviously reduce 2/5 recurrent risk of stoke.

● According to the report from the Antithrombotic therapy for Atrial Fibrillation Collaborative Group, indicated that Warfarin (international normalized ratio [INR] 2.0～3.0) was more beneficial for the patients with atrial fibrillation to reduce the risk of ischemic stroke and the hazard of death, compared with Aspirin.

(3) Chronic Kidney Disease (CKD)

● The prevalence rate of CKD in patients with CAD is 24.8% in China.

● CKD is a high risk factor of cardiovascular events in patients with DM.

● In comparison with normal BP, the relative risk of end-stage renal disease in individuals aged over 40 years with high-normal BP, grade 1 and grade 2 hypertension is 1.3, 1.5 and 2.6, respectively.

(4) Cardiovascular Surgery

● In the last 4 years, the operation volume of cardiovascular surgery in China Mainland increased annually by 14%, and it was 136 015 in 2007.

● 130 heart transplants were performed in 2007.

● The mortality of coronary artery bypass graft (CABG) is higher for men than for women, and it elevated in patients with BMI ＜20 or＞35 kg/m^2.

● Early mortality of valvular-heart-disease surgery is 2.8%～8.6%. The postoperative 5-year, 10-year and 15-year survival is 89%, 84%, and 65%, respectively.

(5) Peripheral Artery Disease (PAD)

The prevalence rate of 1ow extremity arteriosclerosis disease in China is 2.1%～22.5%, with smoking, DM, dyslipidemia and hypertension as the major risk factors.

(6) Arrhythmia

● Around 35 000 patients underwent permanent cardiac pacemaker implantations in 2007, half of them were sufferers from sick sinus syndrome.

● Approximate 20 000 cases of radiofrequency ablation were performed in 2007 for treatment of tachycardiac arrhythmia, 88% of which was supraventricular tachycardia.

● The prevalence of atrial fibrillation in Chinese population aged over 30 years is 0.77%, and application of radiofrequency ablation in treatment of atrial fibrillation develops rapidly.

● The incidence of sudden cardiac death in China is 41.8/100 000 (44.6/100 000 for male and 39.0/100 000 for female). It is estimated that 544 000 cardiac sudden deaths occur annually.

(7) Typical Examples of Community-based Prevention and Treatment on CVD

● Experiences from Capital Steel Corporation: Under the direction of cardiological experts in Beijing Fuwai Hospital from 1969, prevention and treatment of CVD were actively carried out, in the community of Capital Steel Corporation. A network of cardiovascular management was established, which comprises tertiary hospitals, cardiovascular institute and public health service and adopts classified management of hypertension. These efforts have achieved remarkable results.

2 736 hypertensives were enrolled in integrated management of hypertension from 1974 to 1995, and the average BP levels in male patients dropped 145/92 mmHg from to 137/84 mmHg.

Data from a 28-year disease surveillance from 1974 to 2001 in the community of Capital Steel Corporation demonstrates that the incidence and mortality of stroke declined from 138/100 000 and 52/100 000 to 64/100 000 and 18/100 000, respectively.

● Community-based Comprehensive Intervention on Stroke in 3 Cities in China.

The 8th and 9th Five-Year National Programs for Key Science and Technology Projects were carried out from 1991～2000 on the community-based comprehensive intervention for cerebrovascular disease in Beijing, Shanghai and Changsha. With conduction of Health Education and Promotion Project as well as active antihypertensive therapy in susceptible population for 9 years, the risk of stroke was decreased by 11.4% in the intervention community in comparison with that in controls.

目 录

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Chapter 1
Cardiovascular Diseases

1.1 The Number of Existing Patients with CVD

It is estimated that the number of existing patients with CVD (including coronary artery disease, stroke, heart failure and hypertension, etc.) is about 230 millions in China, which means 2 CVD patients in every 10 adults . In the total CVD sufferers, 200 million are patients with hypertension, 7 million patients with strokes, 2 millions with myocardial infarction, 4.2 millions with heart failure, 5 millions with cor pulmonale, 2.5 millions with rheumatic heart disease, and 2 millions with congenital heart diseases.

1.2 Death of CVD

It is estimated that about 3 million patients die of CVD every year, i.e. 1 in every 3 deaths is attributed to CVD. It means that there are 8 400 patient death of CVD every day, or 1 death of CVD in about every 10.5 seconds.

1.3 Mortality and All-Causes of Death of CVD

(1) The mortality of CVD is still at lofty level in China, which exactly like the data in 1990, 1995, 2000 and 2005. The mortality of CVD ranked first and was still higher than that of tumor or other diseases in 2006. (Figure 1-3 (1), Figure1-3 (2)).[1]

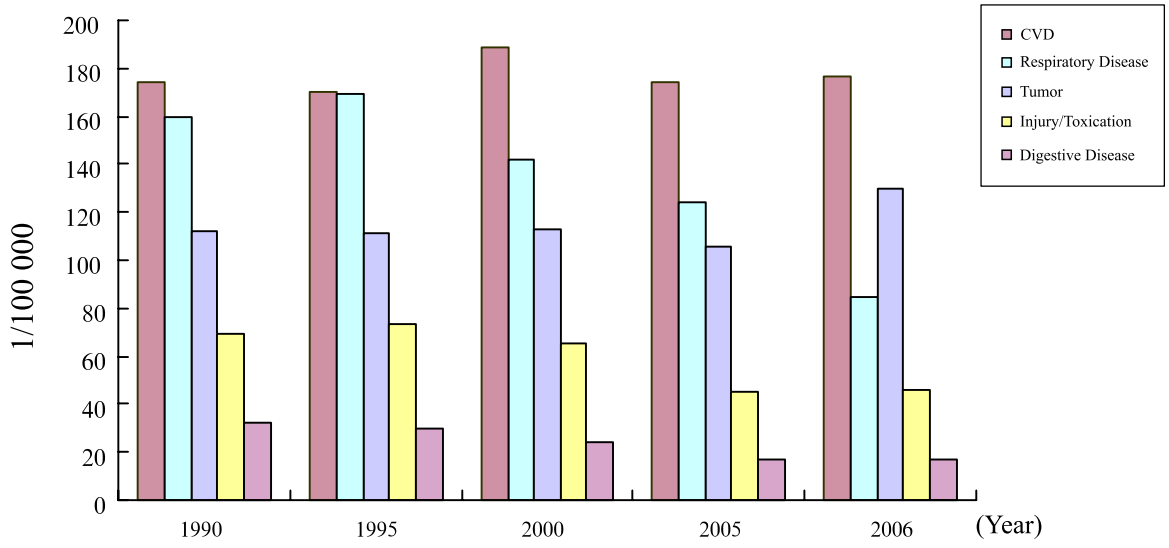

Figure 1-3 (1) Mortality of Major Diseases in Chinese Rural Residents in the Last 16 Years

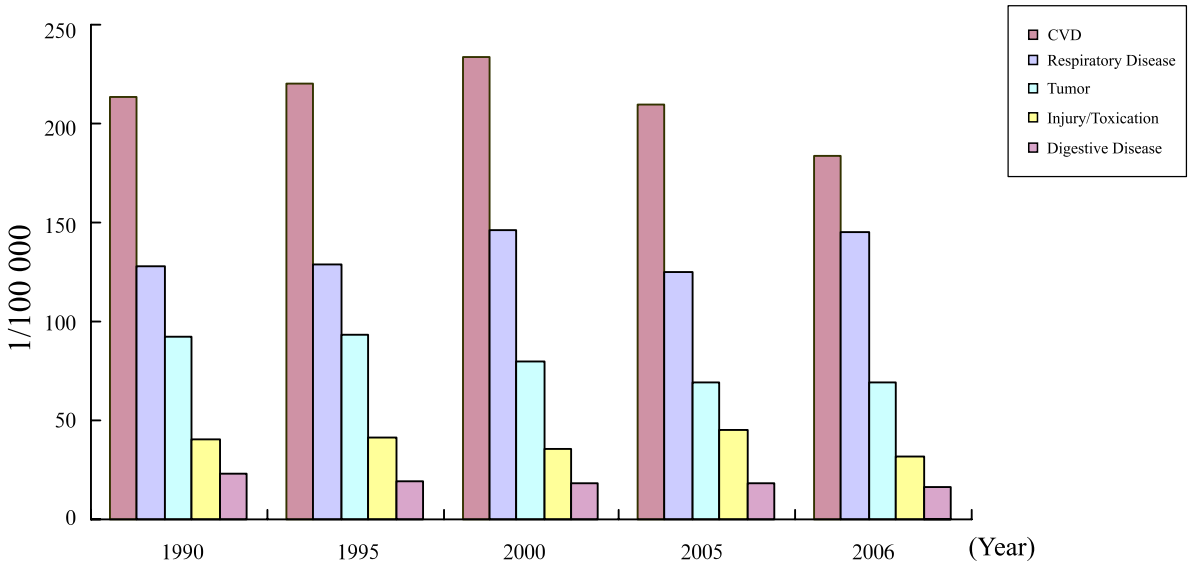

Figure 1-3 (2) Mortality of Major Diseases in Chinese Rural Residents in the Last 16 Years

(2) In all-cause death of major diseases in Chinese residents, CVD is the leading cause. (Figure 1-3 (3), Figure 1-3 (4))

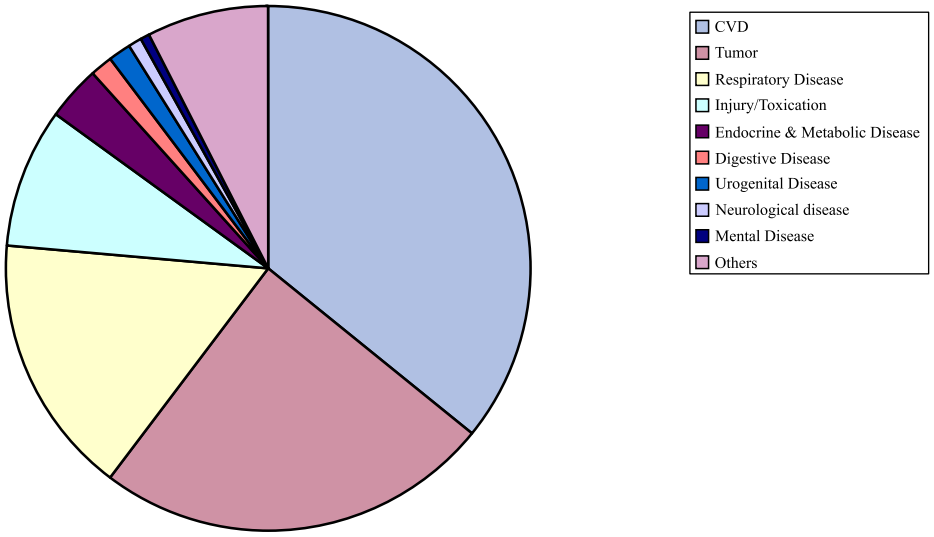

Figure 1-3 (3) Death Constituents of Major Diseases in Chinese Rural Residents (%)

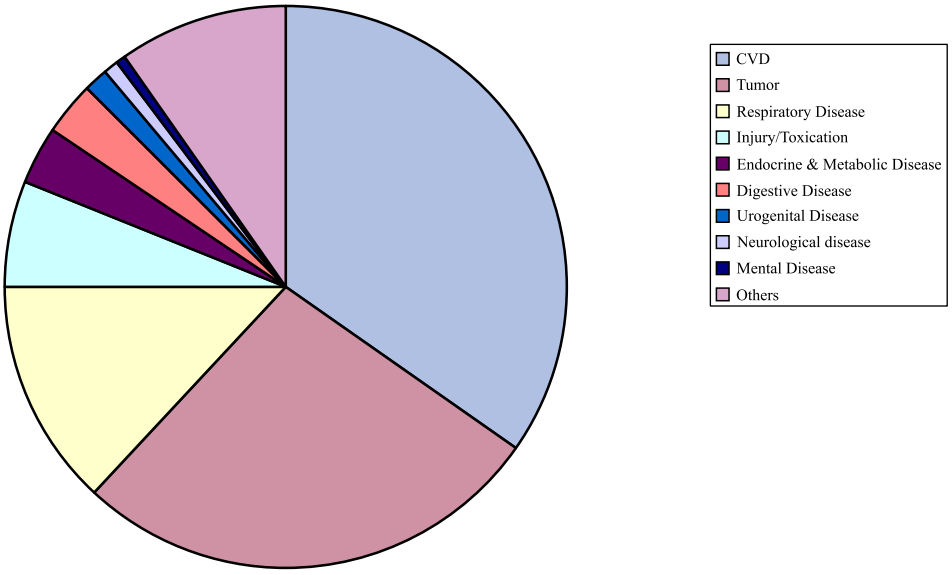

Figure 1-3 (4) Death Constituents of Major Diseases in Chinese Rural Residents (%)

1.4 A 21-Year Follow-up for the Cause of Death in Male Employees of Capital Steel Corporation

Based on World Health Organization Monitoring of Trends and Determinants in Cardiovascular Disease (WHO MONICA) Project[2], implemented a mean 20.8 years of followed-up study for the total of 5 137 male employees aged 45 in Capital Steel Corporation in China, in which 760 deaths occurred in the period. All-cause mortality was $733/10^5$ person-year, and age-standardized mortality rate was $643/10^5$ person-year. Three leading causes of death include tumor, stroke and heart disease, the mortality of which was $231/10^5$, $139/10^5$ and $96.4/10^5$ person-year, respectively. According to the international convention, stroke and heart disease are collectively called CVD, thus, the mortality of CVD is paramount to that of other diseases. The major risk factors of the first 3 deaths were hypertension, smoking and hypercholesterolemia, the relative risk of total death were 1.62[95%CI (1.37～1.90), 1.44 95%CI (1.17～1.77)] and 1.27 95%CI(1.06～1.54), respectively.

1.5 Investigation on the Cause of Death in Veterans in Xi'an[3]

1 268 male veterans aged 55 and over were recruited in 1987 for the physical examination and standard questionnaire in every two years. The total 18-years of follow-up lasts until the end of 2005. There were 491 deaths, 748 survivals and 29 among the population involved in the follow-up. The adjusted mortality rate was $2\,616/10^5$ person-year. Three leading causes of death were cancer, cardiocerebrovascular disease and chronic obstructive pulmonary disease, the death ratio of them accounted for 39.71%, 28.10% and 16.90%, respectively.

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[1] *Health Statistic Yearbood 2007*;Ministry of Health of the People's Republic of China

[2] Duan Xiufang, Wu Xigui, Yu Xuehai et al. *Major causes of death among male steelworkers in Beijing: a prospective study. Chinese Journal of Cardiology 2006,34(7):651～654.*

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Chapter 2
Risk Factors of Cardiovascular Diseases

2.1 Hypertension

2.1.1 Primary Hypertension

2.1.1.1 Level of Blood Pressure in Chinese Population

According to a survey on the Status of Nutrition and Health of the Chinese People in 2002[1], the mean level of blood pressure in Chinese population rose with the increase of age. For the participants under 45 years of age, the level of systolic blood pressure (SBP) was higher for men than that for women; whilefor the participants over 45 years, it was higher for women than for men. Although the level of diastolic blood pressure (DBP) was lower for women among the groups with different age, compared with men, the difference of DBP presented a downward trend when they were over 45 years of age(Table 2-1-1(1)).

Table 2-1-1(1) The Average Level of Blood Pressure in Chinese Populations Aged 15~74 Years

Age Group	SBP(mmHg)		DBP (mmHg)	
	Male	Female	Male	Female
15~24	112.4	107.6	71.9	69.8
25~34	115.7	109.4	75.6	71.5
35~44	118.4	114.8	78.1	74.9
45~54	122.9	123.1	80.0	78.3
55~64	129.3	130.4	80.7	79.1
65~74	135.2	136.8	79.8	78.7

A survey on the Status Nutrition and Health of the Chinese People was implemented in 2002[2]. The analytic result of hypertension in different ethnic groups presented that based on the available research documents of 152 683 participants aged 15 years, the average level of SBP was the highest among men and women of Man ethnic, it was 126.2 mmHg and 125.7 mmHg respectively; however, the average level of DBP was the highest among men and women of Tibetan people, it was 85.7 mmHg and 81.6 mmHg respectively (Table 2-1-1(2))

Table 2-1-1(2) The average Level of Blood Pressure among Chinese Populations Aged more than 15 Years in Different Ethnics

Ethnic	SBP(mmHg)		DBP (mmHg)	
	Male	Female	Male	Female
Han	123.3	120.3	78.6	75.9
Mongolia	123.3	123.3	78.2	77.1
Hui	120.4	118.3	78.2	75.3
Tibetan	124.8	117.0	85.7	81.6

Continue

Ethnic	SBP(mmHg)		DBP (mmHg)	
	Male	Female	Male	Female
Miao	116.2	111.0	73.0	69.7
Zhuang	123.8	116.7	77.4	72.7
Buyi	119.7	117.3	77.1	73.5
Man	126.2	125.7	79.4	77.7
Tujia	122.6	121.0	74.4	73.1
Other	118.2	114.3	76.9	74.6
Total	123.1	120.0	78.5	75.7

2.1.1.2 Prevalence of Hypertension

There were four national large-scale sampling surveys on prevalence of hypertension since P.R. China has established . The outcomes showed a significant upward trend in prevalence rate of hypertension (Figure 2-1-1(1)).

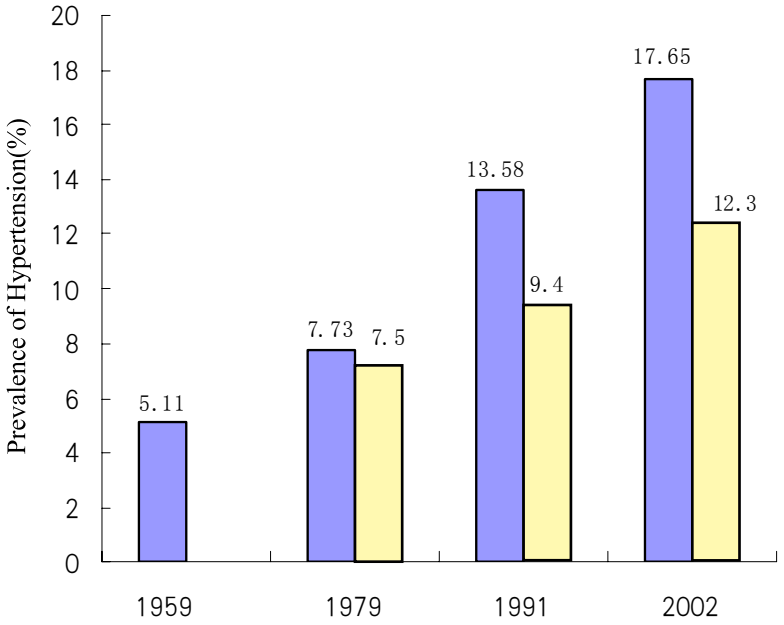

Figure 2-1-1(1) Comparison of Prevalence Rate of Hypertension among Populations Aged over 15 in Four Sampling Surveys Nationwide of China

Note:

It stands for an estimated national prevalence in the same year. The diagnostic criteria of hypertension was somewhat different among various surveys: in 1959, it was DBP>90 and /or SBP>140 under the age of 39 , over 40 years old, SBP would be 10mmHg more with the increase of age in every 10 years ; in 1979-1980: SBP≥141and /or DBP≥91, regardless any anti-hypertensive drug taken within 2 weeks; in 1991: SBP≥140 and /or DBP≥90, or taking anti-hypertensive drug in recent 2 weeks; in 2002: the same as the criteria in 1991.

It stands for age-standardized prevalence. All four surveys used the same criteria that referred between1979～1980. The total population of 1964 was used as a standardized population (aged over 15). Blood pressure unit was mmHg in all four surveys.

The data from a survey on the Status of Nutrition and Health of the Chinese People in 2002 showed[3] that the prevalence of high blood pressure in Chinese adults aged over 18 years was 18.8%, it is higher in males than that in females, and the prevalence presented an upward trend with the increase of age (Table 2-1-1(3)).

Table 2-1-1(3) Gender and age distribution of hypertension prevalence in a survey on Nutrition and Health of the Chinese People in 2002 (%)

Sex and Age	Total	Urban	Rural
Total	18.8	19.3	18.6
Males	20.2	21.8	19.6
Females	18.0	17.9	18.0
Young People(18-44) Years Old			
Subtotal	9.1	9.4	9.0
Males	12.7	14.5	12.0
Females	6.7	6.1	6.9
Middle-age People(45-59) Years Old			
Subtotal	29.3	32.8	28.0
Males	28.6	33.1	26.9
Females	30.0	32.6	29.1
The Elderly(≥60) Years Old			
Subtotal	49.1	54.4	47.2
Males	48.1	54.0	46.0
Females	50.2	54.9	48.4

The prevalence in different age groups was showed in Figure 2-1-1(2), according to grouping of age in every 5 years. No matter males or females, the prevalence of hypertension remained a significant upward trend with the increase of age. For the patients under the age of 40, the increase of prevalence was much significant in males than that in females; for the patients over the age of 40, it was higher in females than in males[4].

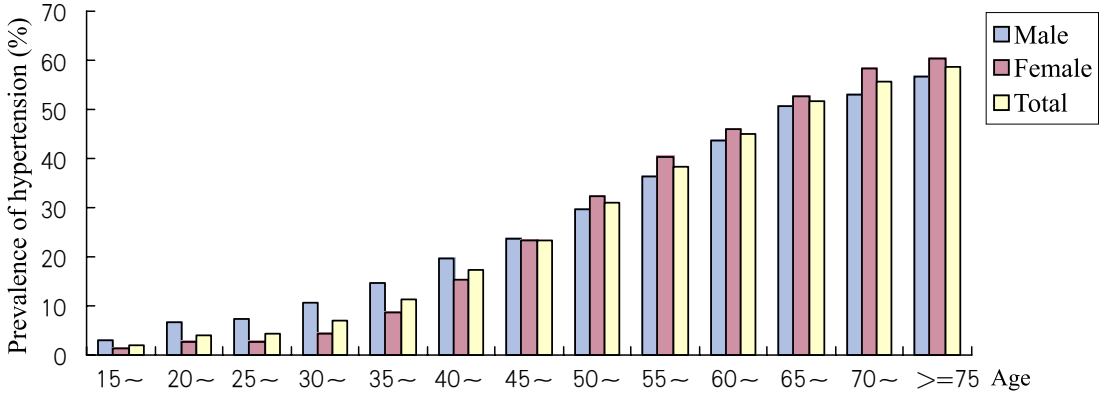

Figure 2-1-1(2) Prevalence of Hypertension among Different Age Populations of China in 2002

Reference: Survey on the Status of Nutrition and Health of the Chinese People in 2002, the Fourth: Hypertension. Beijing: The People's Health Publication, 23～36.

Note: the diagnostic criteria of hypertension: SBP≥140mmHg or DBP≥90mmHg or take any anti-hypertensive drug in recent 2 weeks antihypertensive drug within 2 weeks.

Prevalence of hypertension from 1979 to 2002 showed a trend of increase both in males and in females (Figure 2-1-1(3)). No matter male group or female group, there was a rapid increase in populations aged over 40 years; and there was an obvious difference of the prevalence in various periods [5].

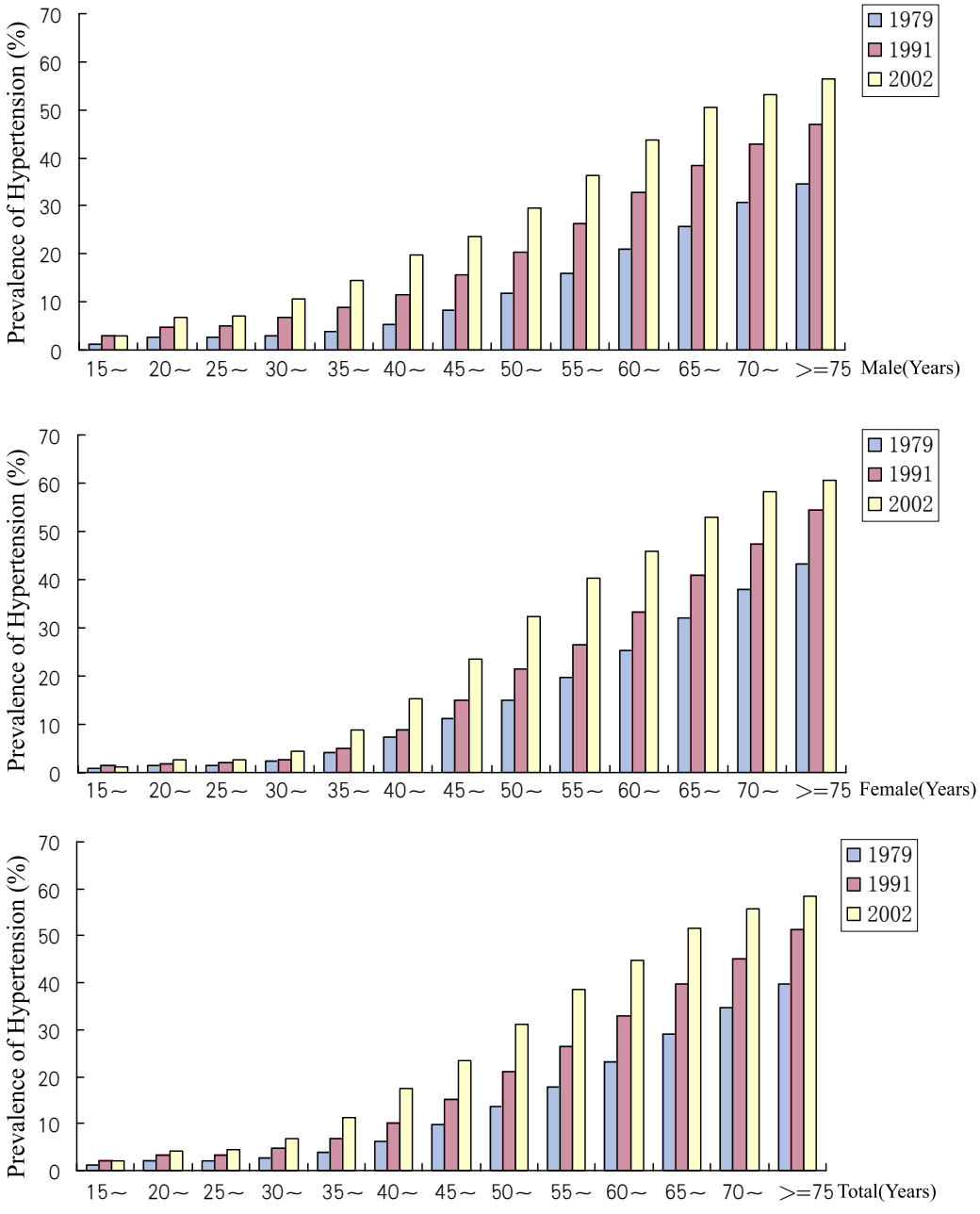

Figure 2-1-1(3) Trend on Prevalence of Hypertension in Different Age Groups between 1979～2002

Reference: Survey on the Status of Nutrition and Health of the Chinese People in 2002, the Fourth: Hypertension. Beijing: The People's Health Publication, 23～36.

Note: the diagnostic criteria of hypertension in 1979: SBP≥140mmHg or DBP≥90mmHg; the criteria in 1991 and 2002: SBP≥140mmHg or DBP≥90mmHg or take any anti-hypertensive drug within 2 weeks .

The investigational data in 2002 showed that the prevalence of hypertension between urban areas and rural areas still remained a difference in China; and also there was significant difference between northern areas and southern areas except for Class III and Class IV village areas (Figure 2-1-1(4)).

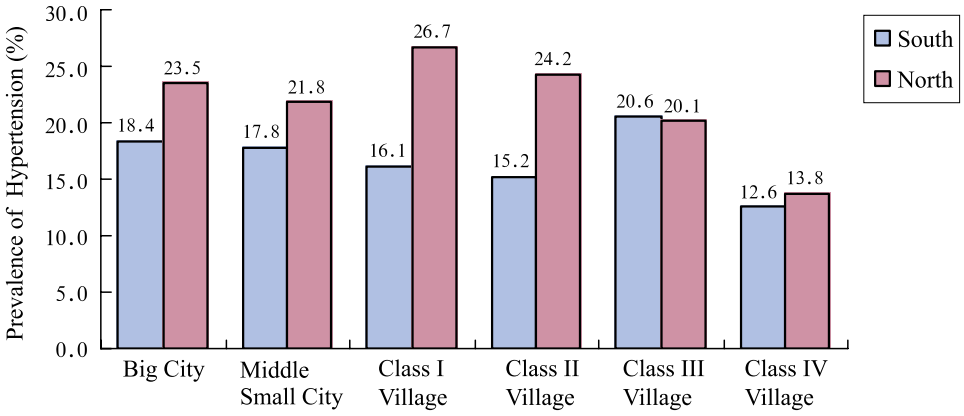

Figure 2-1-1(4) Prevalence of Hypertension among Chinese Populations of Different Regions in 2002

Reference: Survey on the Status of Nutrition and Health of the Chinese People in 2002, the Fourth: Hypertension. Beijing: The People's Health Publication, 23～36.

Note: the diagnostic criteria of hypertension: SBP≥140mmHg or DBP≥90mmHg or take any anti-hypertensive drug within 2 weeks.

The outcomes of surveys on prevalence of hypertension in different periods showed that there was significant difference between urban areas and rural areas, or between different regions. The standardized prevalence in urban areas reached 19.3%, and it was 18.6% in rural areas in 2002. But the difference between urban areas and rural areas presented a trend of reduction(Figure 2-1-1(5)).

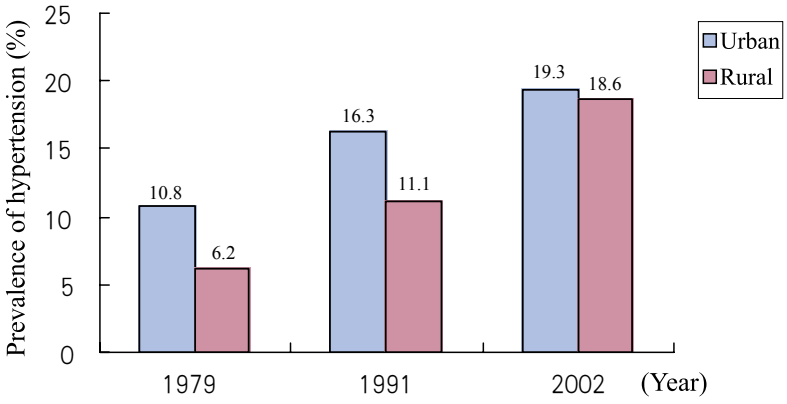

Figure 2-1-1(5) Trend of Hypertension Prevalence in Different Periods

Reference: Survey on the Status of Nutrition and Health of the Chinese People in 2002, the Fourth: Hypertension. Beijing: The People's Health Publication, 23～36.

Note: the diagnostic criteria of hypertension in 1979: SBP≥140mmHg or DBP≥90mmHg; the criteria in 1991 and 2002: SBP≥140mmHg or DBP≥90mmHg or take any anti-hypertensive drug within 2 weeks.

The outcome of the survey on prevalence of hypertension[6], which had 29076 participants, aged 35～85 from 14 provinces of China in 2002, showed that the standardized prevalence in different provinces and cities was 18.68% to 42.61% (Table 2-1-1(4)).

Table 2-1-1(4) Area Distribution of Hypertension Prevalence in Patients of 35～85 Years Old in 14 Provinces and Cities,2002

Region	Participants	Prevalence(%)	Standardized Prevalence(%)
Tianjin	1988	40.69	30.8
Inner mongolia	2029	33.86	42.61
Hebei	2006	48.75	41.05
Shanxi	2031	28.61	28.94
Henna	2696	41.43	41.59
Shandong	1992	16.87	18.6
Zhejiang	2107	36.4	31.45
Hubei	2163	24.13	21.16
Hunan	1741	34.06	24.91
Sichuan	2083	27.36	18.68
Guangdong	2005	27.36	24.91
Jiangxi	2125	34.12	27.71
Yunnan	2278	40.34	30.8
Shanxi	1832	38.1	31.47

The analytic data of hypertension in various ethnic groups[7] showed that in total of 152683 research data available for the participants aged more than 15 years, prevalence of hypertension among Tibetan people was the highest (24.7%), and the prevalence in Miao was the lowest (7.7%). Comparison with that in 1991, there was a biggest increment of the prevalence in Man, however, there was a reduction in Mongolia (Table 2-1-1(5)).

Table 2-1-1(5) Changes of theStandardized Prevalence of Hypertension in Different Nationlity Groups in Different Periods(%)

Ethnic	Male		Female		Total	
	1991	2002	1991	2002	1991	2002
Han	11.6	17.7	10.3	15.3	11.3	16.2
Mongolia	21.1	18.8	15.6	17.2	18.2	17.6
Hui	10.4	16.2	9.3	16.2	9.8	16.0
Tibet	19.5	25.6	16.4	24	17.8	24.7
Miao	8.3	9.2	7.0	6.1	7.7	7.7
Zhuang	9.4	16.1	7.5	8.3	8.8	11.8
Buyi	11.6	13.9	7.8	10.7	9.5	12.4
Man	13.4	23.1	11.1	18.7	12.3	20.5

2.1.1.3 Detectable Rate of High-normal Blood Pressure

In a survey on Nutrition and Health of Chinese people in 2002, according to the definition of *Hypertension Guidelines for Prevention and Control in China in 2005*, the total research data for 147 472 participants aged 18 years and over were classified by BP value, in which, the participants with high-normal BP accounted for 34%; the proportion of normal BP value for men was lower than for women; by contrast, the proportion of high-normal BP value for men was higher, ,compared with that for women (Figure 2-1-1(6)).

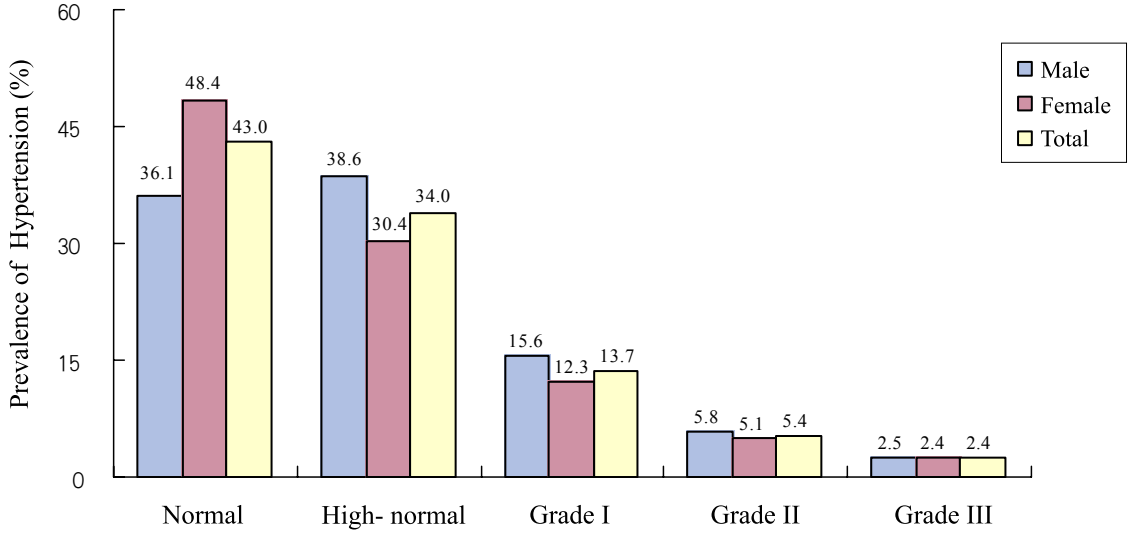

Figure 2-1-1(6) The Classification of Blood Pressure in Chinese Adults in 2002

Reference: Survey on the Status of Nutrition and Health of the Chinese People in 2002, the Fourth: Hypertension. Beijing: The People's Health Publication, 23～36.

Note: Classification of blood 2005 pressure levels was defined by the definition of hypertension guidelines for prevention and control in China.

Table 2-1-1(6) Detectable Rate of High-normal Blood Pressure in Chinese Adults in Different Periods(%)

Age grour	Male		Female		Total	
	2002	1991	2002	1991	2002	1991
18～	37.0	34.8	23.4	16.8	28.5	25.4
25～	40.3	36.0	25.1	17.4	30.9	26.0
35～	41.7	36.5	32.8	24.7	36.7	30.2
45～	40.3	35.9	36.1	30.2	38.0	32.9
55～	36.7	33.8	33.2	31.7	34.9	32.7
65～	31.6	32.3	28.9	30.1	30.3	31.2
75～	29.3	30.5	27.0	27.4	28.1	28.7
Total	38.6	35.2	30.4	23.5	34.0	29.0

It was reported[8] that high-normal blood pressure increased a 56% onset risk of stroke , a 44% risk of coronary heart disease and a 52% risk of overall CVD ; in the events of CHD, stroke and overall CVD, the attributable risk (AR) of high-normal blood pressure was 12.4%, 15.2% and 14.4%.

2.1.1.4 Isolated Systolic Hypertension

According to the data of survey in 2002[9], the standardized prevalence of isolated systolic hypertension (ISH) was 6.0% in Chinese adults, of which, 5.4% for men and 6.9% for women. It was estimated that there were 50-million existing adult patients with ISH in China. Generally, the prevalence of ISH presented an upward trend with the increase of age, especially in the people over 40 years of age . For people under 40 years old, the prevalence was higher for men than for women ; by contrast, for people over 40 years of age, it was higher for women, compared with that for men (Figure 2-1-1(7)).

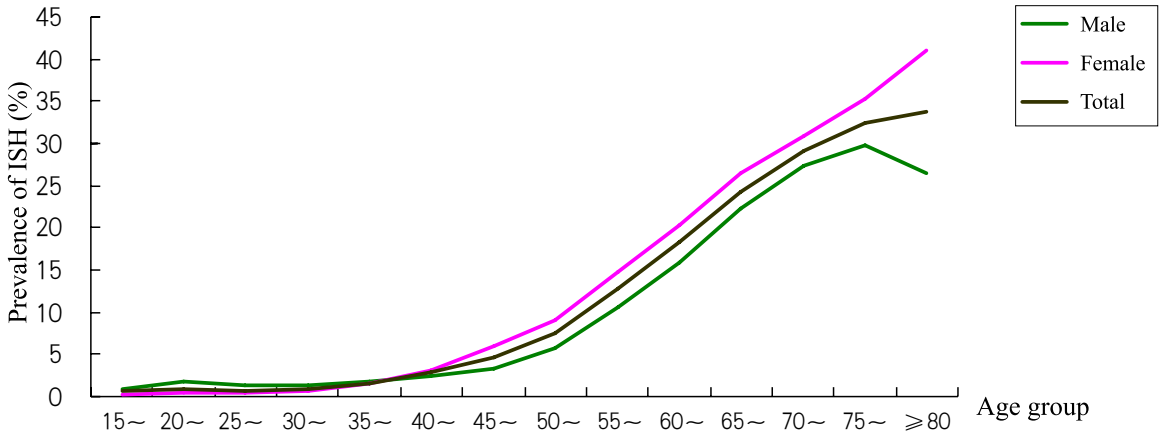

Figure 2-1-1(7) The Standardized Prevalence of ISH by Age Group in China

Reference: Survey on the Status of Nutrition and Health of the Chinese People in 2002, the Fourth: Hypertension. Beijing: The People's Health Publication, 37～48.

Note: prevalence adjusted by regions.

The prevalence of ISH also showed higher in northern areas, and lower in southern areas. But the difference between prevalence rates of ISH and hypertension was that no matter in northern areas or in southern areas, it was higher for women than for men, and higher in rural areas than in urban areas (Table 2-1-1(7)、Table 2-1-1(8)).

Table 2-1-1(7) The Standardized Prevalence of ISH in Chinese Adults in Regions of Urban and Rural in 2002

Sex	Total	Total in Urban	Total in Rural	Big City	Middle-small City	Class I Area	Class II Area	Class III Area	Class IV Area
Male	5.4	4.9	5.6	5.4	4.8	6.5	5.8	5.2	3.9
Female	6.9	6.7	6.9	7.0	6.5	8.2	6.9	77.5	5.0
Total	6.1	5.8	6.2	6.2	5.6	7.3	6.2	6.3	4.4

Table 2-1-1(8) The Standardized Prevalence of ISH in Chinese Population Aged 60 and over in Northern and Southern Areas in 2002

Sex	Urban		Rural	
	Southern Area	Northern Area	Southern Area	Northern Area
Male	4.5	5.4	5.1	5.9
Female	6.6	6.8	6.5	7.5
Total	5.6	6.0	5.7	6.7

Among the participants aged≥60 years, prevalence of ISH was 25.1%. In addition, it was higher in urban areas than in rural areas, and higher for women than for men. In rural, there was highest prevalence in Class I areas, and followed successively in the areas of Class II, Class III and Class IV (Table 2-1-1(9)). Although the prevalence of ISH was still higher in northern area than in southern area, the difference of prevalence between two areas was comparatively small (Table 2-1-1(10)).

Table 2-1-1(9) The Standardized Prevalence of ISH among Chinese Population Aged 60 and over in Different Areas of Urban and Rural in 2002

Sex	Total	Total in Urban	Total in Rural	Big City	Middle-small City	Class I Area	Class II Area	Class III Area	Class IV Area
Male	22.2	22.4	22.1	23.6	21.8	26.1	22.8	20.0	16.1
Female	28.3	29.5	27.8	31.2	28.8	32.6	27.7	29.5	20.4
Total	25.1	26.0	24.8	27.7	25.3	29.3	24.9	24.6	18.3

Table 2-1-1(10) The Standardized Prevalence of ISH in Chinese Population Aged 60 and over in Northern and Southern Areas in 2002

Sex	Urban		Rural	
	Southern Area	Northern Area	Southern Area	Northern Area
Male	22.5	22.3	21.1	22.5
Female	29.1	29.7	26.8	29.1
Total	25.8	26.1	24.0	25.6

For the adult patients with hypertension, the prevalence of ISH was higher for women than for men in different age groups, meanwhile(Figure 2-1-1(8)), it was higher in rural than in urban (Table 2-1-1(11)) and higher in southern areas than in northern areas (Figure 2-1-1(9)). The characteristic of ISH prevalence, compared with hypertension prevalence, was somewhat different .

Table 2-1-1(11) The Standardized Prevalence of ISH in Chinese Adult Patients with Hypertension in the Urban and Rural Areas in 2002

Sex	Total	Total in Urban	Total in Rural	Big City	Middle-small City	Class I Area	Class II Area	Class III Area	Class IV Area
Male	19.5	14.3	21.6	15.5	13.8	23.2	21.0	19.8	22.7
Female	25.3	21.8	26.7	22.6	21.4	2.8	26.2	25.0	27.1
Total	22.3	17.8	24.2	18.9	17.4	26.0	23.5	22.6	25.0

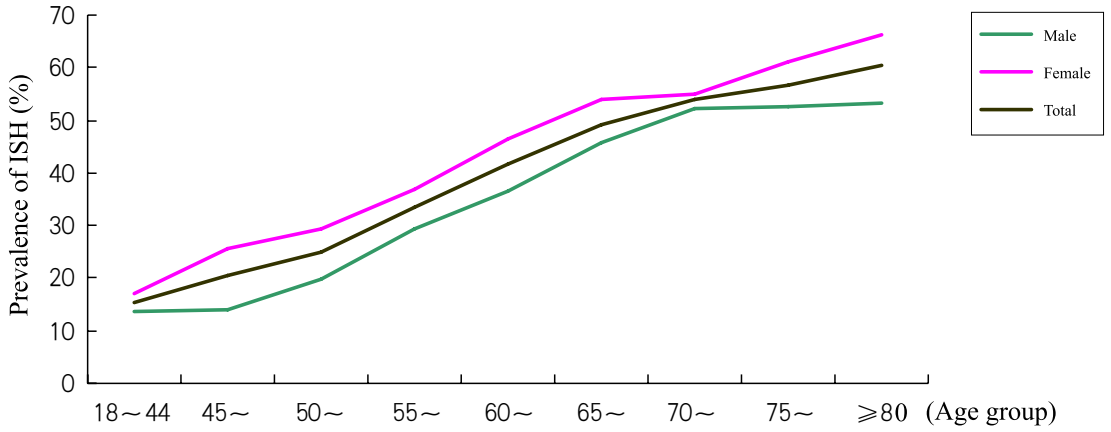

Figure 2-1-1(8) The Standardized Prevalence of ISH among Adult Patients with Hypertension in Different Age Groups

Reference: Survey on the Status of Nutrition and Health of the Chinese People in 2002, the Fourth: Hypertension. Beijing: The People's Health Publication, 37～48

Figure 2-1-1(9) The Standardized Prevalence of ISH in Adult Patients with Hypertension in the North and the South

Reference: Survey on the Status of Nutrition and Health of the Chinese People in 2002, the Fourth: Hypertension. Beijing: The People's Health Publication, 37～48.

Note: prevalence adjusted by regions.

2.1.1.5 Awareness, Treatment and Control of Hypertension

The outcomes of survey [10] in 2002 showed that the percentage of hypertension awareness, treatment and control among Chinese population was 30.6%, 24.7% and 6.1% respectively; for the patients under treatment, the control rate reached to 25%. Hypertension awareness, treatment and control remained an improvement with increase of age, and it was higher in urban areas than in rural areas (Table 2-1-1(12)).

Table 2-1-1(12) Rates of Awareness, Treatment and Control among Hhypertensive Patients in China(%)

	Age Group	Urban Area	Rural Area	Total
Awareness Rate	18~	17.8	11.6	13.6
	45~	40.8	25.1	31.0
	60~	48.5	26.8	37.6
	Sub-total	41.1	22.5	30.2
Treatment Rate	18~	11.8	7.9	9.1
	45~	34.1	19.4	25.0
	60~	43.1	21.3	32.2
	Sub-total	35.1	17.4	24.7
Control Rate	18~	4.2	2.1	2.7
	45~	10.0	3.8	6.2
	60~	11.3	3.9	7.6
	Sub-total	9.7	3.5	6.1
Treatment and Control Rates	18~	36.3	26.8	30.7
	45~	29.7	20.2	25.2
	60~	26.6	19.1	24.1
	Sub-total	28.2	20.4	25.0

This study[11] observed a total of 26 655 out patients of hypertension control the control rate was 50.2% and 56.7% after taking drug for 4 weeks and 12 weeks, respectively. The rate was different among hypertension patients with various types. The difference between the treatment and control rates also existed among hypertensive patients with different risk stratification, in addition, the higher the risk stratification, the lower the rate was. The control rates in patients with diabetes or nephropathy were significant lower than the mean level of control rate (Table 2-1-1(13)).

Table 2-1-1(13) Hypertension Control Rate among the Patients with Different Characteristics in Different Periods (%)

Duration of Treatment	ISH	IDH	SDH	Moderate Risk	Low Risk	High Risk	Very High Risk	Diabetes	Nephropathy	Total
4	56.0	69.1	48.1	84.6	69.6	43.7	40.9	18.9	27.7	50.2
12	57.9	72.6	55.6	93.9	79.5	54.1	49.9	30.3	45.5	56.7

ISH: Isolated Systolic Hypertension, IDH: Isolated Diastolic Hypertension, SDH: Systolic and Diastolic Hypertension.

2.1.1.6 Direct and Indirect Factors Involved in the Prevalence of Hypertension

Age is an unchangeable risk factor of hypertension, no matter men or women, the onset risk of hypertension rose by times . In comparison with men aged 15～24, the risk in men aged 65～74 was 22 times . For women with the same age, the onset risk was as high as 57 times (Table 2-1-1(14)).

Table 2-1-1(14) The Relative Risk of Hypertension in Different Age Groups in China

Age Group	Male		Female	
	Prevalence	OR（95%CI）	Prevalence	OR（95%CI）
15~24	4.76	1	2.13	1
25~34	9.45	2.09（1.85,2.36）	3.82	1.82（1.56,2.13）
35~44	17.27	4.18（3.72,4.68）	11.88	6.19（5.37,7.14）
45~54	27.24	7.49（6.69,8.39）	28.42	18.25（15.89,20.95）
55~64	40.79	13.78（12.30,15.43	43.66	35.61（30.97,40.95）
65~74	52.46	22.07（19.64,24.79）	55.7	57.77（50.09,66.63）

With respect to the relative risk of hypertension between genders in all age groups, it was higher for men than for women under the age of 45, and higher for women than for men when they were over 45 of age (Table 2-1-1(15)).

Table 2-1-1(15) The Onset Risk of Hypertension among Chinese Population with Different Genders

Age Group	Gender	Prevalence(%)	OR（95%CI）
15~24	Male	4.76	1
	Female	2.13	0.44（0.37,0.52）
25~34	Male	9.45	1
	Female	3.82	0.38（0.35,0.42）
35~44	Male	17.27	1
	Female	11.88	0.65（0.61,0.69）
45~54	Male	27.24	1
	Female	28.42	1.06（1.01,1.11）
55~64	Male	40.79	1
	Female	43.66	1.13（1.07,1.190
65~74	Male	52.46	1
	Female	55.7	1.14（1.07,1.22）

The onset risk of hypertension in patients with family history was 2 times as high as patients without family history. The more the alcohol intake, the higher the risk of hypertension was. In comparison with people with normal weight, the one risk of hypertension among people with overweight or obesity increased. No matter triglyceride or cholesterol or high dense lipoprotein cholesterol (HDL-C), the patients with blood-lipid abnormal will be at a high risk of hypertension as compared to ones with normal blood-lipid (Table 2-1-1(16)).

Table 2-1-1(16) Risk of Hypertension Onset for Chinese Population with Different Risk Factors

Risk Factor	Level of RF	Prevalence(%)	OR（95%CI）
His. of Hypert	NO	18.22	1
	Yes	30.38	1.96（1.90,2.20）
Amount of Alcohol Intake(g/d)	<4.8	24.04	1
	≥4.80,<10.51	23.65	0.98（0.86,1.12）
	≥10.51,<19.94	26.25	1.13（0.99,1.28）
	≥19.94,<40.03	30.2	1.37（1.2,1.55）
	≥40.03	35.22	1.72（1.52,1.94）
Overweight/Obesity	Thin	13.7	0.8（0.8,0.9）
	Normal	16.5	1.0
	Overweight	33.3	2.5（2.5,2.6）
	Obesity	51.2	5.3（5.1,5.5）
Triglyceride	Normal	20.69	1
	High	37.2	2,27（2.15,2.4）
Cholesterol	Normal	21.29	1
	High	43.26	2.82（2.56,3.11）
High Dense Lipoprotein Cholesterol	Normal	22.68	1
	Low	25.47	1.17（1.08,1.260）

2.1.2 Secondary Hypertension

There is no large sampling survey on prevalence of secondary hypertension. It is reported[12] that secondary hypertension accounted for 14% among all in-patients with hypertension. The details of subgroup showed in Figure 2-1-2.

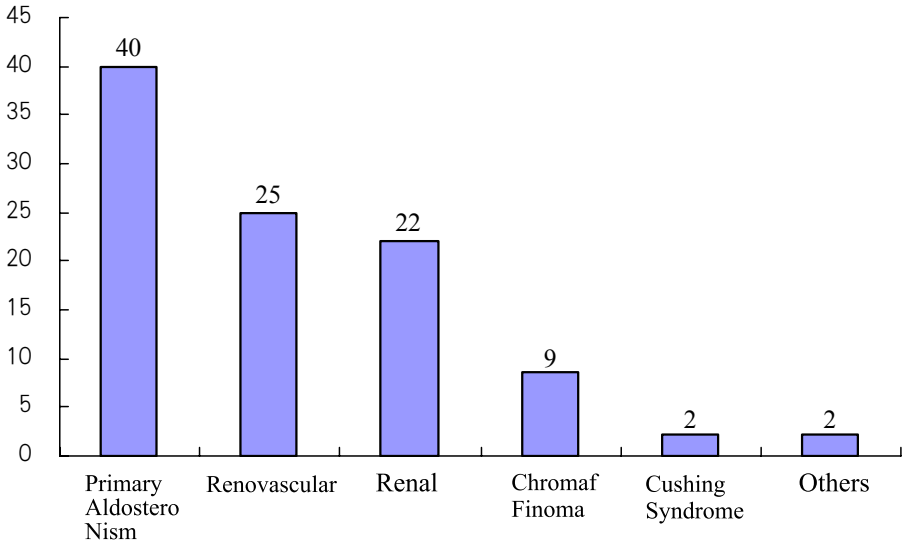

Figure 2-1-2 Subgroup Distribution of Secondary Hypertension among Inpatients(%)

2.1.3 Childhood Hypertension

A survey on total 6 278 children aged 6～13 showed[13] that the prevalence of childhood hypertension reached 3.04% in total, 3.16% in urban areas, 2.76% in rural areas, according to the diagnosis criteria recommended by national heart, lung, blood institute of USA, namely adjusted by height, the 95th percentile of blood pressure (systolic and diastolic) in children aged 6～13 years (Table 2-1-3(1)). If classifying the weight to obesity (more than 20%), overweight (more then 10%～20%) and normal according to the weight for height standard recommended by WHO, the prevalence of hypertension was 36.88% in obese group, it was greatly higher than overweight group (2.18%) , and much higher than normal group (0.28%). There was a positive correlation between prevalence of hypertension and childhood obesity (Table 2-1-3(2)).

Table 2-1-3(1) Prevalence of Hypertension among Children in Jinnan Urban and Rural Areas

	Urban	Rural	Total
Boy	2.72	1.56	2.36
Girl	4.20	5.57	4.62
Total	3.16	2.76	3.04

Table 2-1-3(2) Prevalence of Childhood Hypertension by Physical Status in Jinan Uurban and Rural Areas

	Cases	No. of patients	Prevalence rate(%)
Obesity	141	50	36.88
Overweight	336	7	2.18
Normal	971	3	0.28

2.1.3.1 Detectable Rate and Tendency of High-normal Blood Pressure in Chinese School-age Children

A survey on physical and healthy of Chinese students was conducted in every five years between 1985 and 2005, which was jointly organized by Ministry of Education, State Physical Culture Administration, Ministry of Health, State Civil Affairs Administration and Ministry of Technology and Science. It provided a large-scale dynamic basic data concerning the physical and healthy statusof the students. In the survey, adhered to a principle combined cross-sectional with sampling of whole population; and about 140～400 thousand school children aged 7～18 years were selected from 30 provinces, autonomous region and municipality (except for Tibet) across China. Blood pressure measurement was taken in total five surveys, but only the detectable rates of high-normal blood pressure in surveys of 1991 and 1995 we issued in public[14][15]. Since different record measures of DBP existed in various surveys, the fourth sound of KorotKoff in the year 1991, and the fifth sound of KorotKoff in 1995, caused a less comparability of DBP level between both surveys. Therefore, only the detectable rate of high-normal SBP was described in the following.

The detectable rate of high-normal SBP defined the 95th percentile value by gender and age group in survey of 1991 as the diagnostic criteria (Table 1). In comparison of 1991, the detectable rate of high-normal SBP in boys and girls of urban and rural areas all increased significantly in 1995. For urban boys and girls, the rate increased by 42.5% and 45.5%, respectively, meanwhile, it exceeded the increase of detectable rate of high-normal SBP in rural boys and girls, respectively (23.7% and 31.0%).

Table 2-1-3(3) The 95th Percentile Screening Criteria of Hhigh-normal Blood Pressure in Chinese Adolescences Aged 7～18years in China(SBP/DBP,mmHg)*

Age	SBP		DBP	
	Boy	Girl	Boy	Girl
7	110	110	75	75
8	112	112	76	76
9	114	114	78	78
10	118	120	80	80
11	120	120	80	80
12	122	121	80	80
13	124	121	80	80
14	126	122	81	80
15	130	122	83	80
16	132	124	85	82
17	134	124	86	82
18	134	124	86	82

* According to the 95th percentile of blood pressure (both systolic and diastolic) of Han group (pooled data, including urban and rural, male and female) by age based on the national survey in 1991.

Figure 2-1-3(1) Detectable Rate of High-normal SBP in Chinese Children by Ggender and Region in the Years of 1991 and 1995

2.1.3.2 Regional Distribution of High-normal Rate of Blood Pressure in Chinese School-age Children

According to the screening criteria in Table 2-1-3(3), Figure 2-1-3(2) demonstrated the region distribution characteristics of detectable rates of high-normal SBP and DBP among school-age children of Han in urban and rural areas: no matter urban areas or rural areas, and boys or girls, the rate was the highest in northern China (2.1%～3.4%), followed by the northeast (1.4%～2.3%), and the lowest rate existed in southwest of China (0.2%～0.6%); of which, the rate of high-normal BP was higher in rural children than urban children in both regions of the north and the east of China.

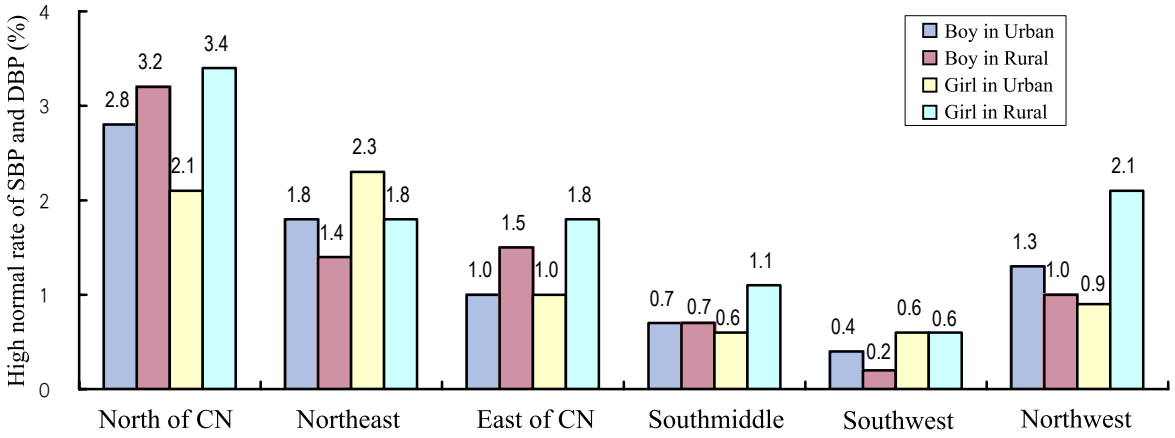

Figure 2-1-3(2) High-normal Rate of SBP and DBP in Chinese School Age Children by Region in 1995

2.1.3.3 Long-term Cohort Study on Childhood Hypertension in China

In 2004, Capital children institute conducted a population cohort study on children blood pressure in 1987, (during the 7th National Five Plan Project) . An 18-year follow-up study for those children found that in the children with a baseline of hypertension status, 42.9% of them finally developed to adult patients with hypertension (Figure2-1-3(3))[16]. It is verified that children with high-normal blood pressure are the high-risk population to be adult patients with hypertension.

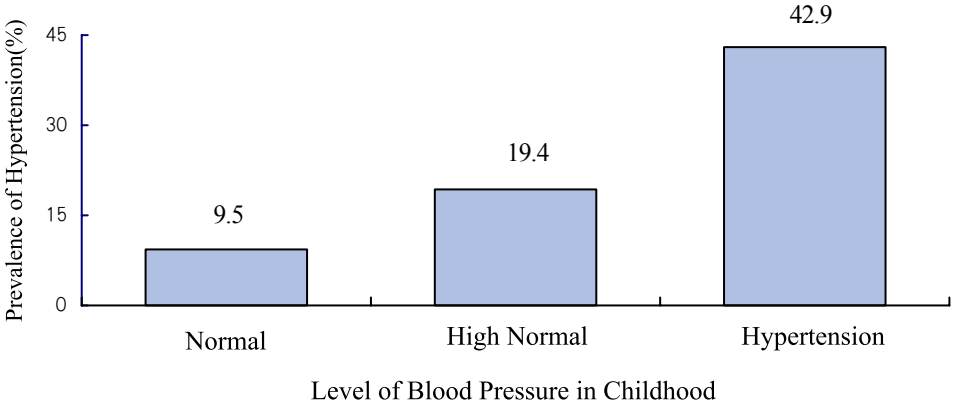

Figure2-1-3(3) Baseline BP (in 1987) and Prevalence of Hypertension in Adults (in 2004)

2.2 Tobacco Use

2.2.1 Epidemic Situation of Cigarette Smoking

2.2.1.1 Overall Prevalence

The outcomes of National Sample Survey conducted in 2002 showed the rate of tobacco use was 35.8% among Chinese population aged 15 years and over, in which, the male and the female smokers accounted for 66.0% and 3.1%, respectively. An estimated 350-million Chinese people aged 15 and over are current smokers. Furthermore, 540 millions were passive smokers. The prevalence rate of smoking was higher among the rural population compared with that among the urban population. Conclusive evidence indicate that both active smoking and passive smoking can cause various diseases, including cancers and coronary heart diseases etc., and result in over 1-million people death of smoking-related illnesses every year. It is estimated, by 2030, that there will be 33% of the male people with middle age death of smoking-related diseases[17].

The outcomes of survey in 2002 presented a 1.8% decline of smoking rate among Chinese population aged 15 and over, compared with that in 1996. Among which, 3.1 of decline in men and 1.0 of that in women (using the standardized data of 2000 National Census to make a comparison between two outcomes of the surveys); The drop of smoking rate was more markedly among the urban residence than that among the rural residence, which made a wider gap between the two populations. However, owing to increment and aging of Chinese population, the number of total smokers was 30 million more than that in 1996. Meanwhile, the rate of smoking cessation increased from 9.42% in 1996 to 11.5% in 2002[18]. The smoking prevalence among Chinese men has been sustained at a high level. Especially among male physicians and teachers, the smoking rate was more than 50%; the smoking rate of the Chinese male physicians was one of the highest in the world, accounting for about 57% of the total Chinese smokers[19]. Meanwhile, the rate of smoking cessation among smoking physicians was only 10.8 %, and nearly 90% of them were unwilling to quit smoking[20].

Table 2-2-1(1) A Comparison among the Surveys of Smoking Prevalence in Chinese Population Aged 15 and Over

Survey Year	Sample Size	Smoking Rate of Men	Smoking Rate of Women	Total Rate
1984	519 000	61.0%	7.0%	33.9%
1996	122 000	66.9%	4.2%	37.6%
2002	167 000	66.0%	3.08%	35.8%

Note:There was a difference of smoking definition in 3 surveys:

- In 1984 National Sample Survey of Smoking Prevalence, “smoker” was defined as a person who has smoked at least 1 cigarette per day for 1 year or longer at the time of survey.
- In 1996 National Prevalence Survey of Smoking Pattern, “smoker” was defined as a person who has smoked daily for at least 6 months at the time of survey.
- In 2002 National Behavioral Risk Factors Surveillance, “smoker” was defined as a person who has smoked at least 100 cigarettes at the time of survey.

It is noted that there is a tendency toward a younger age of smoking initiation in China. Although the age-specific smoking rate in 2002 was lower than that in 1996 in most populations, the smoking rate was climbing up in 2002. At present, the current smokers reach about 15 millions among the total of 130-million adolescents aged 13～18. Meanwhile, the people who is willing to have a smoke were 40 millions or over. There was also

a tendency toward a younger age of smoking initiation among Chinese adolescents, and both the attempting rate and the current smoking rate of schoolgirls were increasing. The outcomes of the survey in 2005 showed that the current smoking rate of Chinese adolescents was 11.5% in which, 18.4% for schoolboys and 3.6% for schoolgirls. The current smoking rate was rapidly increasing with the age among Chinese schoolboys [21].

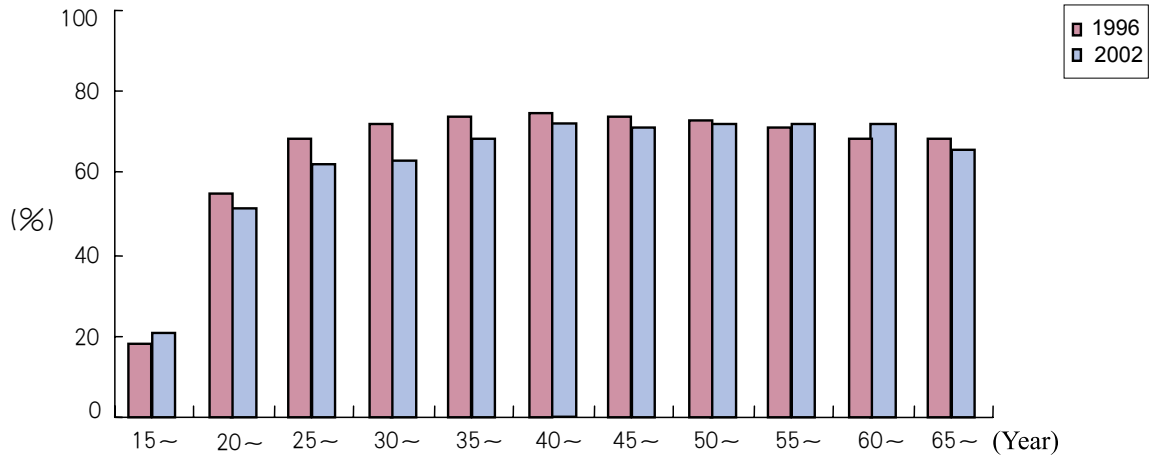

Figure 2-2-1(1) A Comparison of Smoking Rate among Chinese Men Aged 15 and over between 2002 and 1996

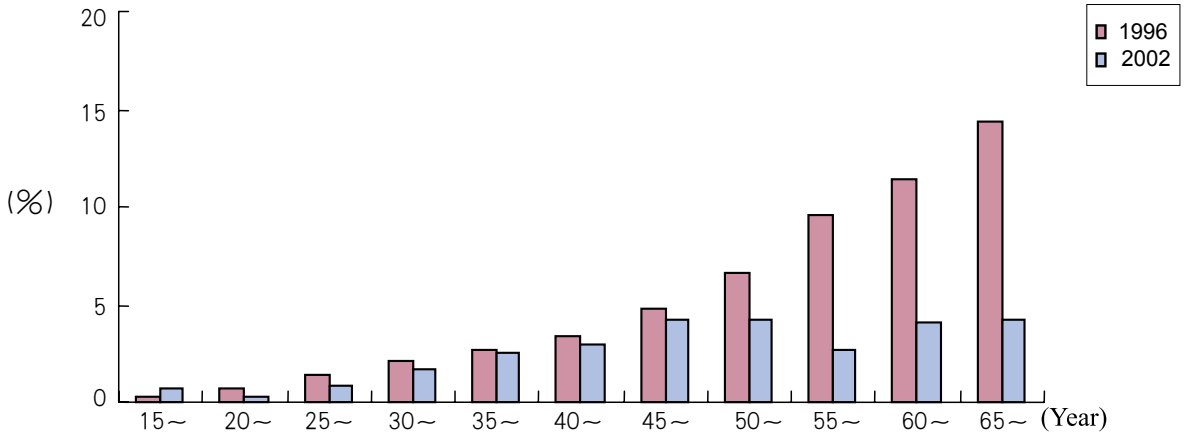

Figure 2-2-1(2) A Comparison of Smoking Rate among Chinese Women Aged 15 and over between 2002 and 1996

2.2.2 Passive Smoking

The outcomes of the survey in 2002 showed that the proportion of passive smoking in non-smokers was 51.9%(Figure 2-2-2). A comparison among three surveys of smoking prevalence in 1984, 1996 and 2002 found that the situation of passive smoking was not improved. Currently, about half of adolescents are suffering the harm of passive smoking in China. It is estimated that about 180-million children and approximately 65-

million teenagers aged 13～18 are exposing to environmental tobacco smoke, among the adolescents. 43.9% of exposure occurs in their homes and 55.8% of exposure in public places[22].

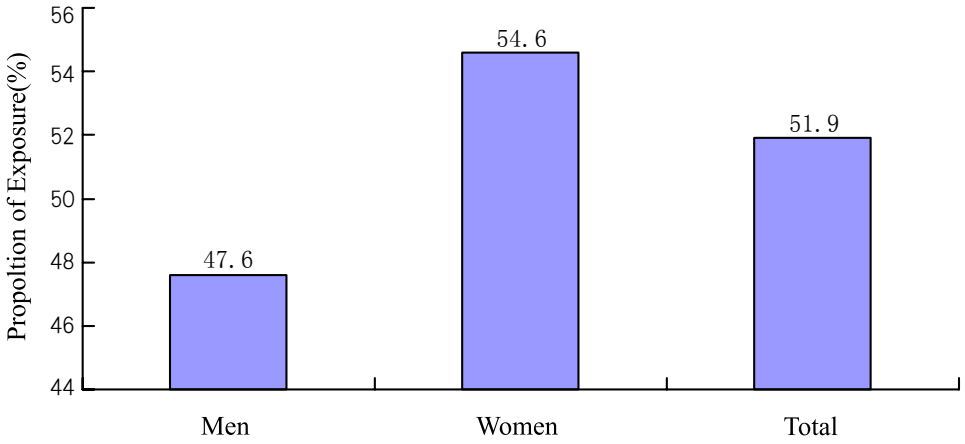

Figure 2-2-2 Proportion of Exposure to Secondhand Smoke among Nonsmokers in China

* Definition of passive smoking: Non-smoker has to be exposed to smoker's tobacco smoke at least 15 minutes one day a week.

2.2.3 Hazards of Active Smoking and Passive Smoking

Both cigarette smoking and passive smoking are the one of the major preventable causes of deaths among the adults of China. The relative risk (RR) of smoking population and the population attributable risk (PAR) of death associated with smoking in China was 1.23(95%CI 1.18～1.27) and 7.9% respectively; in which, 1.18 (1.13～1.23) of RR and 10.0% of PAR for men, and 1.27(1.19～1.34) of RR and 3.5% of PAR for women[23].

2.2.3.1 Impact of Cigarette Smoking on the Onset and Death of Cardiovascular Diseases

Cigarette Smoking is the One of Independent Risk Factors of CVD and Stroke Events

A 10-year follow-up study on 30 000 population aged 35～64 years (the Chinese Multi-Provincial Cohort Study, CMCS) showed that hypertension, cigarette smoking, diabetes mellitus (DM), high total cholesterol/low HDL- cholesterol were the independent risk factors for acute coronary heart disease (CHD) events. In addition, hypertension, DM, high total cholesterol/low HDL, cigarette smoking and obese were the independent risk factors for acute ischemic stroke events. Among people aged 35～64 years, 19.9% of acute coronary disease events and 11% of acute ischemic stroke events were attributed to cigarette smoking. A multivariate regression analysis found that the risk of coronary disease events, ischaemic stroke events and haemorrhage stroke events among Chinese smokers was 1.75 times, 1.37 times risk and 1.21 times respectively, compared with that in Chinese nonsmokers[24]. There were the similar outcomes in the 15-year follow-up study involved in 10 000

participants between China and the USA. The study revealed that 31.9% of ischaemic CVD events (CHD and ischemic stroke) among Chinese population aged 35～59 years were attributed to cigarette smoking. In the male smokers and the female smokers, the risk of ischemic CVD onset was increased by 100% [RR=2.04, 95%CI(1.43～2.92)] and 59%[RR=1.59, 95%CI(1.10～2.30)] respectively, compared with that in nonsmokers [25].

Cigarette Smoking and Deep Vein Thrombosis,DVT [26]

A total of 547 inpatients aged 14 years and over with post-trauma DVT of orthopedic participated in a follow-up study in Tianjin Hospital between November 2003 and October 2004, in which, the mean age of the subjects was 39.6 years, and total smokers accounted for 26.7%. The results of study showed that the possibility of DVT occurrence in smokers was 2.34 times compared to non-smokers[95% CI (1.04～1.47)], when extra factors was under control.

Joint Effect of Cigarette Smoking and Alcohol Consumption on Mortality [27]

A total of 66 743 men aged 30～89 were recruited in a follow-up study in Shanghai, being a part of study with total 297 396 people per years in China from 1996 to 2000. The results of study found that there were 982 deaths from cancers and 776 deaths from CVD in total of 2 514 deaths, Drinking alcohol in moderate amounts, such as 1～7 units per week, was correlated with the reduction of death risk, particularly in the reduction of CVD death risk (the hazard rate [HR=0.7, 95%CI(0.5, 1.0)] Compared to never-smokers, all-cause mortality of both former and current smokers rose significantly, and the death risk increased with the amount of smoking. Among all moderate drinkers, the HR of total death was 0.8[95%CI(0.6, 1.0)] for non-smokers, 1.0[95%CI(0.9, 1.2)] for moderate smokers and 1.4[95%CI(1.2, 1.7)] for heavy smokers. The death risk of the participants with heavy drinking and smoking was the highest [HR=1.9, 95%CI(1.6, 2.4)]. The conclusion of study was that the benefit of moderate alcohol consumption was offset by cigarette smoking, although it could reduce the death risk of CVD.

2.2.3.2 Impact of Passive Smoking on the Onset and Death of Cardiovascular Diseases

Impact of passive smoking on the onset of cardiovascular diseases

There was an upward trend in the onset risk of CVD both among cigarette smokers and among passive smokers. The hazard of passive smoking on cardiovascular system had been verified 10 years ago. Then the hazard degree of passive smoking had been further analyzed by following studies. The results of a combined meta-analysis for 18-item epidemiological studies demonstrated the onset risk of CHD in passive smokers increased by 25%[RR=1.25, 95%CI (1.17～1.32)]; in which, the cohort study showed a 21% of increase in onset risk in passive smokers[RR=1.21, 95%CI (1.14～1.30)], and the case-control study indicated a 51% of increase in the onset risk in passive smokers[RR=1.51, 95%CI (1.26～1.81)][28].

Correlations between the prevalence rate of stroke and passive smoking among non-smoking women exposed to cigarette smokes from their husbands in Shanghai, China [29]

A total of 60 377 Chinese women aged 40～70 years participated in a Women's Health cohort study Shanghai from 1997 to 2000. The outcomes of study found there was an upward trend in the onset risk of stroke following the increase of cigarette smoking amount in nonsmoking housewives, for example, if a

husband smoked 1～9 cigarettes, 10～19 cigarettes and more than 20 cigarettes per day, the onset risk of stroke for his wife was 28%, 32% and 62%, respectively.

Table 2-2-3(1) Odds Ratios for Stroke among Female Nonsmokers according to Their Husbands' Smoking Status, Shanghai Women's Health Study, China, 1997～2000

Husbands' Smoking Status	Total Participants	Cases of Disease	Age-adjusted OR	95%CI	Multi-factor OR	95% CI
Never Smoking (Control)	22,982	213	1.00		1.00	
Formerly Smoking	5,108	74	1.03	0.79,1.35	0.94	0.71,1.24
Currently Smoking	32,287	239	1.47	1.22,1.78	1.41	1.16,1.72

* Adjusted for age, level of education, occupation, family income, alcohol consumption, exercise, body mass index, menopausal status, hormone therapy, oral contraceptive use, history of hypertension and diabetes, and use of antihypertensive medication and aspirin.

Impact of Passive Smoking on Onset and Death of Cardiovascular Diseases

Based on the application of statistic method, it was estimated to be 100 000 deaths of passive smoking among Chinese population in 2002. In which, about 31 300 nonsmokers died from CHD that was caused by passive smoking[30]. A prospective cohort study in Shanghai presented that HR of all-cause death increased 15% among nonsmoking women exposed to environmental tobacco smoke from their husbands [HR=1.15 95%CI (1.01～1.31)], in which, HR of death from CVD increased 37% [HR=1.37,95%CI (1.06～1.78)]; For childhood exposed to "secondhand" smoke, the HR went up to 26% [RR=1.26,95%CI (0.94～1.69)][31].

A Follow-up Study of Death Cause for the Male Retired Officers, Xi'an, China[32]

An 11-year follow-up study for total of 1 268 male retired military officers aged 55 and over in Xi'an, China showed that the mortality of vascular disease was 28.10%. Compared with the non-smokers, the total mortality and CHD mortality among current smokers were 1.37 folds[HR=1.369 95%CI(1.083～1.731)] and 1.81 folds [HR=1.805 95%CI(1.022～3.188)] respectively. Multivariate analysis showed that some factors, such as age, daily cigarettes amount[HR=1.026 95%CI(1.013～1.039)], SBP, triglyceride, family history , existing diseases , body mass index, and smoking age started [HR=0.988 95%CI (0.978～0.999)] , were associated with all-cause mortality. The conclusions of the study are that smoking is one of the leading causes of death among the male senior people in China; Quit-smoking can reduce all-cause deaths and death from CVD.

Table 2-2-3(2) Hazard Ratios and 95% CI for Cigarette Smoking for all Cause Mortality

Smoking Status	Crude HR[1]	95% CI	Adjusted HR[2]	95% CI	P
Cigarettes Per Day(Number)	1.023	1.015～1.032	1.026	1.013～1.039	<0.001
Duration of Smoking(Year)	1.012	1.006～1.017	1.005	0.997～1.013	0.218
Age of Starting Smoking(Year)	1.003	0.996～1.011	0.988	0.978～0.999	0.028

1: crude hazard ratio; 2: adjusted hazard ratio (adjusted for age, systolic blood pressure, triglycerides, cigarettes per day, duration of smoking, age of starting smoking, exercise, BMI, negative affairs, family history of diseases including hypertension, stroke and cancer, and existing all kinds of diseases at baseline).

Table 2-2-3(3) Hazard Ratio and 95% CI of Continuous Variables Related Tosmoking for all Cause Mortality

	Deaths	HR	95% CI	P	P for Trend
Smoking Status*	491				
Non Smokers	126	1.000			
Former Smokers	193	1.089	0.865～1.372	0.467	
Current Smokers	172	1.369	1.083～1.731	0.009	
Smoking Index	172				<0.001
<350	34	1.000			
350～569	29	1.163	0.901～1.501	0.2457	
570～749	48	1.531	1.188～1.974	0.001	
≥ 750	61	2.069	1.642～2.606	<0.001	
Age of Starting Smoking(Year)	365				0.038
<19	101	1.000			
19～22	109	0.823	0.627～1.078	0.157	
23～27	74	0.763	0.565～1.029	0.077	
>27	81	0.720	0.537～0.966	0.028	
Cigarettes Per Day(Number)	365				<0.001
1～9	49	1.000			
10～14	32	1.093	0.700～1.707	0.694	
15～19	130	1.316	0.947～1.828	0.101	
≥ 20	154	1.831	1.327～2.527	0.001	

*Adjusted for age, systolic blood pressure, BMI, total cholesterol, triglycerides, regular alcohol consumption, Exercise, as well as existing disease at baseline.

BMI was grouped by Chinese standard.

BMI was Grouped by Chinese Standard. Smoking, Quitting and Mortality in an Elderly Cohort of 56 000 Hong Kong Chinese[33][34]

Mortality by smoking status was examined in a prospective cohort study of 56 167 (18 749 men, 37 416 women) Chinese aged over or equal 65 years enrolled from 1998 to 2000 in Hong Kong, with the mean follow-up of 4.1 years. The results indicated that the adjusted RRs (95% CI) for all-cause mortality in former and current male smokers were 1.39 (1.23～1.56) and 1.75 (1.53～2.00), compared with never smokers. Risks of death from all causes were increasing significantly with the number of cigarettes smoked per day in current smokers (trend test, P <0.001) RRs (95% CI) were 1.24 (1.04～1.47) and 1.57 (1.28～1.94) for all cardiovascular deaths, and 1.49 (1.30～1.72) and 2.20 (1.88～2.57) in former and current smokers for all deaths from cancer, respectively. Quitters had significantly lower risks of death than current smokers from all causes, including stroke and CVD. The conclusion drew from this study was in old age, smoking continues to be a major cause of death, and quitting is beneficial.

2.3 Dyslipidemia

2.3.1 Prevalence of Dyslipidemia in Chinese Adults

According to *The Survey on Nutrition and Health in Chinese Residents in 2002* The prevalence of dyslipidemia in adults (18 years old) was 18.6%, and the estimated number of adult patients with dyslipidemia was 200 million on the base of the prevalence survey in 2006. The prevalence was 2.9% for hypercholesterolemia (TC5.72mmol/L) 3.9% for borderline high cholesterol levels (TC: 5.20~5.71 mmol/L) 11.9% for high TG, and 7.4% for low HDL-cholesterol (HDL-C<1.04mmol/L), respectively.

The prevalence of both hypercholesterolemia and gradually rose with increase of age; it was significantly higher for men compared to women in young group, and much higher for women compared to men in the aged and middle-aged groups the prevalence was higher in urban population than that in rural population (Figure 2-3-1(1) Figure 2-3-1(2))[35].

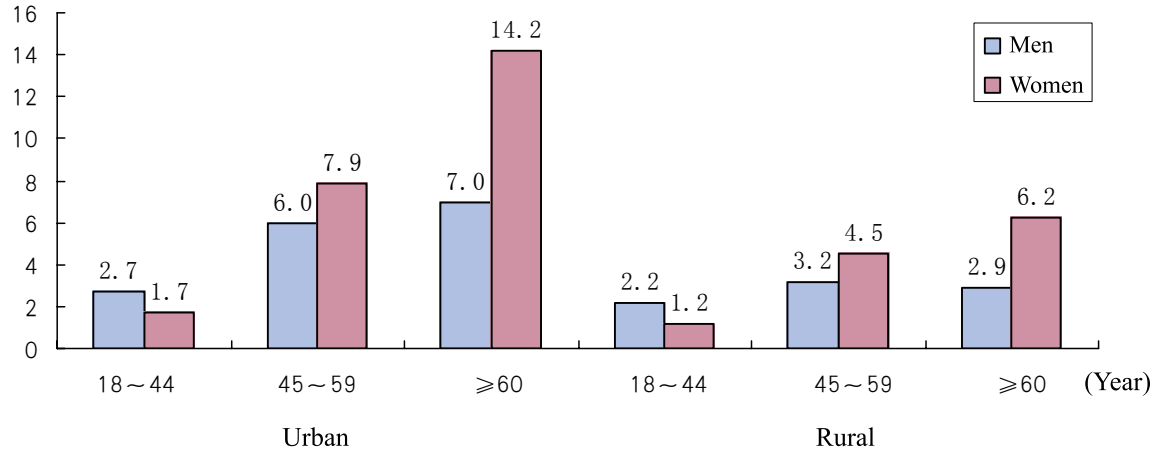

Figure2-3-1(1) Age, Gender and Region (Between Urban and Rural Areas) Distribution in Prevalence of Hypercholesterolemia (TC≥5.72mmol/L) among Chinese Adults (%, Adjusted and Weighed by Age and Region)

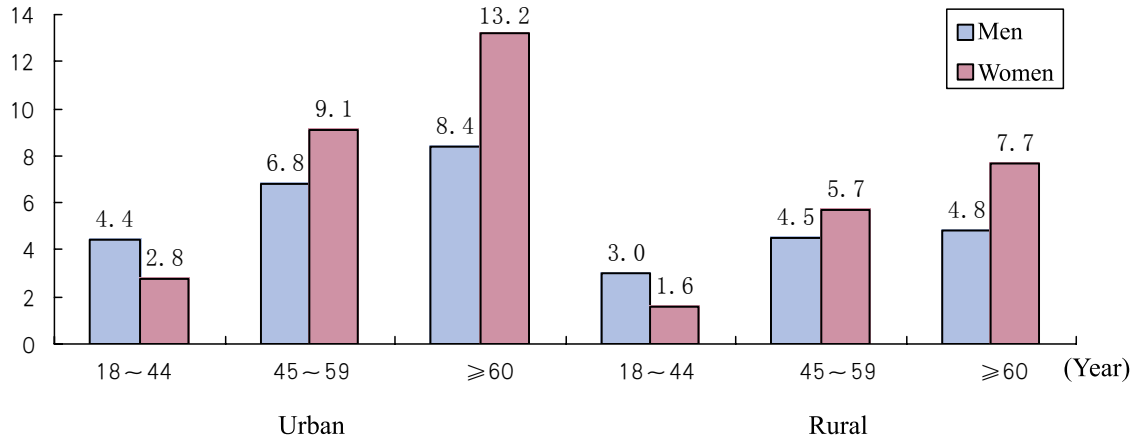

Figure2-3-1(2) Age, Gender and Region (between Urban and Rural Areas) Distribution in Prevalence of Hypercholesterolemia (TC≥5.72mmol/L) among Chinese Adults (%, Adjusted and Weighed by Age and Region)

From 2005 Jun to Sept, an epidemic survey on the blood-lipid levels of CHD patients and the prevalence of dyslipidemia was conducted in 52 cardiac departments of hospitals in 7 cities such as Beijing, Shanghai etc. A total of 3 513 valid cases were included in the survey. Total incidence of blood-lipid pathobolism for all participants was 79.7%, and the incidence in subject groups with <50, 50~59, 60~69, and 70 years of age was 90.6%, 86.9%, 80.0% ,72.5% , respectively. The incidence rate of TC, LDL-C, HDL-C and TG disorders presented a trend of reduction with increase of age. The similar tendency existed in total incidence of blood-lipid pathobolism [36].

2.3.2 Blood-lipid Levels and Ischemic Cardiovascular Diseases

A correlation analysis between blood-lipid levels and ischemic cardiovascular diseases, for the data of PRC-USA Collaborative Study of Cardiopulmonary Epidemiology and China Multi-Provincial Cardiovascular-disease Cohort Study published, was conducted by unified research methods in Fu Wai Hospital of the Chinese Academy of Medical Science and Institute of cardiopulmonary vascular diseases of Beijing (Table 2-3-2). The outcomes of analysis provided an important evidence for formulating *The Guidelines on the Management of Dyslipidemia in Chinese Adults* and defining a borderline diagnosis of dyslipidemia and a layering plan of dyslipidemic hazard, which were suitable for the characteristics of Chinese population. . The diagnostic criteria of dyslipidemia in Chinese population were consistent with international related criterion [37].

Table 2-3-2 The Incidence and RR of Ischemic Cardiovascular Diseases and Levels of Blood-lipid between Two Groups of Cohort Population

Levels of Blood-Lipid (mmol/L)	USA-PRC Cohorts				11 Province Cohorts			
	Cases	Incidence/ 100 000 p.y.	RR	95%CI	Cases	Incidence/ 100 000 p.y.	RR	95%CI
TC								
<5.18	7 850	200	1.0		21 800	229	1.0	
5.18~5.67	1 163	342	1.2	0.9～1.6	4 353	326	1.3	1.0～1.6
5.70~6.19	635	435	1.7	1.2～2.3	2 530	355	1.3	1.0～1.8
≥6.22	574	502	1.7	1.2～2.3	3 016	475	1.6	1.2～2.1
LDL-C								
<3.37	7 898	214	1.0		22 774	233	1.0	
3.37~4.12	1 206	352	1.4	1.1～1.8	4 509	369	1.3	1.0～1.6
4.14~4.90	355	460	1.5	0.9～2.3	1 686	421	1.4	1.0～2.0
≥4.92	166	466	1.5	0.8～2.8	1 055	608	2.0	1.4～2.9
HDL-C								
≥1.55	2 687	255	1.0		11 268	191	1.0	
1.04~1.53	6 161	240	1.1	0.8～1.4	16 200	281	1.2	1.0～1.5
<1.04	1 374	262	1.1	0.8～1.6	4 232	425	1.5	1.2～2.0
TG								
<1.70	8 346	226	1.0		23 979	255	1.0	
1.70~2.25	755	348	1.0	0.7～1.4	3 467	303	0.9	0.7～1.2
≥2.26	666	425	1.1	0.7～1.5	2 926	352	1.0	0.7～1.3

Note: RR estimated by multi-factorial analysis. For different grouping of TC and LDL-C, the variables were adjusted by age, gender, tobacco use , diabetes, obesity, low HDL-C and hypertension; for the grouping of HDL-C, the variables were adjusted age, gender, tobacco use, diabetes, SBP, BMI and TC; and adjusted by age, gender, tobacco use, diabetes, SBP, BMI and HDL-C for the various grouping of TG.

2.3.3 Prevention and Treatment of Dyslipidemia

2.3.3.1 Relevant Layering Criteria of Blood-lipid Levels and Hazard Layering Plan of Dyslipidemia

The Guidelines on the Management of Dyslipidemia in Chinese Adults by Cardiovascular Branch of Chinese Medical Academy etc. was published in 2007 [38]. The classification of lipids and related CVD risk is shown in Table 2-3-3(1) and Table 2-3-3(2) respectively.

Table 2-3-3 (1) Relevant Layering Criteria of Blood-lipid Levels

Layering	Blood Lipids mmol/L (mg/dl)			
	TC	LDL-C	HDL-C	TG
Optimal	<5.18 (200)	<3.37 (130)	≥1.04 (40)	<1.70 (150)
Borderline high	5.18～6.19 (200～239)	3.37～4.12 (130～159)		1.76～2.25 (150～199)
High	≥6.22 (240)	≥4.14 (160)	≥1.55 (60)	≥2.26 (200)
Low			<1.04 (40)	

Table 2-3-3(2) Hazard Layering Plan of Dyslipidemia

Risk Factor	Hazard Layering	
	TC 5.18～6.19mmol/L (200～239mg/dl) LDL-C 3.37～4.12mmol/L (130～159 mg/dl)	TC≥6.22mmol/L (240mg/dl) LDL-C≥4.14mmol/L (160mg/dl)
No Hypertension and Other Risk Factors<3	Low Risk	Low Risk
Hypertension or Other Risk Factors≥3	Low Risk	Middle Risk
Hypertension and Other Risk Ractors≥1	Middle Risk	High Risk
CHD and Other Diseases With Equivalent Risk	High Risk	High Risk

Other risk factors include: age(men aged ≥45, women aged ≥55years),tobacco use, low HDL-C, obesity and family history of early ischemic cardiovascular disease.

2.3.3.2 Clinical Control of Dyslipidemia

A sampling survey, for natural populations aged 35~74 in 10 provinces of China between 2000 and 2001, indicated among participants with serum TC6.22mmol/L or taking anti-dyslipidemia drugs, the proportion of awareness, treatment and control of hypercholesterolemia was 21.3%,14.0%,11.3% for men, and 18.1%～11.6%,9.5% for women as well as among participants with serum TC5.18mmol/L or taking anti-dyslipidemia drugs, it was 8.8%,3.5%, 1.9% for men and 7.5%～3.4%,1.5% for women. [39]

In 2006, the second national survey on clinical management of dyslipidemia, including 2 237 individuals, was conducted in 21 provincial hospitals and 6 county hospital in 12 cities nationwide, such as Beijing, Shanghai, Guangzhou, Wuhan, Hangzhou, Nanjing, Changsha, Shenyang, Xiamen, Zhuhai, Chengdu, Wulumuqi and 1 county (Shanxi Yuxian). The outcomes of the survey presented that total control rate of participants with drug therapy of cholesterol-adjusting was 34% and 50% respectively; and the control rate presented a trend of reduction($P<0.001$) with the elevation of hazard layering levels in patients, in accordance with NCEP ATP(2004) and the criteria of *Guidelines on the Management of Dyslipidemia in Chinese Adults* (2007) (Figure 2-3-3-2(1), Figure 2-3-3-2(2))[40]. The control rate of cholesterol adjustment among various hazard layering groups increased significantly in 2006, compared with that in the first survey on clinical control of blood lipids in 2000 (Table 2-3-3-2(1)) [41].

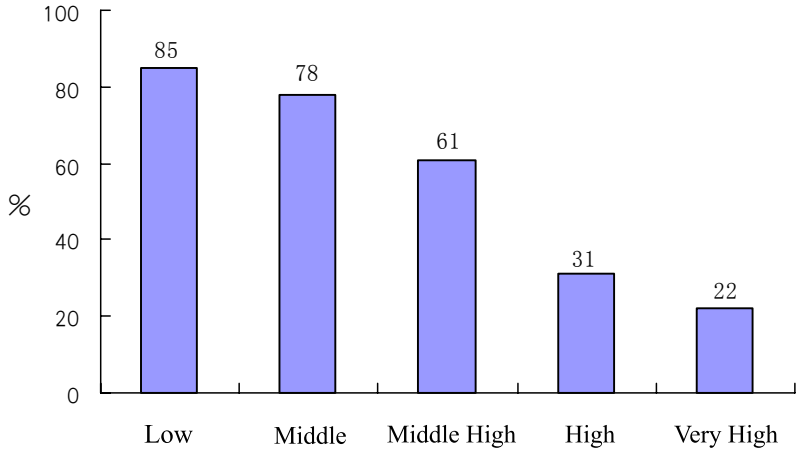

Figure 2-3-3-2(1) Control Rate among Hazard Layering Groups(According to the Target of LDL-Cin NCEP ATP, 2004)

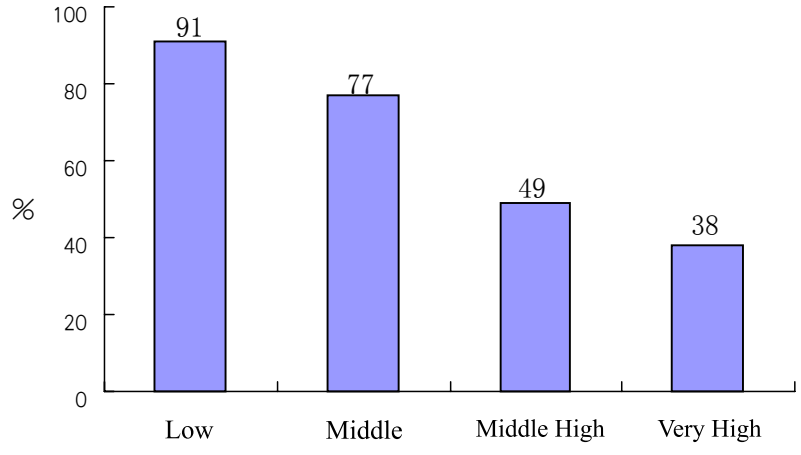

Figure 2-3-3-2(2) Control Rate among Hazard Layering Groups(According to the Target of LDL-C in *Guidelines on the Management of Dyslipidemia in Chinese Adults*)

Table 2-3-3-2 (1) Relevant Layering Criteria of Blood-lipid Levels

Classification	2000		2006	
	Cases	%	Cases	%
RF(-), ASD(-)	49	44.9	4	50.0
RF(+), ASD(-)	1 308	31.7	370	45.9*
ASD (-)	779	16.6	165	26.7*

*P<0.01

RF: risk factor;ASD:atherosclerotic diseases

2.3.4 Prevalence of Dyslipidemia in Children

Currently, there are no consistent diagnostic criteria of dyslipidemia in China, and no national survey results in public. The outcomes of several large-scale surveys in children since 1987 are summarized in Table 2-3-4.

Table 2-3-4 The Prevalence of Dyslipidemia among Chinese Children in Large-scale Studies During Different Periods (%)

Area	Year	Age	Sample Size	High TC	High TG	Low HDL-C
Beijing[42]	1987	7~19	1201	1.3	4.2	0.4*
Guang Dong#[43]	2005	3~14	6188	2.1	2.2	8.0*
Beijing#[44]	2007	6~18	19593	1.2	8.8	–

High TC: TC≥200mg/dl(5.17mmol/L)

High TG:TG≥150mg/dl(1.70mmol/L)

Low HDL-C: HDL-C<40mg/dl(1.04mmol/L)

*HDL-C<35mg/dl(0.9mmol/L)

#Fasting capillary blood was used.

The data of survey in Beijing children in 2007 showed that, no matter with or without family history , such as CVD, diabetes, dyslipidemia and obesity, the prevalence of dyslipidemia (TC≥5.20mmol/L, TG≥1.70mmol/L) in obese children was higher, accounting for about 30% (Figure 2-3-3) [45].

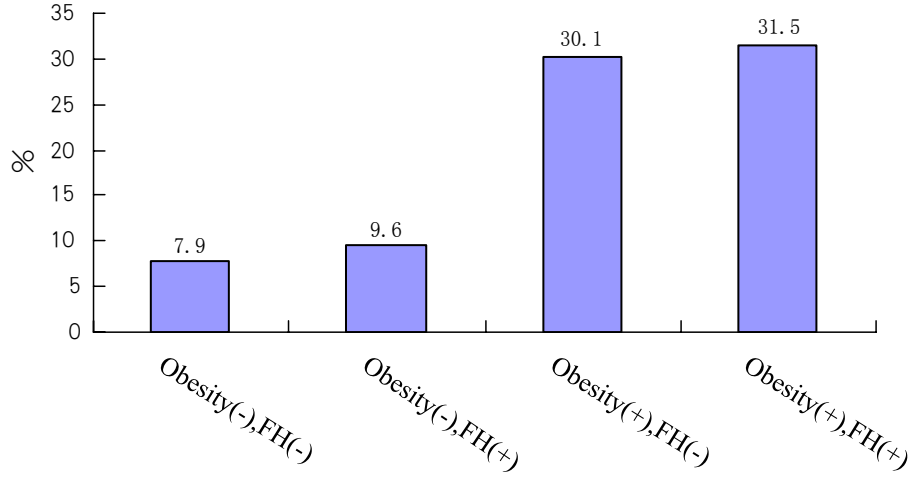

Figure2-3-3 Comparison of Dyslipidemic Prevalence among Children with or without Obesity and Family History.

2.4 Overweight and Obesity

In recent 2～3 decades, the prevalence of overweight and obesity in China has been increasing dramatically. According to the National Nutrition and Health Survey of Chinese residents in 2002, there were about 200-million people with overweight (BMI: 24～27.9kg/m^2) and about 60-million with obesity (BMI≥28kg/m^2) in China. It was estimated that the number of people with overweight or obesity reached 240 million and 70 million, respectively, based on the statistics of census in 2006,

The outcomes of 1993～2004 continuing cross-sectional survey in 9 provinces of China showed that the prevalence of central obesity (waist circumference≥85cm for male, waist circumference≥80cm for female) increased significantly (Figure 2-4(1))[46] both in men and in women, the average annual increase was 2.1% for men and 1.6% for women.

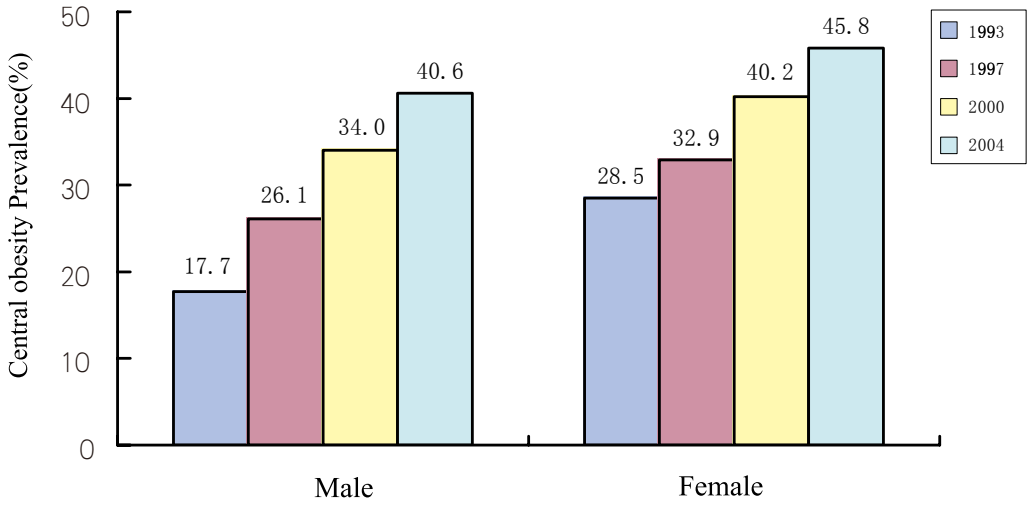

Figure 2-4(1) A Trend in Prevalence of Central-obesity in 9 Provinces of China (1993～2004)

A cross-sectional survey among the senior people aged over 60 [47] showed a 56.3% of prevalence rate of overweight/obesity (BMI≥25kg/m^2) (53.9% for men and 57.9% for women).

The outcomes of the InterASIA prospective study, including about 10 000 participants showed the incidence of hypertension rose significantly following the increase of baseline BMI (Figure 2-4(2))[48]. In a four-year follow up study in 9 provinces of China, analyzed the data of all 4 552 cases involved in the survey of year 2000. The results revealed a positive correlation of incidence between hypertension and either BMI or waist circumference, as well as the hazard of hypertension onset was higher among participants with both general obesity and central obesity (Table 2-4 (1))[49]. The InterASIA study also showed that waist circumference and the ratio of waist circumference to hip circumference, as being two indicators of central obesity, were more closely associated with the onset of diabetes and impaired glucose tolerance (Table 2-4(2))[50].

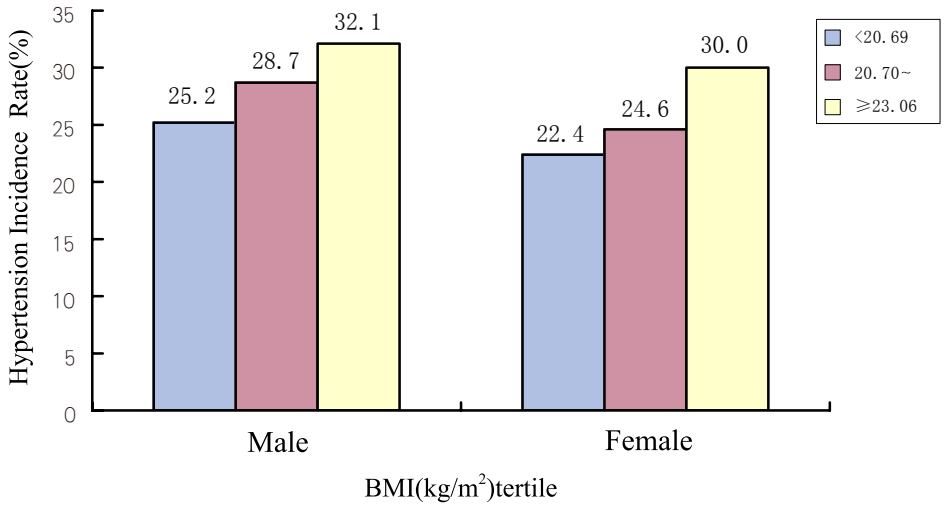

Figure 2-4(2) Relationship Between Baseline BMI(kg/m^2) and 8-Year Cumulative Hyppertension Incidence Rate(Age Adjusted)

Table2-4(1) The Onset Risk of Hypertension among 4-year Follow-up Populations with Different BMI and Waist Circumferences

Group	Male		Female	
	RR	95%CI	RR	95%CI
Normal	1.00	-	1.00	-
General Overweight/Obesity Only	1.74	1.15～2.62	2.05	1.33～3.15
Central Obesity Only	2.00	1.39～2.89	1.60	1.08～2.36
Both General Overweight/Obesity and Central Obesity	2.84	2.14～3.77	2.73	2.05～3.65

Note:Adjusted for age, education, physical activity and alcohol drinking, in logistic regression analysis.

Table 2-4(2) Correlation between the Measuring Index of Obesity and Diabetes (Comparison of Areas Under ROC Curve for Subjects Receiving Test)

	Areas Under ROC Curve	
	Diabetes [Area (95% CI)]	IGT [Area (95% CI)]
WHR	0.666 (0.647～0.685)	0.638 (0.619～0.655)
WC (cm)	0.661 (0.643～0.682)	0.637 (0.615～0.654)
BMI (kg/m2)	0.622 (0.601～0.642)	0.607 (0.589～0.627)

ROC, receiver operating characteristic; IFG, impaired fasting glucose; CI, confidence interval; WHR, waist-to-hip ratio; WC, waist circumference. Comparison among obesity measurements for identifying diabetes: WHR vs. BMI: x^2=21.74, p<0.0001; WC vs. BMI: x^2=47.86, p<0.0001; WHR vs. WC: 2=0.47, p>0.05. Comparison among obesity measurements for identifying IFG: WHR vs. BMI: x^2=11.50, p<0.001; WC vs. BMI: x^2=29.85, p<0.0001; WHR vs. WC: x^2=0.05, p>0.05.

2.5 Deficiency of Physical Activities

Physical activity deficiency is an important risk factor of cardiovascular diseases. In the National Nutrition and Health Survey of Chinese residents in 2002, the data analysis of physical activities for 30 000 professional population aged 18～59 showed that there was a significant difference in proportion of sufficient physical activities between rural areas and urban areas[51], and the occupational physical activities contributed the most part of all physical activities, followed by the household work, and the physical exercise was even less.

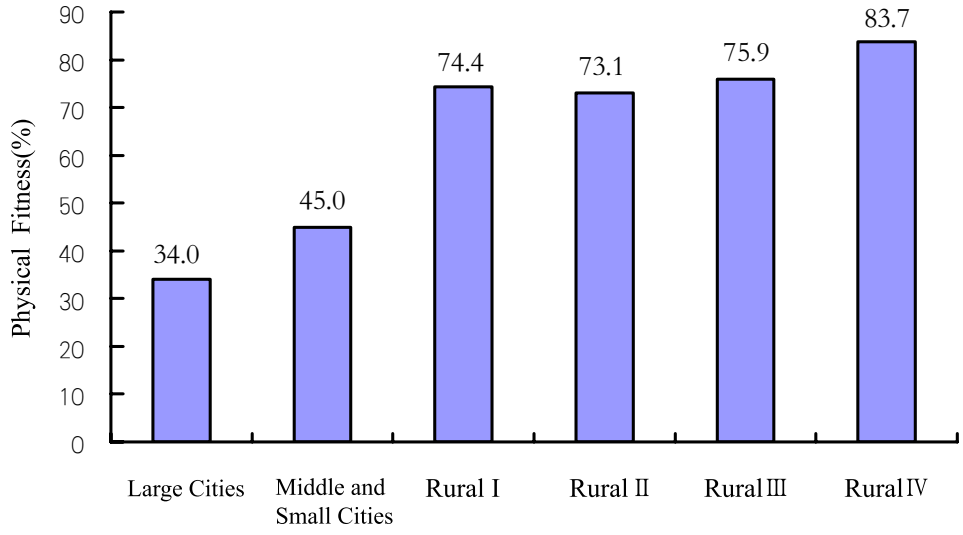

Figure 2-5(1) Physical Fitness of Chinese Residents

The National Nutrition and Health Survey of Chinese residents in 2002 also showed, the physical activities in adults was closely associated with overweight/obesity (BMI≥24) (Figure 2-5(2)[52]), other risk factors of cardiovascular diseases and the metabolic syndrome (Figure 2-5(3)[53]).

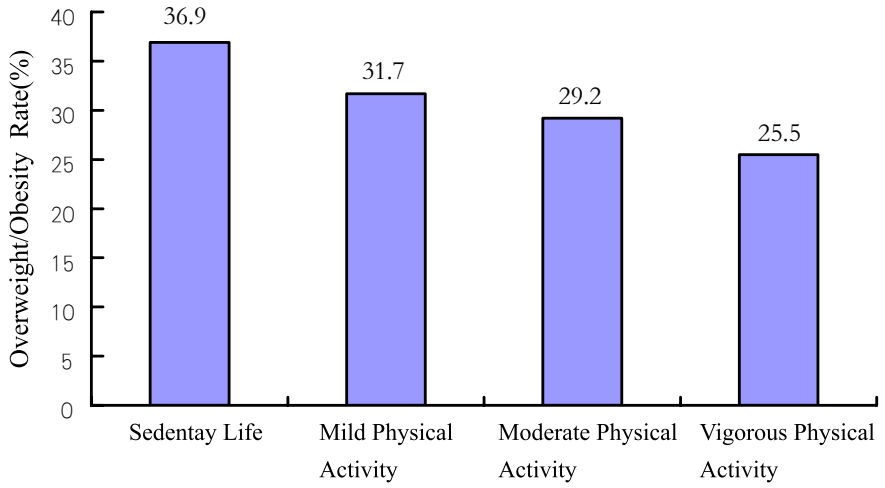

Figure 2-5(2) Relationship between the Intensity Level of Physical Activity and Overweight/Obesity Rate

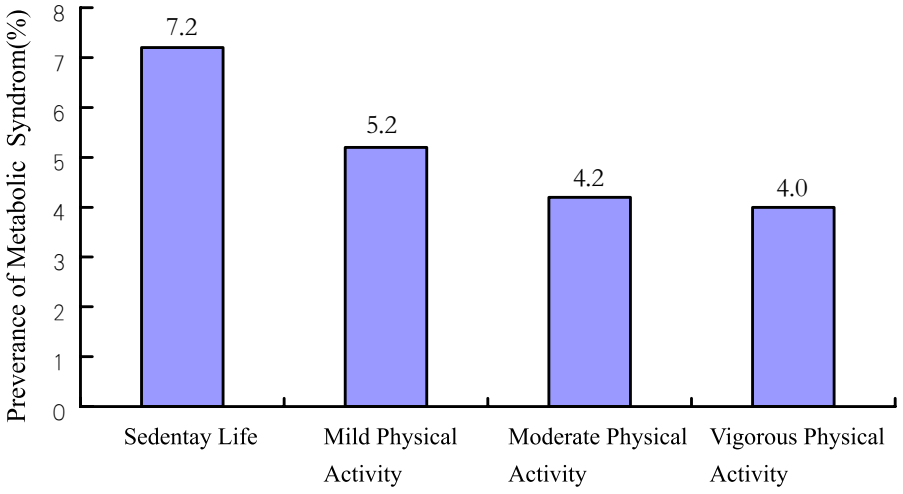

Figure 2-5(3) Relationship between the Intensity Level of Physical Activity and Metabolic Syndrom

A total of 75 000 women aged 47～70 participated in a 5.7-year follow-up study during Shanghai Women's Health Investigation. The results showed that the total amount of baseline physical activities and the amount of physical exercise presented not only a negative relation to the risk of total deaths, but also a close relation to the deaths of cardiovascular diseases (Table 2-5(1))[54].

Table 2-5(1) Relative Risk of the Amount of Baseline Physical Activities (MET-hour/Day), Total Deaths and Deaths of Cardiovascular Diseases

Baseline Physical Activity	Total Deaths		Deaths of Cardiovascular Diseases	
	RR	95%CI	RR	95%CI
Total Amount of Physical Activity				
≤9.9	1.00	-	1.00	-
10.0～13.6	0.81	0.69～0.96	0.94	0.66～1.33
13.7～18.0	0.67	0.57～0.80	0.75	0.52～1.08
≥18.1	0.61	0.51～0.73	0.66	0.46～0.95
P Value of Trend Test	0.000		0.012	
Amount of Physical Exercise				
0	1.00	-	1.00	-
0.1～3.4	0.84	0.69～0.96	0.91	0.70～1.19
3.5～7.0	0.77	0.57～0.80	0.68	0.39～1.18
≥7.1	0.64	0.51～0.73	0.23	0.02～1.64
P Value of Trend Test	0.008		0.038	

Note: (1) MET,Metabolic Equivalent;(2) Adjusted for age, marriage status, education status, family income, smoking, drinking, number of pregnancy, oral contraceptive intake, menopause, other types of physical activity and other chronic disease (including diabetes, hypertension, respiratory disease, chronic hepatitis), in C Cox regression analysis.

An average of 4.6-year follow-up study, also found that both daily physical activities and leisure-time physical activities were negatively associated with the incidence of diabetes type Ⅱ (Table 2-5(2))[55].

Table 2-5(2) Relative Risk of Baseline Physical Activities (MET-hour/Day) and Incidence of Type 2 Diabetes (N=64 130)

	RR	95%CI
Daily Physical Activity		
<7.85	1.00	
7.85～11.26	0.99	0.85～1.15
11.27~15.20	0.92	0.79～1.07
>15.20	0.86	0.73～0.99
P value of Trend Test	0.02	
Leasure Physical Activity		
0	1.00	
<1.4	0.89	0.76～1.03
1.5～3.5	0.99	0.85～1.15
>3.5	0.83	0.70～0.97
P value of trend test	0.05	

Note: (1)MET,Metabolic Equivalent; (2) The included subjects has no prior history of diabetes at study, subjects with prior history of stroke, coronary heart disease and malignant tumor are excluded. (3) Adjusted for baseline age, energy intake, education, income, occupation, smoking, drinking and hypertension, in Cox regression analysis.

2.6 Diet and Nutrition

Since the recent two decades , in general, the nutritional status of Chinese people has greatly improved with a social and economic revolution in China. However, there still remained some unreasonable dietary habits, as well as nutrient intake inefficient or exceeded. Those factors mainly include [56]:

1.Amount of grain food intakes decreased greatly. The grain intake for urban and for rural populations was 366g and 416g per capita in 2002. Compared with the National Nutrition Surveys in 1982 and 1992, the grain intake for urban population decreased by 20% and 10% , and for rural population decreased by 22% and 14%, respectively. In addition, the reduction of grain intake caused a decrease of percent total energy from carbohydrate. Among urban population, the percent total energy from carbohydrate was 51.9%, lower than the baseline of recommended intake of carbohydrate (55%～65%).

2.Amount of fat intake increased considerably. Fat intake was 86g for urban population and 73g for rural population in 2002, of which, over 50% (44g for urban and 41g for rural populations) was from cooking oil. The proportion of fat for energy content increased obviously, in which, the percent total energy from fat for urban population was up to 35%, remarkably higher than the recommended amount of intake by the Dietary Guideline of Chinese population (<30%).

3.Amount of vegetable and fruit intakes are still low, and the status has not improved apparently in the recent two decades. In 2002, the amount of daily vegetable and fruit intakes per capita was about 276g and 45g, respectively.

4.The status of high-salt intake has not been changed. In 2002, although the dietary sodium intake decreased somewhat (with 11.9%) compared to 1992, the daily sodium intake still was as high as 6 268mg/day (that is equal to 15.9g /day of salt).

A total of 10 000 participants of the Qingdao Port Health Study in 2002 showed that the amount of vegetable and fruit intakes was significantly associated with the risk factors of cardiovascular diseases (CVD) (Figure 2-6(1)) [57]. A prospective study in Shanghai, including total about 75 000 female participants (aged 40～70), found that the total deaths and the death risk of CVD decreased significantly among female participants with higher scores in fruit-enriched dietary model had lower risk of all cause mortality and mortality (Table 2-6) [58].

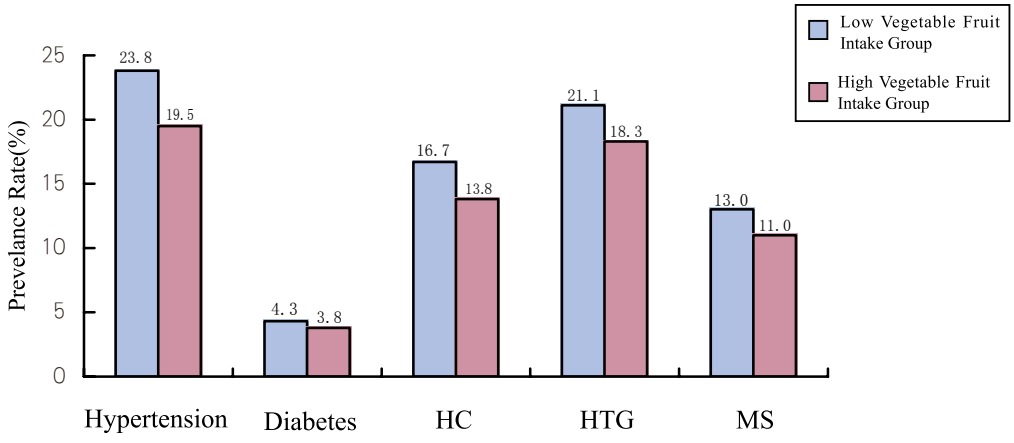

Figure 2-6 (1) Relationship Between Vegetable Fruit Intake and Cardiovascular Risk Factor Level

Table 2-6 Relative Risk of Baseline Fruit Intake Level vs. Total Deaths and Deaths of CVD

Fruit-Rich Dietary Pattern Score	Total Deaths		Deaths of CVD	
	RR	95%CI	RR	95%CI
1st Quartile	1.00	-	1.00	-
2nd Quartile	0.96	0.84～1.09	0.86	0.67～1.11
3rd Quartile	0.91	0.79～1.04	0.79	0.60～1.05
4th Quartile	0.80	0.69～0.94	0.71	0.51～0.98
P value for Trend Test	0.0090		0.0309	

Note: By Cox regression, adjusted for age, BMI, marriage status, income, smoking, alcohol intake, drinking tea, ginseng intake and energy consumption from physical activity.

In the GenSalt study [59]total of 676 subjects with moderate high blood pressure (BP) (high-normal BP or stage 1 hypertension) involved in an intervention study of salt reduction and potassium supplementation. The intervention contained three 7-day stages of low-salt intake (3g/day, 1st stage), high-salt intake (18g/day, 2nd stage), and 18g high-salt intake plus 2.3g potassium supplementation (3rd stage). Compared with baseline BP (Figure 2-6(2)), the levels of BP significantly decreased in low-salt intake stage, and greatly increased in high-salt intake stage, the intervention of high-salt intake plus potassium supplementation also caused a decrease of BP level, but not as low as low-salt intake alone.

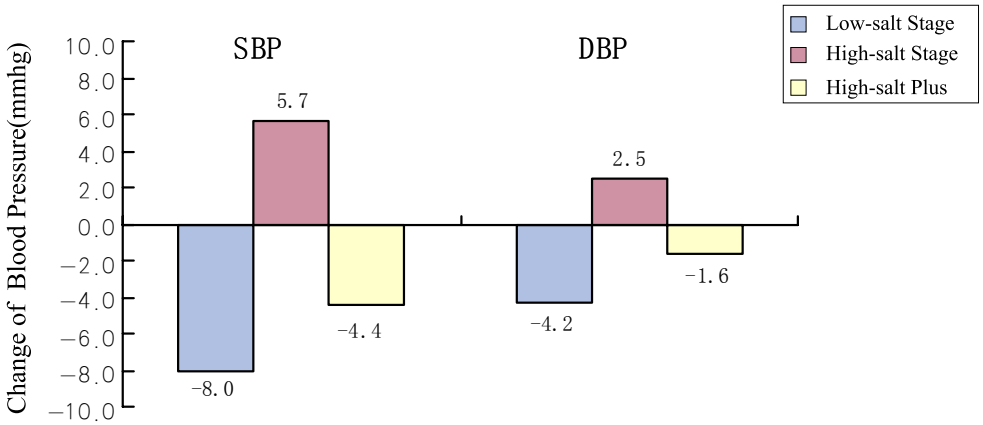

Figure 2-6(2) Change of Blood Pressure in Different Stages

Influence of sodium and potassium on blood pressure was also proved in the China Salt Substitute Study [60]. This was double-blinded, randomized, controlled interventional study. A total of 608 study subjects with the risk factors of CVD were divided into two groups with either normal salt or low-sodium salt for a 12-month period of intervention, there was no limitation of amount of salt intake for both groups during the intervention. For the study subjects in low-sodium group, the systolic blood pressure (SBP) and diastolic blood pressure (DBP) meanly decreased 3.7 mmHg of ($P<0.001$) and 0.7 mmHg respectively, compared with the

control group. However, there was no significant statistic difference between two groups (P=0.2).

In a randomized, double-blinded and multi-center controlled trial of vegetable protein intervention[61], total of 302 participants aged 35～64,with high-normal BP or stage 1 hypertension, were randomly divided into groups of intervention and control. During the 3-month study, a 40g/day of soybean protein supplied continuously for the intervention group , while the control group was given placebo (complex carbohydrate). The study outcomes presented that the increase of soybean protein intake resulted in 4～6mmHg reduction of SBP and a 2-3mmHg decrease of DBP. It was suggested that increased soybean protein intake might play a certain role in prevention and treatment of hypertension(Figure 2-6(3)).

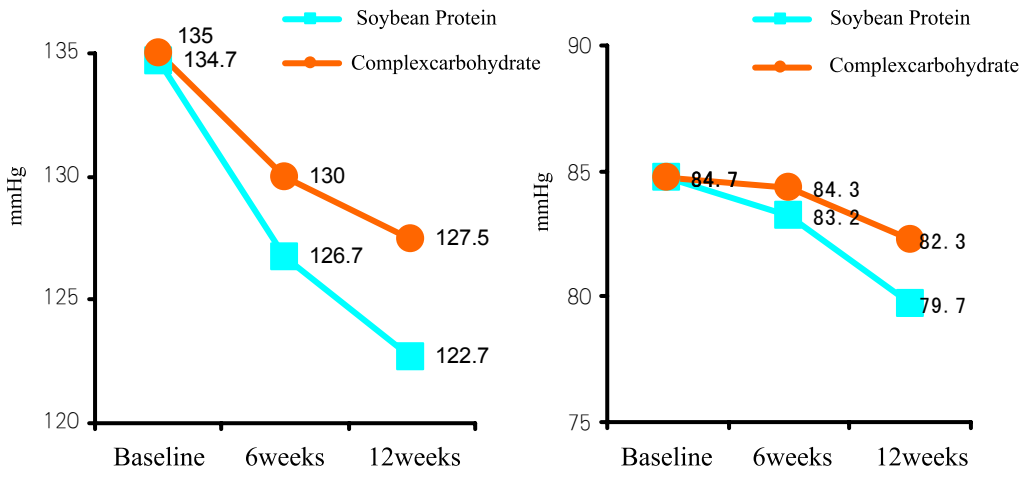

Figure 2-6(3) Randomized Clinical Trial of Soybean Protein for Prevention of Hypertension

2.7 Metabolic Ryndrome

2.7.1 Epidemic Trend of Metabolic Syndrome in China

2.7.1.1 Prevalence Rate of Metabolic Syndrome (MS)

In population aged over 18 National Nutrition and Health Survey, a multi-stage cross-sectional population sampling study[62], for population aged over15 from 31 provinces, autonomous regions and municipalities was carried out in 2002, Total of 48 556 subjects involved in epidemiological analysis of MS. Crude prevalence rate of MS among population aged over 18 was 6.6% according to the diagnostic criteria of MS, based on Chinese Diabetes Association (CDS) 2004, based on the ATPIII criteria of adult hypercholesterolemia of NCEP in USA the crude rate was 13.8%.

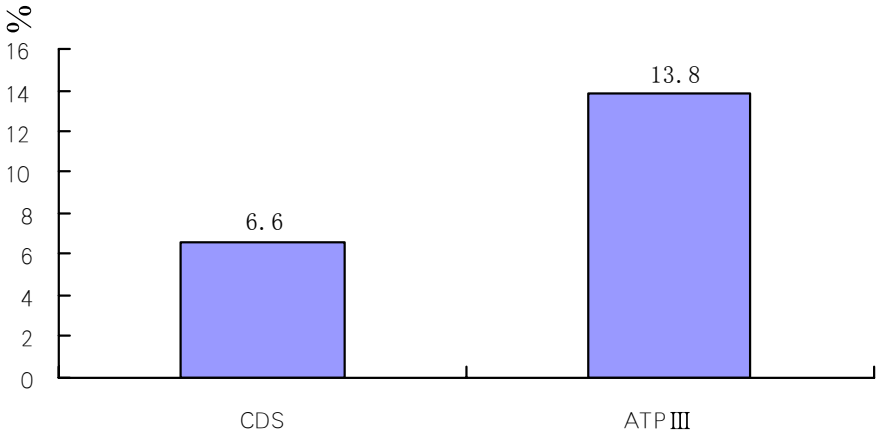

Figure 2-7-1 (1) Prevalence Rate of MS Diagnosed by Different Criteria

2.7.1.2 Prevalence Rate of MS in Different Gender[63]

According to CDS diagnostic criteria of MS, prevalence rate of MS was close in both genders (6.4% in male and 6.8% in female), there was no significant statistic difference. Based on ATPIII diagnostic criteria of MS, it was higher significantly in female than that in male (10.9% in male and 17.1% in female)P<0.001.

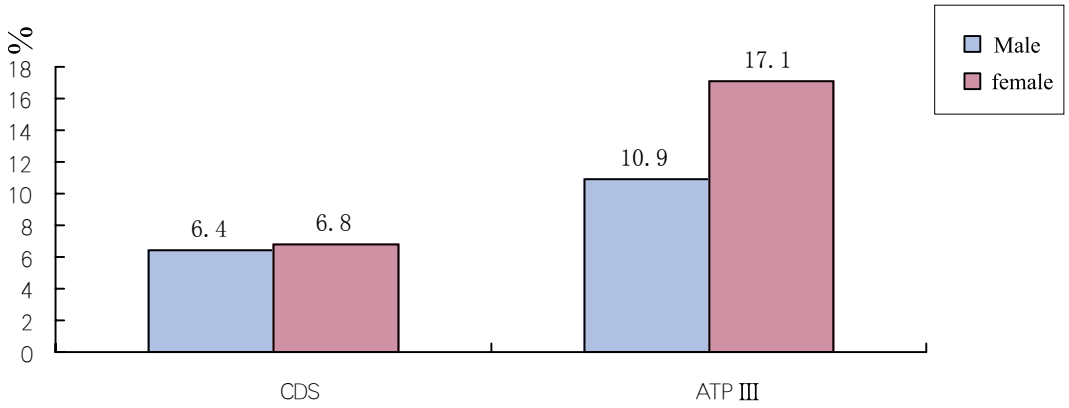

Figure 2-7-1(2) Prevalence of MS in Different Gender

2.7.1.3 Prevalence Rate of MS in Different Age Groups

(1)Prevalence rate of MS in adults with different age:[64]Prevalence of MS increased with the age increasing (CDS criteria) It manifested spiking to maximum in the group of 65 to 70 years old, and than falling. The same trend manifested in male and female. While it was higher in male than that in female less than 50 years old, and lower than that in female over 50 years old.

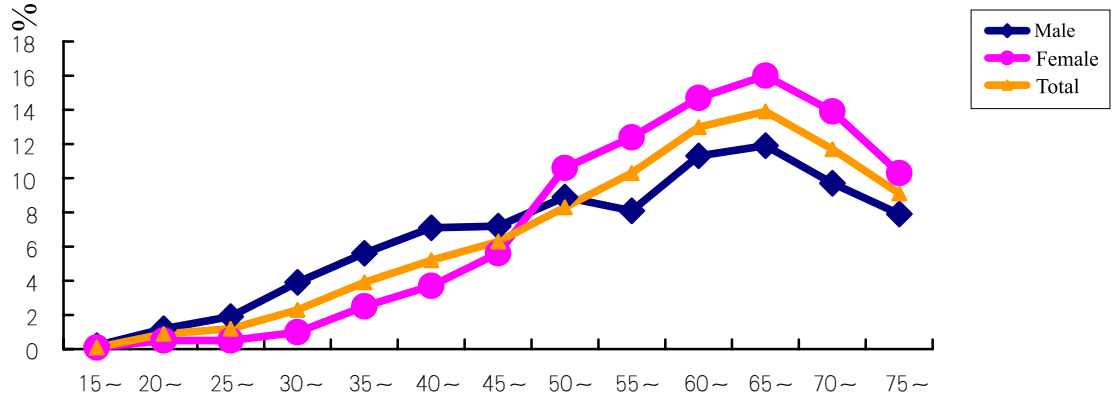

Figure 2-7-1(3) The Prevalence of MS in Different Age Group Over 18 Years Old

(2)The prevalence of MS in child and adolescent:[65] A survey was carried out in 2004, in total of 3 471 aged from 6 to 18 years old children and adolescents from 7 districts in Beijing received the investigation. The prevalence of MS in obese and overweight children was higher than that in normal weight children respectively (IDF criteria and NCEPIII criteria) (P<0.001)

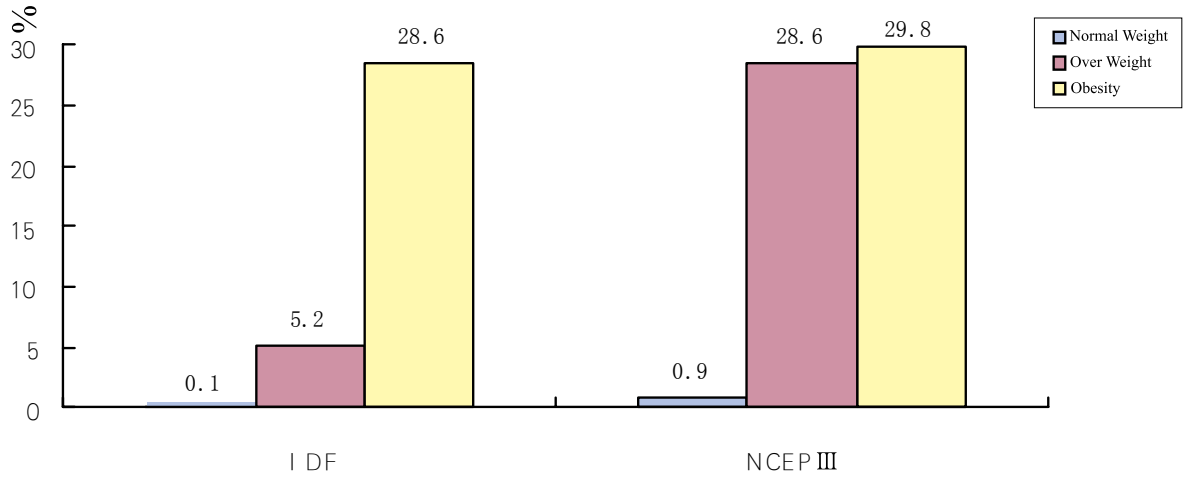

Figure 2-7-1(4) The Prevalence of MS in Child and Adolescent

2.7.1.4 The Prevalence Rate of MS in Different Area [66]

The prevalence rate of MS over 15 years old was 9.7% in urban and 4.6% in rural. It was higher in big city with the rate of 11.4%, and in the third kind of region in rural with the rate of 6.1%.

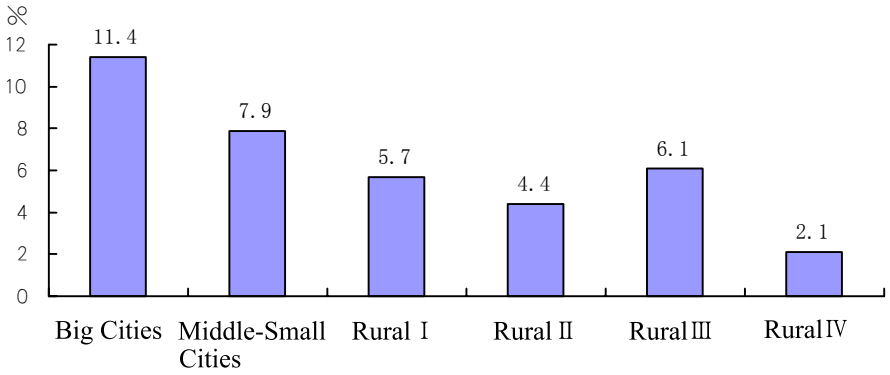

Figure 2-7-1(5) The Prevalence Rate of MS in Different Area

2.7.1.5 Proportion of Different type of MS [67]

It was the most type of MS with components of obesity or overweight plus hypertension plus lipid disorder featured by hyper-triglyceride and hypo HDL-cholesterol in China, the proportion was 53.7% out of the total MS.

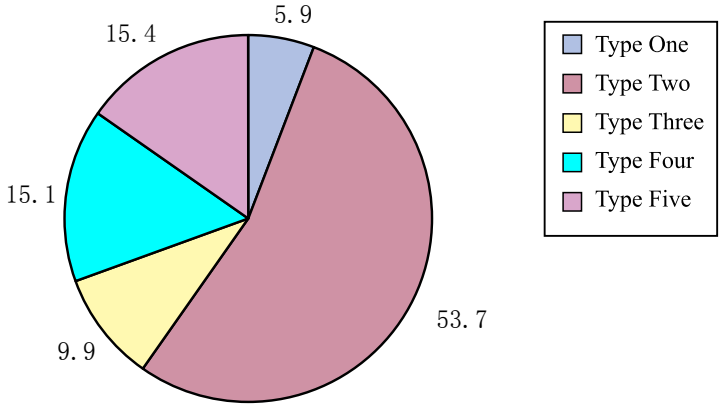

Figure 2-7-1(6) Proportion of Different Type of MS

Note: Type one: diabetes or impaired glucose regulation plus hypertension plus lipid disorder; Type two:obesity or overweight plus hypertension plus lipid disorder;Type three:obesity or overweight plus diabetes or impaired glucose regulation plus lipid disorder; Type four;obesity or overweight plus diabetes or impaired glucose regulation plus hypertension; Type five:obesity or overweight plus diabetes or impaired glucose regulation plus hypertension plus lipid disorder

2.7.1.6 The Trend of the MS Prevalence Change (in Qingdao Port Health Study)[68]

Surveys was carried out in individuals aged from 18 to 54 years old in Qingdao city in 2000 and 2004 respectively. The prevalence rate of MS (ATPIII criteria) was 10.0% in 2000 (N=11 364) and 12.5% in 2004 (N=10 834) The prevalence rate of MS was range from 6.0% to 8.9% in female, and the rate increased by 48.3%. The prevalence rate of MS was range from 13.9% to16.1% in female, and the rate increased by15.8%.

2.7.2 Relationship of MS and Cardiovascular Disease[69]

A total of 30 378 subjects aged from 35 to 64 years old were recruited from 11 provinces in the CMCS in 1992 and followed-up for new CHD and stroke event for 10 years. The incidence rate of CHD was207.9/100 000 and 101.1/100 000 respectively in population with MS (N=5 534) and without MS(N=24 844)in baseline and the incidence rate of ischemic stroke was 450.5/100 000 and 159.7/100 000 respectively. And the incidence rate of hemorrhagic stroke was 130.6/100 000 and 67.2/100 000 respectively.

Table 2-7-2 Incidence Rates (1/100000 Person Years) and Hazard Ratios of CVD

CVD	Non-MetS	MetS
CHD		
Incidence	101.1	207.9
HR(95%CI)	1	1.80 (1.36～2.37)
Ischemic stroke		
Incidence	159.7	450.5
HR(95%CI)	1	2.41 (1.98～2.37)
Hemorrhagic		
Incidence	67.2	130.6
HR(95%CI)	1	1.63 (1.16～2.30)

Reference:

[1]. *Survey on the Status of Nutrition and Health of the Chinese People in 2002, the fourth: hypertension.* Beijing: The People's Health Publication, 49～90.

[2]. Hu Yisong Yao Chonghua Wang Wenzhi, et al.*Survey on the Prevalence of Hypertension in Different Ethnic Groups in China in 2002. Journal of Hygiene Research, 2006, 35: 573～575.*

[3]. *Survey on the Status of Nutrition and Health of the Chinese People in 2002, the First: General Report.* Beijing: The People's Health Publication, 53～57.

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Chapter 3
Cardiovascular Diseases

3.1 Coronary Heart Diseases, Acute Coronary Artery Syndrome and Angina Pectoris

3.1.1 Epidemiological Studies of Coronary Heart Disease

3.1.1.1 Mortality and Epidemic Trend of Coronary Heart Disease (CHD) in Chinese Population [1]

Crude Death Rate of CHD in 2006

According to the data from *Health Statistic Yearbook of Ministry of Health of China in 2007,* the crude death rate of CHD was 57.1/10^6 among urban residents in 2006, it accounted for 60.9% of all cardiac deaths. In rural residents, the crude death rate was 33.74/10^6, accounting for 47% of the all. Generally, the crude death rate of CHD was higher in urban areas than in rural areas, and higher for men than for women (Figure 3-1-1(1) & Table 3-1-1(1)).

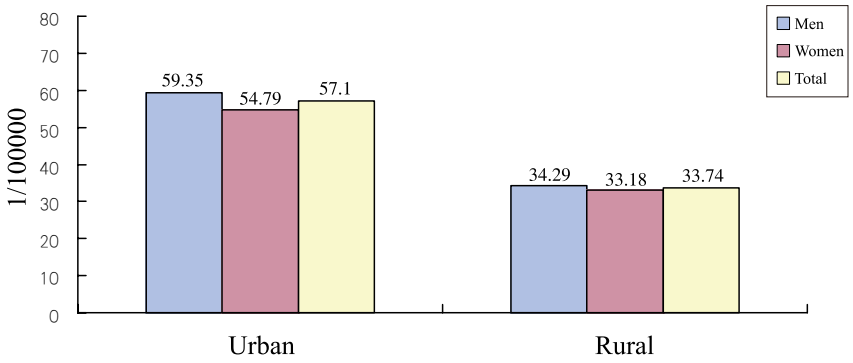

Figure 3-1-1(1) Comparison of CHD Crude Death Rate Between Different Genders in Chinese Urban and Rural Areas in 2006

Table 3-1-1(1) Crude rate of CHD in 2006 (1/100 000)

	Total of Urban Area			Large City		
	Total	Men	Women	Total	Men	Women
AMI	25.53	28.47	22.51	30.96	34.56	27.31
Other CHD	31.57	30.88	32.28	43.16	41.87	44.46
CHD Total	57.1	59.35	54.79	74.12	76.43	71.77
Cardiac Disease Total	93.69	95.95	91.36	107.87	110.24	105.46
Percentage of CHD Deaths	60.9%	61.9%	60.0%	68.7%	69.3%	68.1%

Continue

	Middle- or Small-city			Rural Area		
	Total	Men	Women	Total	Men	Women
AMI	18.61	20.82	16.3	18.4	20.24	16.49
Other CHD	16.81	17.07	16.53	15.34	14.05	16.69
CHD Total	35.42	37.89	32.83	33.74	34.29	33.18
Cardiac Disease Total	75.61	77.99	73.13	71.84	71.79	71.9
Percentage of CHD Deaths	46.8%	48.6%	44.9%	47.0%	47.8%	46.1%

(1) Age-Specific Death Rates of CHD in Urban Population of China in 2006 (1/100 000)

The mortality of CHD in urban areas rose with the increase of age, and it was higher for men than for women in different age groups. A similar indexation of the mortality to age was presented in the trend of increase (Figure 3-1-1(2), Table 3-1-1(2)).

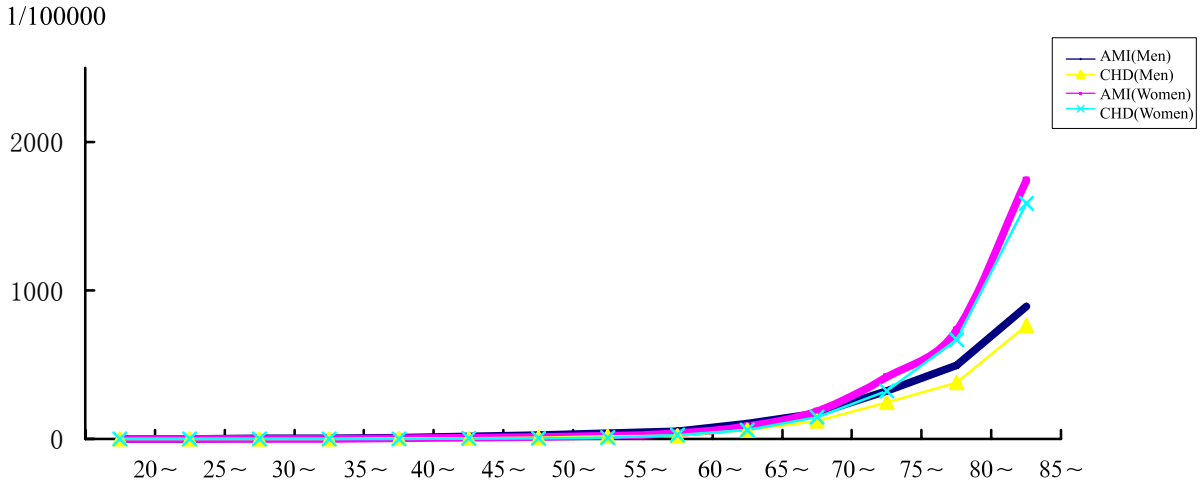

Figure 3-1-1(2) Comparison of Age-specific Death Rates of CHD among Groups with Different Gender and Age in Urban Areas

Table 3-1-1(2) Age-specific Death Rates of CHD in Rural Population of China in 2006 (1/100 000)

		20~	25~	30~	35~	40~	45~	50~
Men	AMI Other CHD	0.66	0.90	2.60	3.99	9.79	15.60	25.73
	AMI Other CHD	0.27	0.28	0.61	1.31	4.02	6.63	14.19
Women	AMI Other CHD	0.42	0.24	0.63	1.95	2.91	3.97	9.31
	AMI Other CHD	0.06	0.12	0.29	0.41	1.39	2.22	4.81
Total	AMI Other CHD	0.54	0.58	1.64	2.99	6.44	9.88	17.57
	AMI Other CHD	0.17	0.20	0.45	0.87	2.74	4.46	9.52

Continue

		55~	60~	65~	70~	75~	80~	85~
Men	AMI Other CHD	38.99	49.60	102.19	173.16	325.43	496.76	894.12
	AMI Other CHD	20.55	39.63	85.76	183.51	418.99	734.85	1743.46
Women	AMI Other CHD	15.84	23.24	60.65	119.78	244.07	379.28	764.97
	AMI Other CHD	10.66	24.55	62.47	146.79	321.28	666.96	1585.22
Total	AMI Other CHD	27.49	36.30	81.05	145.48	281.91	429.30	811.99
	AMI Other CHD	15.64	32.02	73.91	164.47	366.73	695.86	1642.83

(2) Age-Specific Death Rates of CHD in Rural Population of China in 2006 (1/100 000)

In rural areas, increase of age-specific death rates presented a similar index relation to age, but generally remained a lower level compared with that in urban areas (Figure 3-1-1(3)), Table3-1-1(3)).

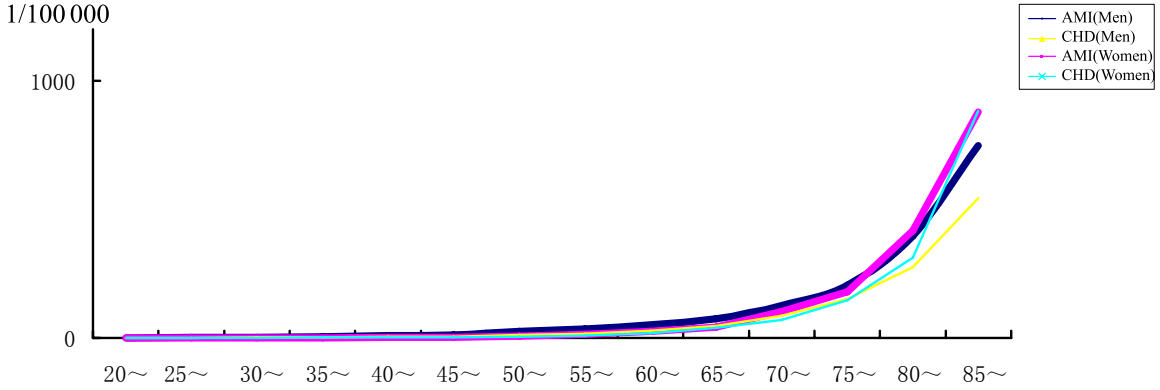

Figure 3-1-1(3) Comparison of Age- specific Death rates of CHD among Groups with Different Gender and Age in Rural Areas

Table 3-1-1(3) Age-specific Death Rates of CHD in Rural Population of China in 2006 (1/100 000)

Sex	The Type of CHD	20~	25~	30~	35~	40~	45~	50~
Men	AMI	0.75	1.20	2.33	5.63	10.36	11.08	25.15
	Other CHD	0.08	0.13	0.49	0.87	2.17	2.92	7.57
Women	AMI	0.25	0.41	1.31	2.27	5.23	5.06	11.63
	Other CHD	0.17	0.20	0.37	1.17	1.40	3.10	5.02
Total	AMI	0.50	0.81	1.82	3.97	7.85	8.12	18.58
	Other CHD	0.13	0.17	0.43	1.02	1.79	3.01	6.33

Continue

Sex	The Type of CHD	55~	60~	65~	70~	75~	80~	85~
Men	AMI	34.38	50.83	74.08	126.28	204.20	396.40	749.12
	Other CHD	12.96	26.12	41.77	102.62	179.14	416.62	877.37
Women	AMI	17.46	27.86	46.02	86.80	152.35	274.95	542.55
	Other CHD	10.31	19.60	39.36	69.06	147.39	311.23	883.91
Total	AMI	26.22	39.89	60.30	105.85	175.29	322.57	608.45
	Other CHD	11.68	23.02	40.58	85.25	161.43	352.55	881.82

3.1.1.2 Risk Factors of CHD

Hypertension

A multi-province cohort study was carried out, which included the analyses of correlation between baseline BP levels among total 30 378 subjects aged 35～64 in 11 Chinese provinces in 1992, and CVD events (CHD and stroke) from 1992 to 2003. The results show that: (1) the prevalence rate of high-normal BP (SBP 130～139 mm Hg, and/ or DBP 85～89 mm Hg) was 32.1 % among the Chinese population aged 35～64, the ratio of high-normal BP to hypertension was 1.2:1. (2) Multivariate regression analysis revealed that high-normal BP increased a 44% of CHD risk [RR = 1.441, 95 % CI(0.996, 2.086)] and a 52 % of the total risk of CVD onset [RR = 1.522; 95 % CI(1.206, 1.919)], compared with the normal BP. (3) 14.4 % of total CVD events was attributed to high-normal BP, in which, high-normal BP contributed a 12.4 % of CHD [2].

Another cohort study started in 1993 with subjects above 60 years old focused on correlation between the levels of BP in the elderly and coronary heart disease . A total of 3 440 elderly people aged 60 and over in sampling survey of 1993 enrolled in an 11-year follow-up study. The results show that (1) the incidence of recent CHD and stroke was 16.9% and 15.4%, in the population with baseline hypertension, it was significantly higher compared with that in normal BP group (13.2% vs. 10.1%); (2) the incidence of CHD increased along with the rising of baseline SBP or DBP level; (3) CHD incidence in the female elderly with the same level of BP was higher than that in the male elderly; (4) the incidence of cardio- and cerebro-vascular diseases was higher in the younger elderly, compared with that in the older elderly[3].

Coexistence of Multiple Risk Factors

A clinical survey on clinical diagnosis for total of 2 993 patients with CHD was conducted by using selective coronary angiography as a golden standard. The results of survey showed that the positive rate of coronary angiography rose with the increase of coexisting risk factors (such as aging, male, diabetes, hyperlipemia, hypertension and smoking). The percentage of coronary multi-vessel lesions increased significantly, as well as the percentage of severe and occlusive lesions presented an upward trend [4].

A cross-sectional survey of China Heart Survey (CHS) showed that (1) the prevalence of chronic kidney disease (CKD) was 24.8% among total 3 513 diagnosed inpatients with CHD. Compared with CHD patients without CKD, CHD patients with CKD were more likely to suffer hypertension (49.5% vs. 42.8%; P = 0.001), diabetes (43.1% vs. 29.5; P < 0.001); and the level of high-density lipoprotein was relatively lower. It was suggested that the more active measures of risk factor control should be taken for those patients [5].

3.1.2 Study of Percutaneous Coronary Intervention (PCI) Registry

3.1.2.1 Number of PCI from 2002 to 2006 in Mainland China

3.1.2.2 Study of Multi-link Vision and Multi MiniVision Stent Registry in Asian Patients with Coronary Artery Disease: A Prospective, Multi-center Study

An observational, prospective, multi-center, non-randomized post-marketing registry study was conducted in 14 clinical centers of Asia to demonstrate the efficacy of the (BMS) ML Vision / ML MiniVision stents. A total of 429 Asian people with coronary artery disease (CAD) mean age of (61.7±7.4) years, and 77.2% of men, with 449 lesions, (3.0±0.5) mm of the average reference vessel diameter of target lesions , and (15.7±5.0)

mm of mean length were enrolled in and implanted bare metal stents (BMS)-ML Vision/ML MiniVision stents. The clinical outcomes of participants were observed during hospitalization and 6-month follow-ups. Results show in Table 3-1-2.

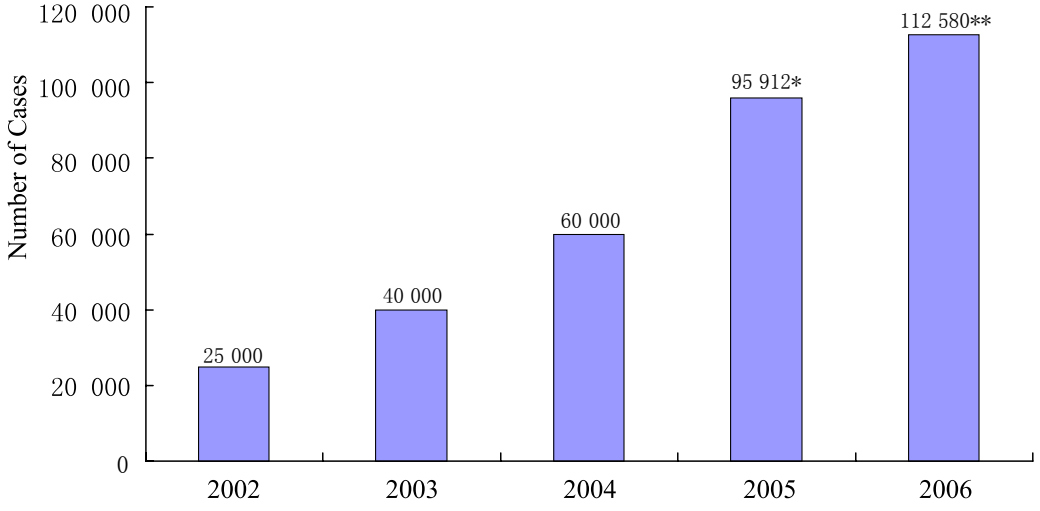

Figure 3-1-2-1(1) Number of PCI from 2002 to 2006 in China

Sources:*LV Shu-Zheng, Song Xian-Tao, Chen Yun-Dai, et al. *Chin Med J 2006;34(11):966～970.*
Sources:**LV Shu-Zheng, Chen Yun-Dai, Song Xian-Tao. *Chin Med J 2007;35(9):871～872.*

Table 3-1-2 Outcomes during Hospitalization and Follow-up (n=429)

Events	Number of Patients	Percent (%)
Primary Procedural Success	426	99.3
In-hospital MACE	2	0.5
Out-of-Hospital to 6-month MACE	27	6.3
Total 6-month MACE	29	6.8
Death	2	0.5
Q-MI	0	0
Non-Q MI	1	0.2
Recurrent Angina	20	4.7
TLR	6	

Sources: Xu Ya-wei, Wei Yi-dong, Tang Kai, et al. *Chin Med J 2007;120(12):1093～1096*

Mace: Major adverse cardiac events; MI: Myocardial infarction; TLR: Target lesion revascularization; TVR: Target vessel revascularization.

The current registry showed the excellent 6-month clinical outcomes of ML Vision/ML minivision stents in Asian patients with CAD.

3.1.3 Thrombolytic Therapy of Acute Myocardial Infarction

A comparison of acute myocardial infarction thrombolytic therapy between recombinant staphylokinase and recombinant tissue-Type plasminogen activator, a randomized multi-center clinical trial.

A multi-center, randomized paralle1 and controlled clinical trial was conducted in 12 hospitals across China from January 2002 to October 2003 to compare the safety and clinical efficacy of recombinant staphylokinase (r-Sak) with recombinant tissue-type plasminogen activator(rt-PA)in patients with acute myocardial infarction(AMI) Two hundred and ten patients (age70 years)with ST segment elevated AMI within 12 hours of onset were enrolled in and randomly divided into r-Sak group(3mg of total 15mg r-Sak for intravenous injection, another 12mg for intravenous infusion within 30 minutes n=104) and rt-PA group(8mg of total 50mg rt-PA for intravenous injection and 42 mg rt-PA for intravenous infusion within 90 minutes n=106) All patients received aspirin and intravenous heparin, and underwent angiography to determine infarct related artery(IRA) patency in 90 minutes after the drug therapy Rescue percutaneous coronary intervention(PCI)was performed for patients with TIMI grade 0～2. The effect of AMI therapy with r-Sak was observed for coronary artery revascularization, clinical function and safety, the results showed in Table3-1-3. There was no other drug-related severe adverse events and allergy reaction in the observation.

Table 3-1-3 Primary Endpoints and Secondary Endpoints

The Final Points	r-Sak Group (N=104)(%)	rt-PA Group (N=106)(%)	P-value
Primary Endpoints			
IRA Patency			
TIMI Grade 2 or 3	77.8	63.6	0.0277
TIMI Grade 3	57.6	48.5	0.1929
Death Within one Month of Post-therapy	8.7	5.7	0.3997
Non-fatal Re-MI	2.9	3.8	1.0000
Recurrent Myocardial Ischemia	8.7	16.0	0.1043
Complex Clinical End-points	18.3	21.7	0.5345
Secondary Endpoints			
Hemorrhage	28.8	27.4	0.8105
Severe or Life-threatening Hemorrhage	1.9	3.8	
Hemorhagic Stroke	0.96	3.85	

Sources: A grant-maintained project from the National Tenth Five-Year Key Projects. The number of project:2001BA703B10. Chin J Cardiol,2007; 35(8): 691～696.

This study demonstrates that the r-Sak is a safe and effective thrombolytic agent, its therapeutic effect for AMI is at lest similar to therapy with 50mg of rt-PA.

3.1.4 Coronary Secondary Prevention Study

3.1.4.1 Effect of Xuezhikang on Cardiovascular Events and Mortality in Elderly Patients with History of Myocardial Infarction: a Subgroup Analysis of China Coronary Secondary Prevention Study (CCSPS) for Elderly Patients

Between November 1, 1996 and December 31, 2000, a multi-center, randomized, double blind, placebo-controlled clinical trial [the China Coronary Secondary Prevention Study (CCSPS)] was conducted among 66 hospitals nationwide. Total of 4 780 patients with MI history were enrolled in CCSPS. This subgroup analysis was only for 1 445 select elderly patients aged 65 to 75. Those participants were randomly divided into Xuezhikang group (0.6g of Xuezhikang, bid, n=735) and placebo controlled group (n=710). There were well-matched baseline characteristics, an average 4-year follow-up and observations for coronary artery events, all-cause death rate and other clinical events in both groups. The results of subgroup analysis showed in Table3-1-4(1).

Table 3-1-4(1) Clinical Events

Clinical Events	Xuezhikang Group (n=735) n (%)	Placebo Group (n=710) n (%)	Intergroup Difference	P-value
Total CHD Events	69(9.4)	106(14.9)	-36.9	0.001
Non-fatal AMI	18(2.4)	35(4.9)	-51.0	0.01
Fatal AMI	13(1.38)	11(1.55)	12.3	0.74
Sudden Death	24(3.3)	31(4.4)	-25.0	0.27
Other CHD Death	14(1.9)	29(4.1)	-53.6	0.02
Total CHD Death	51(6.9)	71(10.0)	-31.0	0.04
Total Death	68(9.2)	96(13.5)	-31.9	0.01
Total Stroke	24(3.3)	42(5.9)	-44.1	0.04
Stroke Survival	17(2.3)	39(5.5)	-58.2	0.006
Stroke Death	7(0.9)	3(0.4)	125.0	0.22
PCI/CABG	14(1.9)	26(3.7)	-48.6	0.07
Cancer	13(1.8)	26(3.7)	-51.4	0.03
Cancer Survival	7(0.9)	9(1.2)	-25.0	0.57
Cancer Death	6(0.8)	17(2.4)	-66.7	0.02

Sources: Ye Ping, Lu Zong-Liang, Du Bao-min, et al. *J Am Geriatr Soc 55:1015～1022, 2007.*

This study demonstrates that treatment with Xuezhikang capsules is safe and effective for the secondary prevention of the Chinese elderly people with CHD.

3.1.4.2 Xuezhikang (an Extract of Cholestin) Reduces Incidence of Cardiovascular Events among Patients Co-existing Type 2 Diabetes and CHD: a Subgroup Analysis of China Coronary Secondary Prevention Study (CCSPS) for Patients with Type 2 Diabetes

Between November 1996 and December 2000, a randomized, double-blind, placebo-controlled clinical trial [China Coronary Secondary Prevention Study (CCSPS)] was conducted in 66 hospitals in 19 provinces & cities across China, and total of 4870 patients with MI history were enrolled in the clinical study. In the subgroup analysis of CCSPS, 591 patients with type2 diabetes were selected from 4 870 registry cases and divided into groups of xuezhikang (0.6g of Xuezhikang, bid, n = 306) and placebo control (n = 285). There were well-matched baseline characteristics, an average 4-year follow-up and observations for coronary artery events, all-cause death rate and other clinical events in both groups. The results of subgroup analysis showed in Table3-1-4(2).

Table3-1-4(2) Clinical Events

Clinical Events	Xuezhikang Group (n = 306) n (%)	Placebo Group (n = 285) n (%)	Intergroup Difference	P-value
Non-fatal AMI	7(2.3)	18(6.3)	−63.8	0.015
Fatal AMI	4(1.3)	9(3.2)	−58.5	0.125
Sudden Death	11(3.6)	14(4.9)	−26.9	0.426
Other CHD Death	6(1.9)	12(4.2)	−53.4	0.112
Total CHD Death	21(6.9)	35(12.3)	−44.1	0.025
Total CHD Events	28(9.2)	53(18.6)	−50.8	0.001
Stroke Survival	11(3.6)	13(4.6)	−21.3	0.625
Stroke Death	3(0.9)	6(2.1)	−53.6	0.273
Total Stroke	14(4.6)	19(6.7)	−31.3	0.335
PCI/CABG	14(4.6)	12(4.2)	8.8	0.836
Total Death	27(8.8)	45(15.8)	−44.1	0.009

Sources: Zhao Shui-ping, Lu Zong-liang, Du Bao-min, et al. *J Cardiovasc Pharmacol 2007;49:81～84.*

This investigation demonstrates that the therapy with xuezhikang can effectively reduce cardiovascular events of patients coexisting diabetic and CHD, as well as it is safe and reliable.

3.2 Stroke

3.2.1 Epidemic Trend of Stroke

Effect of Population-based Intervention on Incidence of Stroke in Three Cities of China [6]

In 1991, two well-matched communities, about 50 000 people for each, were selected as intervention group or control group in the urban areas of Beijing, Shanghai and Changsha. Between 1991 and 2000, regular health education and health promotion activities were carried out in the intervention group, but no special action was taken in the control group. Through 10-year intervention, the onset risks of all-cause stroke, ischemic stroke and hemorrhagic stroke in intervention group decreased by 11.4%, 13.2% and 7.2% respectively, compared with control group (Table 3-2-1).

Table 3-2-1 Average Annual Change Rate (%) of Initial Stroke (All-cause, Ischemic or Hemorrhagic Stroke) in Intervention Group Versus the Control Group in 3 Cities of China, 1991～2000

Communities	All-cause Stroke Trends	Ischemic Stroke Trends	Hemorrhagic Stroke Trends
Beijing			
Intervention	–6.1	–3.6	- 9.1
Control	–0.8	4.0	- 11.7
Shanghai			
Intervention	- 5.6	- 0.6	- 9.0

Continue

Communities	All-cause Stroke Trends	Ischemic Stroke Trends	Hemorrhagic Stroke Trends
Control	0.2	7.7	- 4.5
Changsha			
Intervention	- 11.1	- 11.1	- 10.1
Control	- 6.5	- 4.6	- 7.7
3 Cities (Total)			
Intervention	- 7.9	- 5.1	- 9.6
Control	- 2.9	2.2	- 8.0

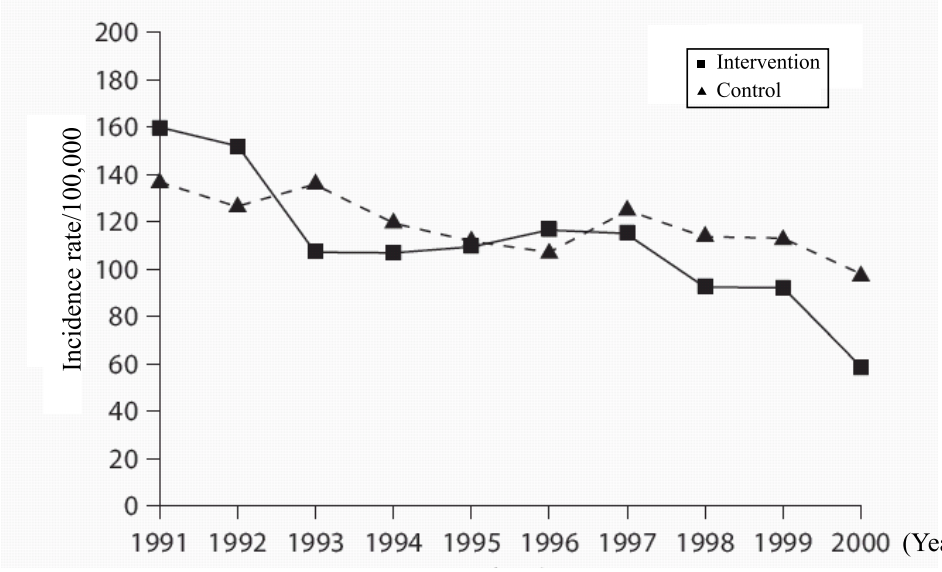

Figure 3-2-1 Age-adjusted Incidence of Initial Stroke in Total Study Group.

Difference of Mortality and Its Trends in Stroke Between Urban and Rural Populations in China from 1987 to 2001 [7]

The age-adjusted mortality of stroke was higher in urban population than in rural population until the end of 1990s. The ratio of urban areas to rural areas was 1:16 for men and 1:21 for women in 1987, and in 2001, the ratio dropped to 0.77 and 0.79,respectively, i due to a remarkable decrease in stroke mortality in urban areas (-2.0% for men and -2.5% for women annually), while, there was a less reduction of the mortality in rural women (0.7%) over the period. The decrease mainly occurred in the elderly. For population aged 35 to 54, the mortality increased in all areas and gender groups except for urban women.

RecurrenceRate of Ischemic Stroke in Chinese Patients [8]

First-year recurrence rate was 11.2% in the registered patients. Hypertension, atrial fibrillation (AF) and smoking were associated with increased risk of recurrence. Hypertension and AF control halved the recurrent risk. The hazard ratio of recurrence reduced from 1.71 to 1.39 for more than 1-year cessation of smoking. There was no significant change of recurrent risk in diabetics with well-controlled blood-sugar level. The recurrence rate of ischemic stroke was higher in Chinese patients compared with the reported data in western population.

3.2.2 Risk Factors of Stroke

Family History

A study, regarding correlation between parents with history of hypertension and their offsprings incidence of cardiovascular disease in Chinese population [9], showed that the risk of cardiovascular diseases onset was higher for individuals whose either parent had hypertension history, especially for people with hypertension history of both parents. A total of 15 131 individuals were enrolled and followed up for 10.8 years. There were 82 CHD events and 370 stroke events in the study .

Table 3-2-2(1) Incidence of Cardiovascular Events in the Cohort(1/10 000 Person Year)

	Hypertension History of Parents	Cardiovascular Events					
		Population Aged ⩽50		Population Aged≥50		All Populations	
		Case	Incidence	Case	Incidence	Case	Incidence
Male	Without History of Hypertension	61	17.7	124	61.0	181	33.5
	With Hypertension History of Either Parent	34	25.4	33	64.9	67	36.3
	With Hypertension History of Both Parents	10	45.1#	10	121.1*	20	65.8#
Female	Without History of Hypertension	28	6.7	87	37.2	115	17.7
	With Hypertension History of Either Parent	24	17.2#	28	48.7	52	26.4*
	With Hypertension History of Both Parents	7	30.3#	6	52.9	13	37.8#

Compared with those without parental history of hypertension, *P<0.05; #P<0.01.

Abnormal Blood Lipids

A study revealed that TC/HDL-C ratio was an independent predictor for the incidence of ischemic stroke in Chinese middle-age population, and its effectiveness of prediction might be better than TC or LDL-C value alone. The prospective cohort study was conducted based on the PRC-USA Collaborative Study on Cardiovascular and Cardiopulmonary Epidemiology. A total of 10 121 subjects(4 921 men and 5 200 women), aged 35～59, with complete study data, and without history of MI and stroke were selected from 4 cohort populations (including workers and peasants in Beijing and Guangzhou cities). The average period of follow-up was 15.9 years [10]. During the follow-up , 277 cases of ischemic stroke and 125 of hemorrhagic stroke were diagnosed. The age-adjusted incidence of ischemic stroke, which was calculated in the ratio of TC/HDL-C < 3.0,

3.0~, 3.5~, 4.0~, and 4.5 respectively, rose with the increase of the ratio, especially in the group with4.0~ and 4.5 of TC /HDL-C ratio(1/100 000-year). Cox regression analyses indicated that adjusted for the variables of age, gender, region, diastolic blood pressure, blood glucose, cigarette smoking and alcohol intake, the relative risk of ischemic stroke incidence was significantly higher in groups with 4.0 and 4.5 of TC/HDL-C ratio, as compared to the control group (TC/HDL-C < 3.0) Table 3-2-2(2). TC/HDL-C ratio, TC and LDL-C were independent predictors for ischemic stroke, and the relative risk of ischemic stroke was linearly related to the Quintile of TC/HDL-C ratio, but no significant correlation was observed between the Quintile of TC/HDL-C ratio and hemorrhagic stroke.

Table 3-2-2(2) Correlation Between Serum TC/HDL-C Ratio and Age-adjusted Incidence and its Relative Risk of Ischemic and Hemorrhagic Stroke

TC/HDL-C Ratio	Ischemic Stroke					Hemorrhagic Stroke				
	Case of Onset	Person Year	Incidence (1/100 000)	RR*	*P* Value	Case of Onset	Person Year	Incidence (1/100 000)	RR*	*P* Value
<3.0	78	55 117.6	144.1	1.0		45	55 373.8	89.4	1.0	
3.0~	57	34 702.6	169.4	1.33	0.123	26	34 929.0	75.5	0.96	0.865
3.5~	43	25 885.2	166.7	1.37	0.117	24	26 45.2	91.7	1.21	0.472
4.0~	39	15 740.3	226.9	1.59	0.024	18	15 869.8	110.2	1.34	0.322
≥4.5	60	20 251.8	282.2	1.87	0.001	12	20 509.1	57.2	0.65	0.205

* Control of variables includes age, gender, region, diastolic blood pressure, blood glucose, cigarette smoking and alcohol intake.

Features of Stroke in Chinese Diabetics [11]

The characteristics of demographic, risk factors, stroke subtypes and its outcomes were compared among total of 2 532 initial-stroke in-patients with and without diabetes . As compared to the patients without diabetes, the incidence risk of ischaemic stroke in diabetics (471 cases, accounting for 18.6%) was significantly higher (92.1% versus 71.3%), especially for the patients with lacuna infarction (41.2% vs. 35.2%) , while, less cerebral haemorrhage occurred in diabetics (4.2% vs. 18.1%). In-hospital mortality of ischaemic stroke was similar in both groups (18.2% in diabetics and 16.9% in non-diabetics). The factors of prediction for in-hospital diabetes mortality included consciousness disturbance, congestive heart failure and atrial fibrillation. In conclusion, there was a difference of stroke between diabetics and non-diabetic patients: a less incidence of cerebral hemorrhage and a higher incidence of lacuna infarct syndrome occurred in diabetics, but in-hospital mortality from ischaemic stroke was not increased. The definite clinical factors of stroke onset markedly

influenced on in-hospital mortality and may help physicians provide a more accurate prognosis.

Table 3-2-2(3) Pathological Types of Stroke in Diabetic and Non-diabetic Patients

Stroke Subtypes	Diabetic (N = 471)	Non-diabetic (N = 2061)	P-value
Cerebral Haemorrhage	4.2%	18.1%	0.000
Subarachnoid Haemorrhage	0.2%	1.6%	0.018
Unclassifiable	3.5%	9.0%	0.000
Cerebral Infarction (Ischaemic Stroke)	92.1%	71.3%	0.000
Ischaemic Stroke Subtypes	(n=434)	(n=1470)	
Total Anterior Circulation Infarct	23.3%	25.3%	NS
Partial Anterior Circulation Infarct	25.4%	30.2%	0.050
Posterior Circulation Infarct	10.1%	9.2%	NS
Lacunar Infarct	41.2%	35.2%	0.026

3.2.3 Primary and Secondary Prevention of Stroke

Hypertension Control

Long-term treatment of hypertension is an important measure for secondary prevention of stroke. It may reduce the risk of stroke recurrence . The results of study, regarding the influence of long-term hypertension control on stroke recurrence in patients with cerebrovascular diseases were reported in 2007[12]. A total of 1 399 patients with cerebrovascular diseases were randomly divided into a group of ACEI plus indapamide (702 cases) or a group of well-matched placebo control (697 cases). A 4-year double-blind treatment and a 2-year open-label treatment were taken in the study. Allsubjects were followed up for 6 years. As compared with the control group, the 4-year double-blind treatment reduced a 12.5/5.3 mmHg of blood pressure(BP), and also the 2-year open-label treatment declined a 9.2/4.7 mmHg of BP. During the 6-year follow-up, there was a 10.5/5.0 mmHg of net decline in blood pressure. The risk of stroke recurrence reduced by 53% (9.5% vs. 20.2%)($p<0.01$) in group of 4-year double-blind treatment, and it declined by 25% in group of 2-year open-label treatment ($p = 0.19$). The risk of stroke recurrence totally reduced by 46% ($p<0.01$) over the 6-year follow-up. It demonstrated that long-term BP control was beneficial for the patients with cerebrovascular diseases, and might lower the risk of stroke recurrence.

Antithrombotic Therapy

Antithrombotic therapy can reduce the incidence of major cardiovascular events, including myocardial infarction and stroke, in patients with peripheral arterial disease. However, there was very limited data regarding the efficacy and safety of oral anticoagulation with or without antiplatelet therapy. The trial of Warfarin Antiplatelet Vascular Evaluation (WAVE) published in the *New England Journal of Medicine* in 2007[13], provided evidence for the secondary prevention of cardiovascular diseases. The randomized, open-labeled clinical trial was conducted in 80 centers of Canada, Poland, Hungary, Ukraine, China, the Netherlands, Australia, etc. A total of 2 161 patients with peripheral arterial disease (including transient ischemic attack (TIA) and stroke) were randomly divided into a group of combined therapy (an antiplatelet agent plus an oral anticoagulant) and antiplatelet therapy alone. The mean follow-up period was 35 months. The outcomes of study

showed that there was no statistical differences in incidence of myocardial infarction (MI), cardiac deaths and stroke (3.5% vs. 3.5%; relative risk 1.01) between the group of combined therapy and the group of antiplatelet therapy alone. But, the incidence of both life-threatening hemorrhage and moderate hemorrhage were increased in the combined therapy group as compared with the antiplatelet-therapy group. Life-threatening hemorrhage in both groups: there were 14 cases of hemorrhagic stroke (1.3%) in the combined therapy group and none in the antiplatelet-therapy group [RR=15.2; 95%CI (2.0～115.6; P = 0.001)]. In conclusion, for patients with peripheral arterial disease, the combined therapy of oral anticoagulant plus antiplatelet therapy was not more effective than antiplatelet therapy alone for prevention of severe complications, and even may cause an increase in the risk of life-threatening hemorrhage.

In a prospective, randomized, multi-center clinical trial in China, the efficiency and safety of warfarin and aspirin were compared for prevention of thromboembolism in patients with nonvalvular atrial fibrillation (AF) [14]. A total of 704 patients were randomly divided into aspirin therapy group (369 patients) or warfarin therapy group (335 patients). The mean follow-up period was 19 months (2～24months). As compared with aspirin therapy, the relative risk of ischemic stroke was reduced by 62% by therapy of adjusted-dose warfarin (Table3-2-3). The incidence of minor and major hemorrhage was higher in warfarin therapy group, compared to aspirin therapy group (P < 0.05). The outcomes of study demonstrated that anticoagulant therapy with dose-adjusted warfarin can cause a reduction of 56% in relative risk of both ischemic stroke and death of nonvalvular AF, the relative risk of ischemic stroke and all thromboembolism event were decreased by 62% and by 52%, respectively, compared with therapy of aspirin in Chinese population. In comparison of aspirin therapy (150～160 mg), the dose-adjusted warfarin (INR 2. 0～3. 0) can effectively reduce deaths and the end-point events of ischemic stroke .

Table 3-2-3 Comparison between Therapeutic End-points of Aspirin Group(n=369)and Warfarin Group(n=335)

Therapeutic End-points	Aspirin Group Cases (%)	Warfarin Group Cases (%)	*P* Value	OR (95% CIs)
Primary End-point Events	24(6.0)	10(2.7)	0.03	0.44(0.198～0.960)
Ischemic Stroke	17(4.6)	6(1.8)	0.04	0.38(0.147～0.977)
Death	8(2.2)	4(1.2)	0.33	0.54(0.163～1.830)
Secondary End-point Events	26(7.0)	19(5.7)	0.46	0.79(0.431～1.461)
Thromboembolism Events	39(10.6)	19(5.7)	0.01	0.48(0.269～0.858)
Combined End-point Events	48(13.0)	28(8.4)	0.047	0.61(0.373～0.997)

3.3 Hypertension

Refer to *The Report on Cardiovascular Diseases in China(2007)* of Chapter 2.1 Hypertension(Page11～24)

3.4 Chronic Kidney Disease

3.4.1 Epidemiology of Chronic Kidney Disease (CKD)

3.4.1.1 Estimation of Renal function in Patients with CKD

In accordance with the principle of early monitoring and prevention of CKD, clinical physician need to make an accurate estimation for the glomerular filtration rate (GFR) of patients with CKD. The applicability of estimated GFR (eGFR) equation, developed for CKD patients by the Chinese eGFR Investigation Collaboration, was greatly improved in GFR estimation of Chinese CKD patients. But underestimation of real GFR value still existed in the patients with a higher GFR . Therefore, the collaborating group made a further development for a new equation of eGFR, which combined serum creatinine (Pcr) with cystatin C (cysC). eGFR=169×Pcr-0.608×cysC-0.63×Age-0.157(Female×0.83)

By comparing the reference GFR from standard dual plasma sampling 99mTc-DTPA clearance, the equation can well match estimation of renal function at all stages of CKD, and it can make a better evaluation for the people with normal renal function, as compared with the early equation[15].

3.4.1.2 Survey on Prevalence of CKD in High-risk Population

The known risk factors of CKD include aging, hypertension, diabetes, uricemia, dyslipidemia and infection, etc. Therefore, the corresponding population with the risk factors mentioned above belongs to the high-risk population. The investigational reports on prevalence of CKD in high-risk population showed in Table 3-4-1(1).

Table 3-4-1(1) Epidemiological Study of CKD in Part Areas of China

Area	Study Subject	Subject Source	Study Case	Diagnostic Criteria of CKD	CKD Prevalence (%)
Seven Cities[16]*	CHD	Multi-centers Inpatients	3513	eGFR <60 ml/min/1.73 m2and/or proteinuria and/or hematuria and/or noninfective leukocyturia	24.8%
Hong Kong[17]	HIV-infected Patients	Single Center Follow-up Patients	322	eGFR <60 ml/min/1.73 m2 and /or protein-to-creatinine ratio (P/Cr)> 0.3	16.8%

*The seven cities include Beijing, Tianjin, Shanghai, Nanjing, Hangzhou, Guangzhou and Wuhan.

A cross-sectional randomized sampling survey was conducted in a total of 15 160 adults aged 35～74. The outcomes of survey demonstrated that if CKD was defined as e-GFR <60 ml/min/1.73 m^2, the odds ratios of CKD prevalence and 95% confidence interval (CI) were 1.64 (1.16, 2.32) in CKD patients with metabolic syndrome (MS), as compared to that in CKD patients without MS. CKD was defined as an estimated glomerular filtration rate and If take serum creatinine 1.14 mg/dl for men and 0.97 mg/dl for women as the criteria of high serum creatinine diagnosis, the odds ratios of high serum creatinine and 95% CI were 1.36 (1.07, 1.73). In comparison of patients without any indicators of MS, the odds ratios of CKD and high serum creatinine rose with increase in indicators of MS abnormalities (Table 3-4-1(2)). The findings of study suggested that MS was

an important risk factor of CKD in Chinese adults [18].

Table 3-4-1(2) Correlation between MS and the Odds Ratio and 95% CI of CKD or High-level Serum Creatinine

Indicators of MS Abnormalities	CKD		Elevated Serum Creatinine (Male≥1.14 mg/dl;Female≥0.97 mg/dl)	
	OR	95%CI	OR	95%CI
1 Item	1.51	(1.02，2.23)	1.11	(0.88，1.40)
2 Items	1.5	(0.97，2.32)	1.39	(1.07，2.04)
3 Items	2.13	(1.30，3.50)	1.47	(1.06，2.04)
4/5 Items	2.72	(1.50，4.93)	2	(1.32，3.03)

Similar results were reported in a population survey of total 2 310 participants (40 years of age) in Beijing. Participants with MS had a higher prevalence of CKD (15.4% vs. 8.3%, p<0.001) compared with those without MS. The prevalence of CKD rose following the increase in items of MS abnormalities [19].

3.4.2 Evaluation for Risk Factors of Cardiovascular Diseases in Patients with CKD

There is a correlation between CKD and cardiovascular diseases (CVD). The patient with CKD is easy to coexist CVD, so CKD is a high-risk factor; contrarily, CVD is an important influent factor of CKD prognosis.

3.4.2.1 Investigation of Carotid artery Intima-media Thickness in CKD Patients

Increased carotid artery intima-media thickness (IMT) can predict the possibility of future vascular events in general population. The monitoring study of carotid IMT function in CKD patients has been conducted .

A cross-sectional study was carried out in total 1 046 residents (40 years of age) in a district of Beijing. It showed that compared with subjects with normal eGFR value, carotid IMT increased with the reduction of eGFR value; the IMT value was greater than the mean IMT value in subjects with albuminuria. For the early CKD patients, increased carotid IMT may be related to the high risk of CVD [20]. The outcomes of a cohort study for total of 203 patients with stage 3 and stage 4 of CKD, conducted in a single center of Hong Kong, showed that base-line IMT was associated with some factors, such as patients age, serum LDL level, Charlson's co-morbidity score, and serum C-reactive protein. In patients coexisting CKD and diabetes, carotid IMT was significantly higher than that in patients without diabetes. In the period of a mean 48-month follow-up study, the analysis of IMT quartiles presented that the survival rate in patients without cardiovascular events successively was 94.4% for score I, 89.8% for II, 77.7% forⅢ, and 65.9% forⅣ(log rank test, P = 0.006). By adjusting multivariate with the Cox proportional hazard model, the onset risk of cardiovascular events increased by 41.6% for each higher quartile of IMT. There

was no statistical difference of actual survival rate among the grades of IMT quartiles at the 48th month. Carotid IMT did not correlate with the decline of patients renal function . Therefore, carotid IMT is a strong predictor of CVD complications in predialysis patients and it may apply to risk stratification of the patients[21].

3.4.2.2 Correlation between CKD and CAHD in Type-Ⅱ Diabetics

A mean 39.4-month follow-up study (20.3～55months) for total 4 421 type-Ⅱ diabetics in Hong Kong demonstrated that all-cause mortality increased from 1.2% of stage-1 CKD (95% CI 0.8～1.7) to 18.3% of stage-4 CKD (9.1～27.5) (P for trend <0.001). Incidence of new cardiovascular endpoints increased from 2.6% (2.0～3.3) to 25.3% (15.0～35.7) (P for trend <0.001). After adjusting multi-variates, such as age, sex, albuminuria, use of RAAS inhibitors, lipids, BP and glycemic control, all-cause hazard ratio (HR) at different levels of eGFR value (90, 60～89, 30～59, and 15～29 ml/min per1.73m^2) was 1.00, 1.27, 2.34, and 9.82, respectively (P for trend <0.001); HR of cardiovascular endpoints was 1.00, 1.04, 1.05, and 3.23 (P for trend <0.001); as well as the HR of renal endpoints was 1.00, 1.36, 3.34, and 27.3, respectively (P for trend <0.001). Thus, the reduction of eGFR value was a high-risk factor for incidence of cardiovascular endpoint events and all-cause deaths in type-Ⅱ diabetics [22].

A prospective cohort study for total 7 067 type-Ⅱ diabetics in Hong Kong showed that risk factors of CHD include age, male gender, duration of diabetes, ratio of spot urinary albumin to creatinine, eGFR, total cholesterol (TC), high density lipoprotein cholesterol (HDL-C) and cigarette smoking. Linear association between TC and CHD was observed only in patients with albuminuria. Although in general population, increased HDL-C was associated with decreased risk of CHD, full-range HDL-C was associated with CHD in an A-shaped manner with a zenith at 1.1 mmol/L. Albuminuria and CKD were the main contributors for the paradoxically positive association between HDL-C and CHD risk for HDL-C values less than 1.1 mmol/L. Therefore, in type-Ⅱ diabetics, both albuminuria and CKD can influence the function of other risk factors on CHD, and albuminuria plays a linking role between conventional risk factors and CHD. The CKD onset changes the correlation between conventional lipids and risk of CHD[23].

3.4.2.3 Hypertension and Renal Function Declination

A representative cohort follow-up study with 158 365 populations over 40 years of age was conducted in China nationwide. A standard protocol was applied to BP measurement and collection of related variables information in 1991; and a follow-up evaluation was conducted between 1999 and 2000. During the follow-up study with 1 236 422 person-years, a total of 380 subjects initiated renal replacement therapy or died from renal failure (30.7/100 000 person-years). Compared with normal-BP subjects , the adjusted hazard ratio (95%CI) of ESRD for groups of high-normal BP, stage 1, and stage 2 hypertension was1.30 (0.98～1.74), 1.47 (1.06～2.06), and 2.60 (1.89～3.57), respectively (P for trend < 0.001). Correspondingly, the hazard ratio (95%CI) of glomerulonephritis-related ESRD for groups of high-normal BP, stage-1 and stage-2 hypertension was 1.32 (0.82～2.11), 1.48 (0.83～2.61), and 3.40 (2.02～ 5.74), respectively (P for trend <0.001). Systolic BP was a stronger predictor of ESRD than diastolic BP or pulse pressure. This study provided the correlation between BP and ESRD onset; and also found that BP level was significantly associated with glomerulonephritis-related

ESRD. Therefore, prevention of ESRD should combine with prevention, treatment and control of BP [24] .

3.4.3 Progress of Treatment for Patients with CKD

Both angiotensin-converting enzyme inhibitor (ACEI) and angiotensin receptor blocker (ARB) are important drugs for treatment of CKD patients, reduction of proteinuria, and delay of renal function development. In a study for patients with non-diabetes nephropathy, proteinuria and chronic renal insufficiency, the patients (n=360) received a combined therapy with benazepril or losartan (intravenous drip) to reach individual maximized tolerated dosages of proteinuria reduction. The outcomes of study presented that over the mean 3.7 years of follow-up, the primary combined endpoint events (doubled serum creatinine, ESRD, and the time of death), and secondary endpoint events (level of proteinuria and speed of renal-disease progression) in group of intravenous drip with both benazepril and losartan (benazepril: 20mg/d of mean dose, the range of 10～40mg/d; losartan: 100mg/d of mean dose, the range of 50 to 200mg/d) decreased by 51 and 53%, respectively (P = 0.028 and 0.022, respectively). Under the same control of BP levels, the group with combined therapy of benazepril and losartan presented a further reduction of proteinuria level and a slow-speed progression of renal hypofunction, compared with group with regular-dose therapy. There was no significant difference of adverse events between two therapeutic groups with intravenous drip or regular dose. It was concluded that drug therapy with benazepril or losartan, at a dosage of individual tolerated and maximum reduction of proteinuria, can obtain a better renal protection for patients without diabetes but with proteinuria and renal insufficiency[25].

3.5 Cardiovascular Surgery

3.5.1 Number of Cardiac Surgical Procedures in China

The number of cardiac surgical procedures has been annually increasing by 14% in the recent four years in mainland China, specifically 90 812 cases in 2004, 104 656 cases in 2005, 118 627 cases in 2006 and 136 015 cases in 2007(Table 3-5-1).

Table 3-5-1 Number of Cardiac Surgical Procedures, and Cardiac & Cardiopulmonary Transplantaion in Mainland China

Area	Province	2006		2007		Number of Transplant in 2007	
		Total	CPB	Total	CPB	Cardiac Transplant	Cardiopilmonary Transplant
North	Beijing	15 500	10 799	16 543	11 885	45	0
	Tianjin	3 445	2 654	4 068	3 140	8	0
	Inner Mongolia	472	388	626	521	0	0
	Shanxi	1 734	1 355	1 770	1 433	0	0
	Hebei	3 980	3 247	4 931	4 041	0	0
North East	Liaonin	3 079	2 405	3 125	2 467	2	0
	Helongjiang	2 105	1 805	3 102	2 245	1	0
	Jilin	1 821	1 463	1 744	1 430	1	0

Continue

Area	Province	2006		2007		Number of Transplant in 2007	
		Total	CPB	Total	CPB	Cardiac Transplant	Cardiopilmonary Transplant
East	Shanghai	8 754	7 414	10 227	8 618	31	0
	Jiangsu	7 712	6 700	7 671	6 818	0	0
	Zhejiang	3 508	3 037	4 045	3 300	0	0
	Shandong	8 876	7 595	10 340	8 520	0	0
Middle	Henan	9 411	8 138	9 792	8 651	0	0
	Hubei	6 209	5 582	7 164	6 503	1	
	Jiangxi	1 748	1 594	2 220	2 044	0	0
	Anhui	1 456	1 456	3 159	2 942	11	1
	Hunan	4 576	4 163	5 356	4 804	2	1
South	Guangdong	7 523	6 623	9 042	7 773	0	1
	Hainan	485	426	505	435	0	0
	Gunagxi	2 398	1 980	2 977	2 536	8	0
	Fujian	3 471	3 024	4 117	3 305	14	0
North West	Shanxi	6 565	4 916	7 190	5 659	3	0
	Gansu	1 807	1 532	1 789	1 474	0	0
	Qinghai	752	504	682	423	0	0
	Ningxia	762	444	838	465	0	0
	Xijiang	1 668	1 382	2 417	2 174	0	0
South West	Chongqing	2 340	2 147	3 046	2 801	0	0
	Sichuan	4 139	3 923	4 543	4 199	2	1
	Yunnan	1 422	1 340	1 739	1 737	1	0
	Guizhou	909	786	1 174	1 066	0	0
	Tibet			73	56	0	0
Nationwide	Total	118 627	98 804	136 015	113 465	130	4

Note: Data from Extracorporeal Circulation Branch of Chinese Society of Biomedical Engineering

3.5.2 Surgical Treatment of Cardiovascular Diseases

3.5.2.1 Surgical Treatment of Coronary Artery Disease

Outcomes of Chinese Coronary Artery by Pass graft (CABG) Registry Study between 2004～2005

The registry study of CABG in China was implemented in total of 32 large-middle hospitals in China nationwide. The data analysis for all CABG cases was completed in the collaborating hospitals From January 1,2004 to December 31,2005. The number of surgical procedures in the collaborating hospitals reached 9 247,

accounting for 2/3 of total CABG cases during the period of study in China nationwide.

The outcomes of the study between 2004～2005 presented a correlation between the mortality of CABG operation and some para such as age, gender and BMI (Figure 3-5-2(1)～Figure 3-5-2(3)).

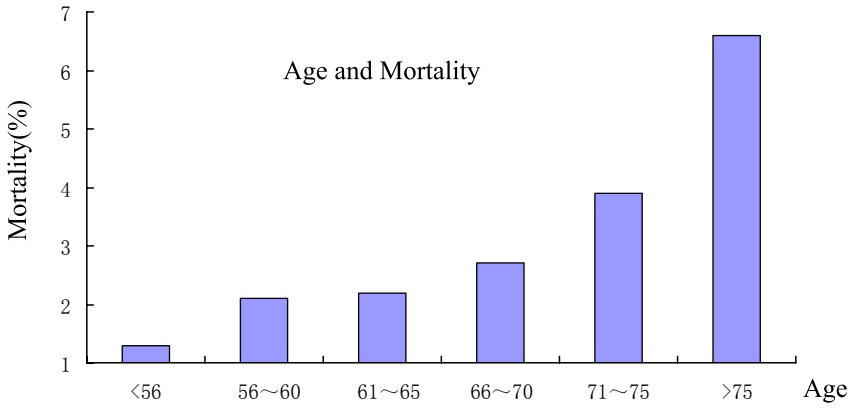

Figure 3-5-2(1) Correlation Between Age and Mortality of CABG

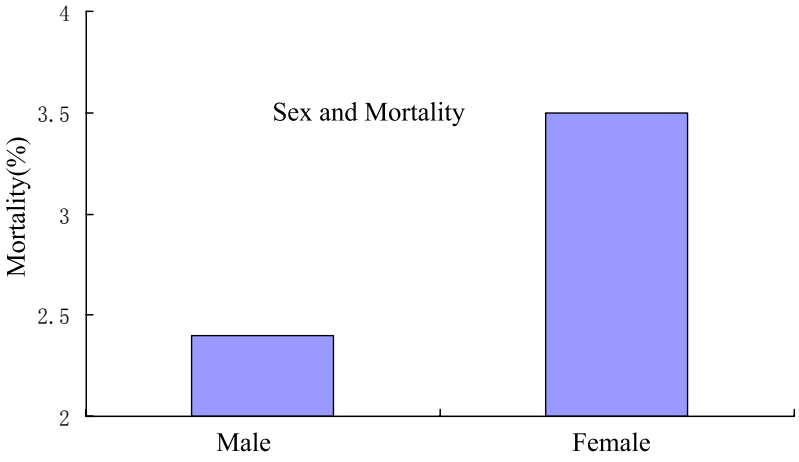

Figure 3-5-2(2) Correlation Between Gender and Mortality of CABG

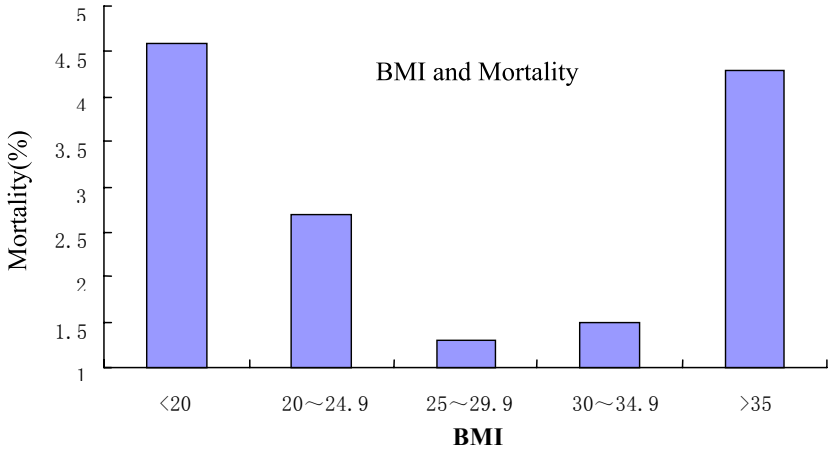

Figure 3-5-2(3) Correlation Between BMI and Mortality of CABG

Compared with the data of EuroScore (Europe) and STS (U.S.A), the results of registry study of CABG in China demonstrated that there was a higher incidence of coexisting diseases among the Chinese patients during pre-operation, such as hypertension, diabetes, stroke; or unstable angina, pulmonary hypertension; or multiple coronary-vessel diseases or left main-stem disease . However, there was a lower proportion of coexisting diseases for women; in addition, the lower proportion of coexisting diseases, such as COPD, periphery vascular diseases, renal dysfunction and active endocarditis, occurred in younger patients, and also in patients with cardiovascular surgical history or with dysfunction of left ventricle. There were different characteristics among Chinese, European and American people. The emphasis of risk factors was much different, which was associated with baseline characteristics, such as nationalities, races, economic and social situation, geographical position, life custom.

3.5.2.2 Surgical Treatment of Heart Valve Disease

In Mainland China, there were three reports on heart-valve-disease operations with larger amount of cases in 2007. One of them focused on mid- and long-term effect of surgical treatment for triple heart valve disease. The other two reports focused on perioperative data analysis of the heart valvular operations (Table 3-5-2 (1)～Table 3-5-2(5)).

Table 3-5-2(1) Comparison of Cardiovalvular Surgical Situation in Mainland China in 2007

Group	Duration of Cases	Case	Female	Age	Early Mortality of Post-operation
Group A[26]	1993～2004	5 066	47. 2%	45. 3	4. 6%
Group B[27]	1997～2005	1 003	56. 4%	53. 4±13. 2	2. 8%
Group C[28]	1985～2005	1 137	56. 4%	46. 0±3. 2	8. 6%

Table 3-5-2(2) Comparison of Cardiovalvular Surgical Types in Mainland China in 2007

Group	Surgical Procedures					
	MVR(%)	AVR(%)	TVP/TVR(%)	BVR(%)	BVR+TVP(%)	BVR+TVR(%)
Group A[29]	51. 7	15. 8	1. 9	30. 3		
Group B[30]	55. 3	13. 9	2. 6	27. 2		0. 99
Group C[31]					98. 2	1. 8

Note: MVR mitral valve replacement, AVR aortic valve replacement, TVP tricuspid valve plastic operation, TVR tricuspid valve replacement, BVR, artic and mitral valve replacement

Table 3-5-2(3) Comparison of Cardiovalvular Operation Complications in Mainland China in 2007

Group	Complication of Operation (%)	Low Cardiac-output Syndrome(%)	Re-thoractomy for Bleeding(%)	Renal Failure(%)	Refractory Arrhythmia(%)	Cerebral Infarction (%)	Hydropericardium (%)
Group A[32]	18. 2	4	3. 9	2. 2	1. 6		
Group B[33]	7. 3	0. 5	2. 3	0. 4	0. 9	0. 9	1. 2

Table 3-5-2(4) Long-term Survival Rate of Cardiovalvular Operation in Mainland China in 2007

Group	Long-term Follow-up Rate	Average Follow-up Duration (Year)	Total Follow-up Case (Patient•Year)	Cumulative Survival Rate of Post-operation (%)		
				5 Year	10 Year	15 Year
Group C[34]	93.2%	4.15	3678	89.2±1.5	83.9±3.1	65.3±5.1

Table 3-5-2(5) Embolism and Hemorrhage of Cardiovalvular Postoperation in Mainland China in 2007

Group	Without thromboembolism of post-operation (%)			Without Anticoagulation-related Hemorrhage of Post-operation (%)		
	5 Year	10 Year	15 Year	5 Year	10 Year	15 Year
Group C[35]	97.1±1.7	91.8±3.1	88.1±4.8	95.9±2.5	89.9±3.7	82.0±5.0

Among which, the correlation between left ventricle ejection fraction (EF value) and peri-operative mortality of valvular replacement was analyzed in group A of valvular operation(Table 3-5-2(6)[36]).

Table 3-5-2(6) Influence of EF Value on Per-operative Mortality of Valvular Replacement

Type of Valvular Disease	EF value			
	< 0.40 (%)	0.40～0.50(%)	0.50～0.60(%)	≥0.60(%)
Aortic Stenosis	12.5	0	0	3.4
Aortic Regurgitation		9.3	2.8	1.6
Mitral Stenosis	6.9	6.7	4.0	4.4
Mitral Regurgitation	22.2	9.9	4.7	1.8
Total	8.6	7.8	4.1	3.9

The outcomes of study showed that preoperative EF value is an important effective factor of peri-operative mortality of valvular surgery. Generally speaking, the lower the EF value, the higher the mortality is. Nevertheless, EF value has different predictive effects on various valve diseases. It is most significant for EF value to evaluate the operative risk of patients with mitral insufficiency; secondly in patients with aortic insufficiency; and the lowest significance of EF value for operative risk evaluation existed in patients with mitral stenosis and aortic stenosis.

3.6 Peripheral Arterial Disease

Peripheral arterial disease (PAD) is a common manifestation of systemic atherosclerosis excluding the coronary and intracranial arteries. This report is only involved in lower extremity arteriosclerosis disease (LEAD).

3.6.1. Prevalence Rate of LEAD

LEAD is a common clinical syndrome in elderly people. Many epidemiological studies were implemented for prevalence rate of LEAD, which applied some non-invasive diagnostic methods, such as Rose Claudication Questionnaire, ankle-brachial index (ABI) and pulse wave velocity (PWV) et al. The outcomes of studies demonstrated that LEAD morbidity was associated with subjects age, risk factors and

basal diseases. Table 3-6-1 showed the outcome of LEAD epidemiological studies in China. the diagnostic method of LEAD in the table was ABI＜0.90.

Table 3-6-1 Epidemiological Findings of LEAD Prevalence Rate in China

Group	Cases	Age	Prevalence Rate (%,Male / Female)
Fisher in Zhoushan Area, Zhejiang [37]	2668	≥35	2.1 (3/1.2)
Group of MUCA[38]	18140	＞35	6.0 (5.4/9.3)
The Elderly in Wanshoulu Area, Beijing [39][40][41]	2124	60~95	16.4 (12.7/18.1)
Diabetes [42]	1347	＞50	19.4 (18.3/20.4)
Metabolic Syndrome [43]	2115	32~91	22.5 (21.7/23.4)

MUCA:Multiple unit collaborating analysis of cardiovascular disease epidemiology in China.

The findings of studies showed that prevalence rate of LEAD were different for different study population. For example, the prevalence rate of LEAD was 2.1% for fishers in Zhou shan area, 6.0% and 16.4% for people aged over 35 and people aged over 60 in Beijing, respectively; and 19.4% for diabetics and 22.5% for patients with metabolic syndrome. However, there were some similar characteristics in those study population, for example, the prevalence rate of LEAD rose with the increase of age, and it was higher for women than for men.

3.6.2. Risk Factors of LEAD

The outcomes of epidemiological studies presented that the prevalence rate rose with the increase in age and risk factors of atherosclerosis. The major cause of LEAD was atherosclerosis. The atherosclerosis-related risk factors, such as cigarette smoking, diabetes, hyperlipemia, hypertension and hyperhomocysteinaemia, all can cause an increase in prevalence rate of LEAD. Multiple logistic regression in Beijing area revealed a positive correlation of LEAD incidence and its serious degree with age, smoking, duration of diabetes , stability of blood glucose, high systolic pressure, hypercholesterolemia and high LDL-C[44]. LEAD coexisted in 30% patients with cerebrovascular diseases and in 25% patients with ischemic heart disease[45][46]. Therefore, LEAD is an important window of the systemic arteriosclerosis, and also is very important for early detection and therapy of systemic arteriosclerosis.

3.7 Arrhythmia

3.7.1 Pacemakers and ICD

The first case of artificial cardiac pacemaker was implanted in Shanghai, China in 1962. Since then the annual number of pacemaker implantations has been growing consistently, of which, physiological pacemakers account for more and more percentage. As shown in Figure 3-7-1(1), there has been a steady growth of pacemaker implantation number since 2002. As an example in 2005, there were 460 hospitals nationwide capable of pacemaker implantation with a total amount of 18 090 pacemakers implanted(per CSPE survey

of pacemaker application). Among them, the male patients accounted for 55.5% of the total, and the patients aged lower 60 years were 23.6%. In 2006, a total of 20 000 pacemakers were implanted, and more than 35 000 estimates in 2007.

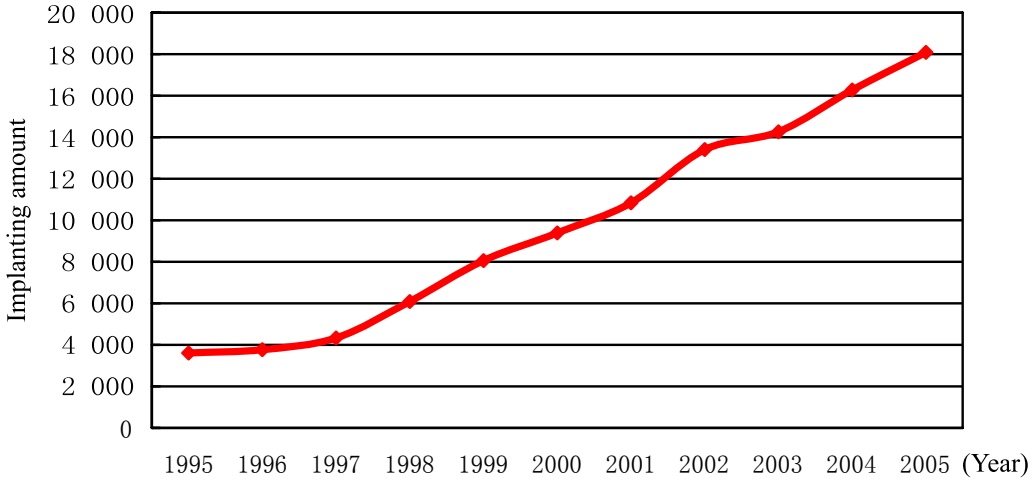

Figure 3-7-1(1) Annual Amount of Pacemaker Implantation in China (2002～2005)

Pacemaker categories: The statistic data in 2005 showed that dual chamber pacemakers accounted for 51.5% of the total amount, and the proportion of physiological pacemakers reached 52.9% if AAI/R mode pacemakers were included in the calculation, which exceeded the percentage of non-physiological pacemakers. The indication of pacemaker implantation was mostly sick sinus syndrome (SSS), which accounted for 50.1%, followed by atrio-ventricular block (AVB) accounting for 39.4%; and other indications with 10.5% (Figure 3-7-1(2)). The etiological constitution of pacemaker implantation: 35.9% of recipients were patients with coronary artery disease (CAD), 10.4% were the patients with cardiomyopathy, and other etiologies and non-organic heart disease accounted for 53.7% of the total pacemaker patients.

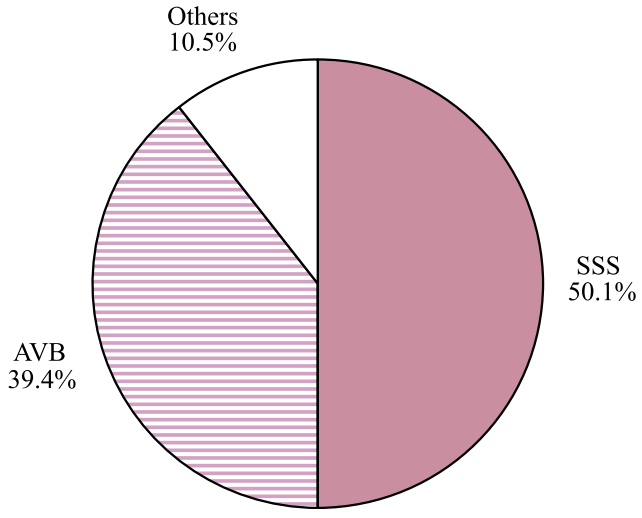

Figure 3-7-1(2) Indications of Pacemaker Implantation Nationwide in 2005

The first case of ICD implantation in China occurred in 1996 via intravenous approach, and a total of 285 ICDs were implanted nationwide prior to year 2001. There were 186 cases of ICD and 340 cases of CRT implantation nationwide in 2005, and the implanting amount of ICD and CRT presented a trend of steady increase between 2002～2005 Figure 3-7-1(3). It is estimated that there were more than 500 cases of ICD implantation in 2007.

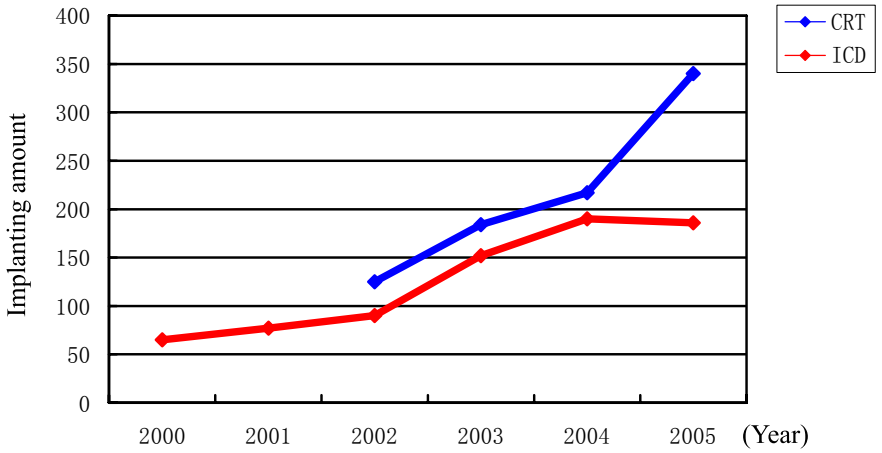

Figure 3-7-1(3) Annual Implanting Amount of ICD and CRT in China (2002～2005)

3.7.2 Catheter Ablation

The first clinical radio-frequency cardiac arrhythmia (RFCA) in China was reported in 1991 The amount of RFCA cases increased rapidly in the late 1990s. The survey data in year 2000 showed the total amount of RFCA at 10 811 cases (Figure 3-7-2(1)) that were performed in 136 hospitals. The total amount of RFCA reached 20 000 cases in 2006.

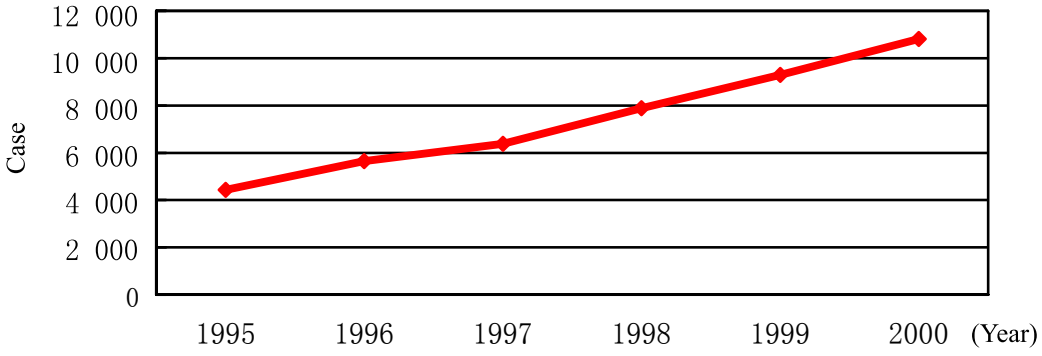

Figure 3-7-2(1) Annual Amount of RFCA Case in China (1995～2000)

In 2000, among the patients receiving RFCA treatment, the percentage of AVNRT was 56.3%, followed by AVRT at 31.7%, and others include ventricular arrhythmia and atrial arrhythmia, etc (Figure 3-7-2(2)).

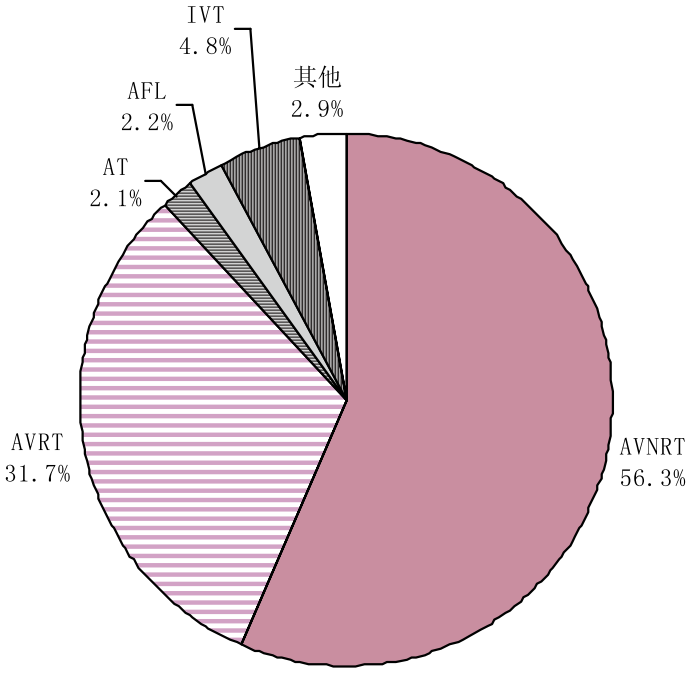

Figure 3-7-2(2) Disease Constitution of RFCA in China in 2000

RFCA for Af in China: RFCA for AF increases dramatically in recent years as shown in Figure 3-7-2 (3). There were a total of 3 196 cumulative cases of FRCA for AF by the end of 2005 nationwide, with 1 427 cases in 2005 alone[51]. According to the initial statistics, the number of FRCA for AF was 2 160 in 2006 alone.

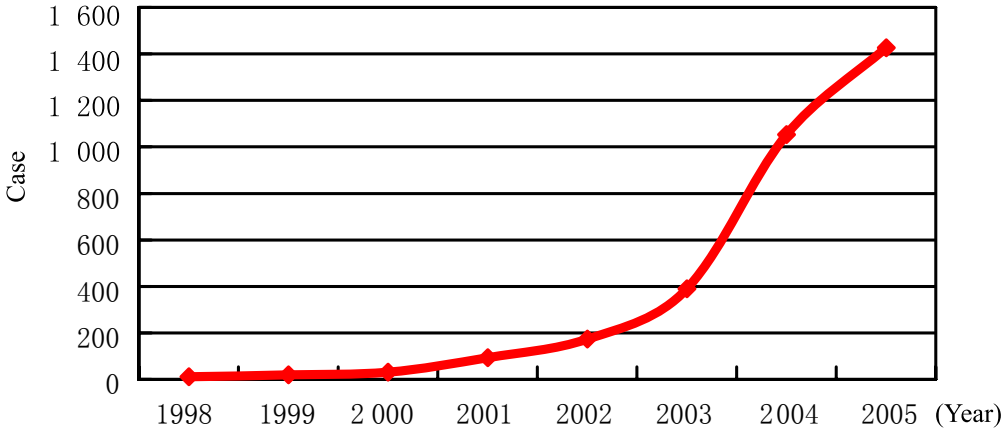

Figure 3-7-2(3) Annual Cases of RFCA for AF in China (Between 1998～2005)

3.7.3 Atrial Fibrillation

The prevalence rate of AF was 0.77% in population aged over 30 years in China; and the rate of AF was 0.61% when the population was standardized in 1990. The prevalence rate was higher for men than for women (0.9vs.0.7%). The proportion of the valvular, non-valvular and lone AF among all AF patients was 12.9 %, 65.2% and 21.9 %, respectively. Ischemic stroke accounted mainly for the AF-related stroke, and the incidence of stroke was significantly higher in AF patients than in non-AF patients.

In a domestic study for anti-coagulative efficacy and safety of Warfarin, a total of 988 non-valvular AF patients with risk of thromboembolism were randomly divided into normal-dose Warfarin group (target INR: 2.1～2.5), low-dose Warfarin group (target INR: 1.6～2.0) and aspirin group (200mg/d). During a mean period of 15-month follow-up, the annual incidence of thromboembolism was 2.3%,2.6% and 6.4% for three groups above, respectively. The incidence of thromboembolism was significant lower in normal-dose and low-dose Warfarin groups than in aspirin group (P＝0.018 and P＝0.044, respectively). There was no significant difference of the thromboembolism risk between the Warfarin groups with normal-does or low-does. The incidence of severe hemorrhage was 2.9%, 2.8% and 1.0% respectively, without significant difference among three groups (P＝0.101). The therapy with low-dose INR=1.6～2.0 Warfarin had the same efficacy as the therapy with normal-dose warfarin INR=2.1～2.5.

3.7.4 Sudden Cardiac Death

A 1-year follow-up study for total of 678 718 subjects was conducted in year 2006. Of the total, there were 2 896 cases of deaths during the study, among which the deaths of sudden cardiac death (SCD) accounted for 9.5%(284 patients), the incidence of SCD was 41.8/100 000, and higher for man than for woman (44.6/100 000vs.39.0/100 000). There was a higher incidence of SCD in patients aged over 25 years, 61.7/100 000 for man and 53.3/100 000 for woman. Based on this study, it is estimated to be 544 000 deaths of SCD annually in China.

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Chapter 4
Community-based Prevention and Treatment on CVD

4.1 Case 1: Community-based Comprehensive Intervention on Stroke in Three Cities in China[1][2][3]

The outcomes of epidemiological sampling survey demonstrated that in urban- and rural areas of China, the annual incidence, mortality and prevalence rate of stroke was 200/100 000,130/100 000 and 400/100 000~700/100 000, respectively. It is estimated that new patients with stroke are over 2 million annually, more than 1.5-million individuals die of cerebrovascular diseases every year, and the survivals of stoke remain 6~7 million. Both high mortality and high disabled rate caused harm to our country and citizens. Thus, an effective approach of prevention, especially an effective intervention for community population, will be an attractive research field in the distant future in China.

A study of comprehensive interventional measures for community-based population with cerebrovascular diseases, being one of the 8th and the 9th Five-Year National Key Projects, was carried out between 1991~2000. With the leadership of National Office for Prevention and Treatment on Cerebrovascular Disease, three research agencies, including Beijing Institute of Neurosurgery, Institute of Neurology Affiliated to Fudan University, and Institute of Neurology and Xiangya Hospital Affiliated to Central South University, involved in the study. This project was started in three cities with high incidence of stroke, such as Beijing, Shanghai and Changsha in 1991. Two separate and comparable communities were selected from three cities, respectively, of which one community for intervention and the other one for control, and 50 000 participants in every community. The total sample size of all cities was about 300 000 of population. This project includes 2 phases. In the 1st stage from 1991 to 1995, the research target was focused on screening, management and intervention for patients with hypertension; and in the 2nd stage between 1996 and 2000, it emphasized intervention and management for both diabetes and cigarette smoking, in addition to take a continuing intervention for patients with hypertension. The specific measure and its effects are summarized as follows:

4.1.1 Comprehensive Interventions for Community-based Population

1. Medical staff of all-level hospitals in the communities received professional training with necessary knowledge and skills, and also made them qualified for screening and managing the individuals at high risk of stroke.

2. With BP measurement and questionnaire, healthcare practitioners in the basic level hospitals screened most patients with hypertension from the population aged 35 years, and take a period of 2-3month follow-up for monitoring their BP level, in addition, provided them with advise of treatment. The patients were informed how to measure their BP regularly and take appropriate medications of anti-hypertension. It was suggested for the patients to consult physician at necessary, and to adopt proper therapeutic measures.

3. From 1999 to 2000, with a large-scale detection of urinary glucose and plasma glucose, the diabetics were screened from the populationaged over 55 years, and provided them with therapeutic guidance at regular intervals. The measures should be taken to control blood-glucose level, including dietary restriction, enhanced regular exercise and drug therapy.

4. From 1996 to 2000, health education was advocated for cigarette smokers in the interventional community, and a small-scale intensive intervention was performed among smokers with nicotine gum or cigarette substitute.

5. Health education and promotion activities with various forms were carried out in the whole community

population. The brochures and handbooks of stroke prevention were distributed to the houses in 2-3 months; using blackboard to regularly spread the theme; . The 3 ~ 4 lectures of disease-related knowledge and related risk factors, such as hypertension, CHD and diabetes, were provided for the chief of residents' committee, community residents and patients with hypertension every year. The residents were encouraged to take healthy lifestyles, such as restriction of salt intake, regular physical exercises, body weight control, smoking cessation and moderate alcohol consumption.

6. A strict quality control was applied for monitoring of incidence and all-cause deaths of stroke, in order to scientifically evaluate the effects of prevention.

4.1.2 Effects of Comprehensive Interventions

1. From 1991 to 1995, 38% of patients with hypertension had their BP level control at below 160/95mmHg at least 6 months in one year, and the percentage of BP control increased to 46% from 1996 to 2000.

2. A total of 2 273 and 3 015 cases of stroke occurred in intervention community and control community, respectively, between years of 1991 and 2000. As compared with that in control community, a 9-year intervention caused a 11.4% reduction of onset risk of stroke in the intervention community [RR=0.8959; 95% CI (0.8483~0.9460; $p < 0.0001$)], of which, the onset risks of ischemic stroke and hemorrhagic stroke decreased by 13.2% [RR=0.8676; 95%CI (0.8054, 0.9345; p=0.0002)] and 7.2% [RR=0.9283; 95%CI (0.8517, 1.0117; P=0.0899)], respectively. The findings of the study in 3 cities demonstrated that based on the present healthy conditions of Chinese people, it was effective to reduce the incidence of stroke for taking the intervention measures, such as development of intensive health education, health promotion, selective screening, and active intervention in high-risk population of stroke, including patients with hypertension and diabetes. the incidence of stroke could be cut down dramatically with the conduction of Health Education and Promotion Project as well as screening and on the mellitus of population with. The community-based comprehensive interventions were practicable and effective, the mode of intervention can be popularized in more populations of communities in China.

4.2 Case 2: Experiences of Community-based Comprehensive Intervention in CVD in Capital Steel Corporation[4]

The practice of prevention and treatment on CVD in Capital Steel Corporation is a successful model of the functional community of CVD prevention in China. The well-known Capital Steel Corporation Mode of prevention and treatment on CVD was started in 1969, and total about 130 000 residents were covered. The key target was to establish a comprehensive prevention-treatment network with three different levels , which consisted of health-care service of working area and community outpatient of residential area in the factory, special clinics of CVD, and cardiac wards; as well as a comprehensive management network with three different levels, which included healthcare department of hospitals, institute of CVD prevention, and prevention department.

4.2.1 Key Contents of Experience in Capital Steel Corporation

Establish a comprehensive prevention-treatment network with three different levels, which consisted of health-care service of working area and community outpatient department of residential area in the factory, special clinic of CVD, and cardiac wards; as well as a comprehensive management network with three different levels, which included healthcare department, institute of CVD prevention, and prevention department.

Established the medical records of patients with hypertension, which was based on the data from screening, physical examination, as well as detection and diagnosis of hypertension in outpatient department. A classified management was carried out for all patients with hypertension. Defined retest timetable for hypertensive patients with different severity, according to the plan of hypertension management; adjusted therapeutic plan on the basis of BP retest result, until a preferable BP was observed. The patients with unstable or severe hypertension were referred to the special clinic. For the disable patients, community physicians dropped by their home and interviewed them. The referral of patients with hypertension managed by the health-care service of factory would be taken after their retirement; the professionals in institute of CVD prevention documented the cases of deaths. .

Routine interventions were performed in the whole population, including health promotion and education on lifestyle improvement. Intensive interventions were put into practice for high-risk population, including improvement of dietary structure with emphasis on restriction of salt intake, initiation of educational campaigns against smoking, and reduction of body weight.

4.2.2 Characteristics of Prevention Experience in Capital Steel Corporation

1. Developed a management system of CVD, which was based on the residential area and factory, and focused on community. Established a prevention-treatment network with three different levels and had multiple functions in screening, prevention, treatment, management, and research of CVD.

2. There was a stable processional team of CVD prevention in the pilot project. The team included cardiovascular specialists and healthcare practitioners; and it was necessary for the team to ensure a further development of CVD prevention. Through the team, prevention of CVD was popularized in factory, community and family; and also the corresponding plan of prevention was and implemented according to the reality of population.

3. There was a guidance and collaboration of scientific research units in the project. With the guidance and collaboration of scientific research units, such as Beijing Fuwai Hospital, Anzhen Hospital and Beijing University etc., the Establishment and development of prevention and treatment network of CVD was successful with a high start point and a scientific management, in accordance with the realistic conditions of Capital Steel Corporation.

4. Explored a realized approach of CVD management. A management network was established from factory to community and from working site to residential area in behalf of the patients. No matter whether the patient was at working post of factory or retired at home, they would be managed by medical professionals until the end of his/her lifespan.

5. Prevention and treatment of CVD is a long-term systematic project. Since 35 years, intervention of healthy behavior has been implemented persistently for the whole population. The patients with CVD were monitored closely and followed up periodically. A reasonable measure of prevention and treatment was laid out according to the various monitoring parameters.

6. The prime policy of CVD control is to focus on prevention and to combine prevention with treatment. CVD results from the interaction of multiple factors. The incidence of CVD will be reduced by initiation of prevention, popularization of healthcare knowledge, as well as change of improper lifestyle. The patients with CVD have a high percentage of management and an excellent adherence to intervention. The retest rate of CVD is 80% ~ 90%, and BP control rate is 60% ~ 70%. Both incidence and mortality of CVD have decreased progressively, which suggests that the measures of intervention are quite effective.

4.2.3 Evaluation on Effects of Management

4.2.3.1. Evaluation on Effects of 20-year Comprehensive Management in Total of 2 736 Patients with Hypertension from 1974 to 1995

In the beginning of the 1970s, a mass screening of hypertension was implemented in the employees of Capital Steel Corporation, by Institute of CVD Prevention and Treatment of Capital Steel Corporation Hospital. The prevalence of hypertension in the screening was 8% ~ 12%. All detected patients with hypertension were managed uniformly and treated systematically in the year 1974. By the year 1995, the cumulated cases of management for hypertension patients reached 2 736 in 20 years.

Over the management of hypertension, the classified management was used for the patients according to their BP levels. For the patients with 95-104mmHg of diastolic BP (DBP), BP was measured monthly; for those with 105~114mmHg of DBP checked BP in every half a month; if DBP 115mmHg, did weekly. Over the period of management, electrocardiogram (ECG), ocular fundus, and routine urine, etc should be checked regularly. The two approaches of intervention, including drug and non-drug therapies, should be taken. With the persistent efforts of 20 years, the BP levels of 2 736 hypertensives declined annually with the increase of management duration (Figure4-2-3(1)).

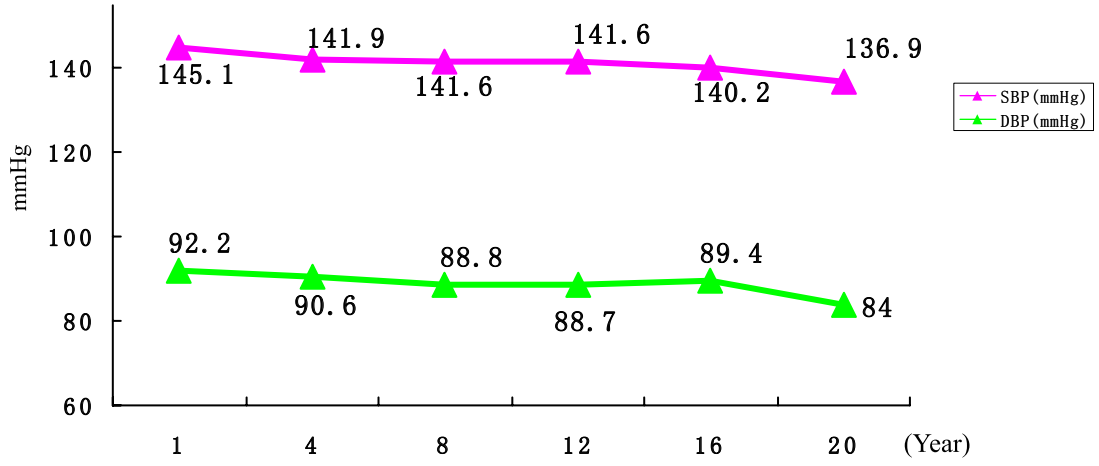

Figure 4-2-3(1) Correlation between BP Levels and the Length of Time among (Male) Hypertensives in Capital Steel Corporation Different Years of Management.

4.2.3.2 Evaluation on Effects of 28-year Surveillance of CVD in the Community of Capital Steel Corporation from 1974 to 2001

The registry of populations with cardiocerebrovascular diseases was started in 1975 in Capital Steel Corporation Hospital, according to the international standards, and made a retrospective investigation on incidence and deaths of cardiocerebrovascular diseases in 1974.

Health Education Project in the community of Capital Steel Corporation was launched in the 1980s, and 1.81 million individuals were enrolled for management in the last 28 years. The incidence of cerebrovascular diseases declined significantly, which was shown in Figure4-2-3(2). The incidence dropped from 138/100 000 to 64/100 000, and at the same time, the mortality decreased from 52/100 000 to 18/100 000. Since 1990s, the incidence and mortality of cerebrovascular diseases inclined stable, but those of myocardial infarction ascended slowly.

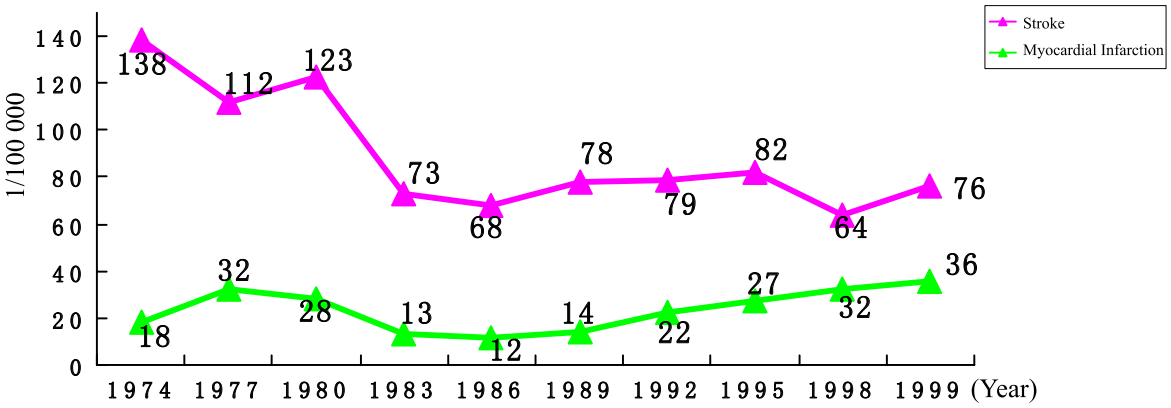

Figure4-2-3(2) Standardized Incidence of Cardiocerebrovascular Diseases in Capital Steel Corporation

The accumulated evidence from so many years of practice demonstrate that the long-term comprehensive interventions can effectively control the BP levels and curtail the incidence and mortality of stroke substantially. The experience from Capital Steel Corporation suggests that the CVD should be preventable.

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Chapter 5
Medical Expenditure of Cardiovascular Diseases

5.1 Burden of Disease of Cardiovascular Diseases in China

In World Banks World Development Report: Investing in Health published in 1993, a new indicator of Burden of Disease (BOD) was formally proposed as the disability-adjusted life years (DALYs)[1]. Since then, there has emerged a global trend of focusing on the research results concerning BOD, and by using DALYs as the indicator of BOD to identify major local health issues existing in different regions.

DALYs is a summary measure for years of life lost (YLL) due to premature death and disability years lost to disability, YLD of a given population (in a particular country or region), namely, it is not only applied to estimate YLL due to premature death, it also evaluates lost years of healthy life owing to disability. One DALY is equivalent to one lost year of healthy life and represents a gap between the current health status and an ideal situation.

In recent years, WHO has been constantly improving the calculation methods of DALYs by adopting in sequence two types of commonly used formulas (details in Notes) to measure BOD in different countries and regions (including China), however, the core content of both formulas remains the same as potential healthy life year loss due to premature death and disability. On the basis of these two types of formulas, this chapter calculates the DALYs of diabetes, coronary heart disease and stroke in China, as well as of coronary heart disease and stroke in Beijing. Meanwhile, the chapter also collects relevant data from WHO and domestic sources concerning these measurements.

5.1.1 BODs of Diabetes, Coronary Heart Disease and Stroke in Chinese Population

Table 5-1-1 lists the losses of DALYs caused by diabetes, coronary heart disease CHD and stroke in the 1980s, the 1990s and the year 2002. It can be observed that the BODs of the three diseases have increased yearly, of which, the BOD of stroke ranks the top.

Table 5-1-1 BODs of Diabetes, CHD and Stroke in Chinese Population DALYs/1 000 Persons

Year	Formula A			Formula B		
	Diabetes	CHD	Stroke	Diabetes	CHD	Stroke
1980	0.71(1980)	—	6.56(1986)	0.90(1980)	—	8.12(1986)
1990	1.23（1994）	1.77（1993）	9.23（1993）	1.59（1994）	2.30（1993）	11.93（1993）
2002	1.97	—	—	2.57	—	—
WHO Data	—	3.74*(1990)	11.21*(1990)	1.61#(2002)	3.94#(2002)	11.18#(2002)

Notes: The concrete years of DALY calculation are showed in parentheses.

* 1990 WHO data come from *World Development Report 1993*: Investing in Health [M]. Beijing: China Financial & Economic Publishing House, 1993.

2002 WHO data come from Death and DALY estimates for 2002 by cause for WHO Member States. http://www.who.int/healthinfo/bod/en/

In addition, Wang Jiansheng et al. calculated the YPLL caused by hypertension and diabetes, according to the results of year 2002 survey on nutrition and health of Chinese residents. The results of YPLL revealed a total 2.54-million years of life lost owing to premature death of hypertension (1.98/1 000 persons), and the premature death of diabetes caused a total 1.3-million years of life lost(1.01/1 000 persons).

5.1.2 BODs of Coronary Heart Disease and Stroke in Beijing

Table 5-1-2 lists the losses from DALYs caused by coronary heart disease and stroke in the 1980s, the 1990s and the year 2002 in Beijing. It can be observed that BODs of both diseases have increased yearly, among which, BOD of stroke greatly exceeded that of CHD.

Table 5-1-2 BODs of Coronary Heart Disease and Stroke in Beijing DALYs/1 000 Persons

Year	Formula A		Formula B	
	CHD	Stroke	CHD	Stroke
1984	0.89	6.95	0.79	8.59
1993	4.72	13.28	6.57	16.43
2000	7.99	17.28	11.27	22.29

Notes: DALYs of coronary heart disease in 1984 are calculated on the basis of incidence and specific death rate of AMI.

The 2000 DALYs of Stroke reflect the average BOD of both year 1998 and 1999.

In addition, the DALYs of Coronary Heart Disease and Stroke in Beijing in year 2002 was calculated by BJCDC, the value was 8.13/1 000 and 15.77/1 000 persons, respectively (Formula A)[2].

5.1.3 Parameter Selection and Data Sources for DALYs Calculation

In calculation of DALYs, the selection of various parameters was based on the unified standards of WHO global BODs, as listed in Table 5-1-3; the gender- and age-specific mortality, prevalence and incidence of diabetes, CHD and stroke, as well as the literature sources of population data in Beijing and in China nationwide totally showed in Table 5-1-4.

Table 5-1-3 Parameter Selection of DALYs Calculation (WHO)

Parameter	Value
D	Diabetes: 0.0605, Coronary Heart Disease: Male, 0.317, Female, 0.297 Stroke: 0.27
r	0.03
K	1
β	0.04
C	0.1658

Note: On the basis of 2001 WHO-published value, Parameter D for Diabetes and Coronary Heart Disease is adjusted and calculated according to the proportion[3] of diabetic complications and proportion[4] of AMI amongst Acute Coronary Heart Disease .

Table 5-1-4 Literature Sources of DALYs Calculation

	Indicator	Year	Literature Source
Diabetes	Gender and Age-specific Prevalence	2002	Wang Longde et al. ed. Survey Report of Nutrition and Health Status of Chinese Residents: 2002 Comprehensive Report[M]. Beijing: People's Medical Publishing House, 2005: 59.
	Gender and Age-specific Death Rate	1987, 1994, 2003	1. Ministry of Health, P. R. China. National Health Statistical Yearbook, 1987 and 1994. 2. Ministry of Health, P. R. China. National Health Statistical Yearbook, 2004[M]. Beijing: Peking Union Medical College Press, 2004.
Coronary Heart Disease	Gender and Age-specific Incidence and Specific Death Rate	Data from 16 Chinese Provinces and Municipalities in 1993 as well as Beijing in 2000	China Monica Research Project Led by Beijing Heart Lung & Blood Vessel Disease Institute
		Data from Beijing in 1984 and 1993	1. Wu Zhaosu, Hong Zhaoguang, Yao Chonghua, et al. SIno-monica-Beijing Study: Report of the Results between 1983～1985 [J]. Chinese Medical Journal, 1987; 100(8):611～620 2. Wang Wei, Wu Zhaosu, Zhao Dong et al. A Discussion of the Developing Trends and Influencing Factors of Mortality Rates from Acute Coronary Heart Disease in Beijing, 1984～1993 [J]. Journal of Cardiovascular and Pulmonary Diseases, 1997,16 (2):99～102
Stroke	Gender and Age-specific Incidence and Specific Death Rate	Data from Beijing and 16 Chinese Provinces and Municipalities in 1993	China Monica Research Project Led by Beijing Heart Lung & Blood Vessel Disease Institute
		Nationwide Data in 1986 and Beijing Data in 1984, 1998～1999	1. Xue Guangbo, Yu Bingxue, Wang Xiaozhong et al. Epidemiological Studies of Cerebrovascular Diseases in Rural and Urban China[J]. Academic Journal of Second Military Medical University, 1991, 12 (2): 207 2. Wu Zhaosu, Hong Zhaoguang, Yao Chonghua, et al. Sino-monica-Beijing Study: Report of the Results between 1983～1985 [J]. Chinese Medical Journal, 1987; 100(8):611～620 3. Wang Wenhua, Zhao Dong, Wu Guixian et al. An Analysis on the Developing Trends of Stroke Prevalence in Beijing, 1984～1999[J]. Chinese Journal of Epidemiology, 2001, 22 (4): 269～272
All Three Diseases	Data Sources of Gender and Age-specific Population and Death Rate	1982	1. Census Office of State Council and Division of Population Statistics, National Statistics Bureau. China 1982 Population Census Data[M]. Beijing: China Statistics Press, 1984. 2. Beijing Municipal Census Office. Third Beijing Population Census Data Collection[M]. Beijing: China Statistics Press, 1984.
		1990	1. Census Office of State Council and Division of Population Statistics, National Statistics Bureau. China 1990 Population Census Data (Volume II and IV)[M]. Beijing: China Statistics Press, 1993. 2. Beijing Municipal Census Office. Beijing 1990 Population Census Data (Volume I and II)[M]. Beijing: China Statistics Press, 1993.
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5.2 Sales of Cardiovascular Disease Medicine

In 2007, the total amount of medicine purchase in hospitals with 100 beds was calculated at 151.5-billion RMB; amongst which the total purchase of cardiovascular medicine was 17.98-billion RMB. The top five types of medicine were Cereb. + Periphe.Vasotherap, All Other Cardiac Preps, Calcium Antagonists Plain, Cholest &Trigly Regulator and Angiotens-II Antag. (Table 5-2-1)

Table 5-2-1 Top 15 Cardiovascular Medicine in 2007 (RMB 10 Million)

Types of Medicine	**2007**
Cardiovascular Medicine Total	179.80
Cereb. + Periphe.Vasotherap*	56.55
All Other Cardiac Preps	26.22
Calcium Antagonists, Plain	19.47
Cholest &Trigly. Regulator	11.71
Angiotens-II Antag., Plain	10.42
Coronary Therapy (Not Including Calcium Antagonists Plain and Nitrites)	8.84
ACE Inhibitors, Plain	8.22
Nitrites & Nitrates	8.15
Systemic Vasoprotectives	5.21
Beta Blocking Agent Plain	4.68
Antiadrenergic and Central Antihypertensives	1.85
Diuretics	1.78
Angiotens-II Antag., Comb.	1.19
Positive Inotropic Agents	1.04
Antiarrhythmics	0.92
Others	13.55

Note: Cereb. + Periphe.Vasotherap includes Herba Erierontis, Deproteinized Calf Blood Extractives Injection, Ginkgo Leaf Extract and Dipyridamole Injection, Ginatol, Ginkgo Biloba Extract, Egb, Interactions of Ginkgo biloba extract, Duxil, Flunarizine Hydrochloride Capsules, Mailuoning and Deproteinized Calf Blood Extractives Injection, etc..

Source: data collected by Market Research Consulting (Shanghai) Co., Ltd. Beijing Branch from over 1000 hospitals in more than 170 Chinese cities, including Chemicals and Chinese Traditional Patent Medicines that have proven curative effects and follow western formulation processes, such as Salvia Miltior. Co, Ginkgo Leaf formulation and Herba Erierontis, etc.

5.3 An Explanation on the Content and Data Quoted in this Report

The medical expenditure of cardiovascular disease in 2007: In view of the 4th National Health Service Survey, being carried out by the Center for Health Statistics Information attached to Ministry of Health in 2008, the medical expenditure of cardiovascular disease(CVD) in 2007 wont be calculated in this annual report. Instead of calculation, we described BODs and its tendency of development in the major cardiovascular diseases (coronary heart disease and stroke) and diabetes.

- DALYs Calculation:

Formula A[5] :

$$DALYs = \int_{a}^{a+l} D[KC_{xe}^{\beta x} + (1 - K)]e^{r(x-a)}d_x$$

$$= \frac{KDC_e^{\beta}}{(\beta + r)^2}\{e^{-(\beta+r)l}[1 + (\beta + r)(L + a)] - [1 + (\beta + r)a]\} + \frac{D(1-K)}{r}(1 - e^{-rl})$$

Formula B[6]:

$$DALYs = YLL + YLD$$

$$YLL = N \times L$$

$$YLD = I \times DW \times L$$

WHO announced Formula A in the year 1993 and Formula B in the year 2001. Though the core contents of both formulas all includes YLL and YLD, formula A gives a comprehensive consideration to various parameters such as disability weight, discount rate, age-weight adjusting factors, etc.; while formula B preserves merely the disability weight parameter. Therefore, in this report, we adopt the same original data in both formulas, and obtain different results. Besides, there still exist quite a few controversies concerning the DALYs calculations, such as disability weight, age-weight adjusting factors, etc..

The selected parameters (disability weight, discount rate, etc.) used for the calculation of BODs can be found on WHO official website; the data regarding the incidence and mortality of diabetes come mainly from the relevant literatures and National Health Statistics Yearbook; the gender- and age-specific mortality, incidence and prevalence rate of coronary heart disease and stroke are mainly drawn from MONICA China Monitoring Project organized by Beijing Anzhen Hospital; the data of gender- and age-specific population and mortality are provided by the national population census statistics in the years 1982, 1990 and 2000. In calculating DALYs, this report has not adopted the standard international life expectancy data recommended by WHO, instead, life expectancies in China and Beijing are calculated on the basis of the national population census statistics in 1982, 1990, 2000.

In calculation of DALYs, we used DISMOD, mainly for the following purposes:

(1) Transfer the indicator values in original data (such as age-specific prevalence, incidence and mortality without use for all-age groups) into indicator values with use for all-age groups.

(2) Due to the inconsistency at various levels existing among the prevalence rate, incidence and mortality in the original data, this report applied DisMod software to performe an internal consistency testing for those indicators, such as incidence, prevalence rate, and mortality. During the test, we also made certain adjustments to the tested indicator values , based on relevant research reports (the level of proved evidence is consistent with the requirements of the annual report) and expert consultations.

(3) By the application of DisMod, we calculated the related unknown indicators in DALYs calculation, for example, prevalence and course of disease, on the basis of those known indicators amongst the 7 indicators, such as prevalence rate, incidence, remission rate, mortality , RR value, course of disease and average age of onset.

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