

Summary



Summary of Report on Cardiovascular Diseases in China, 2012

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The prevalence of cardiovascular diseases (CVDs) is associated with the socioeconomic prosperity, lifestyle changes, accelerated process of ageing and urbanization. The prevalence of CVDs is continuously increasing in China and will remain an upward trend in the next 10 years. CVDs are the leading cause of death for Chinese in both urban area and rural area. Nowadays, 41.09% of deaths in rural area and 41.52% of deaths in urban area are caused by CVDs in China. The burden of CVDs remains heavy and has become an important public health problem. Effective strategies should be enforced urgently for the prevention of CVDs under the supervision of the government. In 2012, the Ministry of Health of China and 14 governmental departments jointly issued the *Work Plan for Chronic Disease Prevention and Control in China (2012-2015)*, a guideline for the prevention of chronic diseases, especially CVDs in China.

Authorized by the Bureau of Disease Prevention and National Health and Family Planning Commission of China, National Center for Cardiovascular Diseases (NCCD) of China organizes the experts of cardiology, neurology, nephrology, diabetes, epidemiology, community health, health economics and biostatistics and other related fields to compile the annual report on CVDs in China. Seven reports have been published since 2005, which is an authoritative document for the CVDs prevention and control in China and frequently used by relevant leaders, experts and researchers.

This paper summarizes the main contents of the *Report on Cardiovascular Diseases in China, 2012*:

1. Prevalence of Cardiovascular Diseases

In general, the prevalence of CVDs (including heart disease and cerebrovascular disease) is continuously increasing in China. It is estimated that the number of patients with CVDs is 290 million, in which 266 million have hypertension, more than 7 million are attacked by stroke, 2.5 million have a

myocardial infarction (MI), 4.5 million have cardiac failure, 5 million have pulmonary heart disease, 2.5 million have rheumatic heart disease, and 2 million have congenital heart disease. One of 5 adults is afflicted by CVDs.

2. Mortality of CVDs

It is estimated that 3.5 million patients die of CVDs every year, which accounts for 41% of all deaths. Averagely 9 590 Chinese die of CVDs each day, i.e. 400 deaths per hour and 1 death every 10 s (Figure 1 and 2).

3. Continuous Increase of Cardiovascular Risk Factors

3.1 Hypertension

Hypertension is the primary risk factor for stroke and coronary heart disease. More than half of CVDs are associated with hypertension in China.

3.1.1 Hypertension prevalence The prevalence of hypertension in adults aged >18 year was 18.8% according to a National Survey in 2002, and increased to approximately 25% in recent years according to the reports from various provinces or municipalities. In some areas in northern China, the prevalence was as high as 30%. It is estimated that 266 million Chinese are hypertensive, indicating that 2-3 of 10 adults are afflicted with hypertension. The prevalence of hypertension in both males and females increased from 1979 to 2002. The difference in hypertension prevalence between rural residents and urban residents is not obvious. It was 19.3% in urban residents and 18.6% in rural residents in 2002.

3.1.2 Hypertension incidence An eight-year follow-up study among 10 525 people aged >40 years indicated that the estimated annual incidence of hypertension was 3% in China.

3.1.3 High-normal blood pressure According to a survey in 2002, the prevalence of high normal blood pressure in adults aged >18 years was 34% in China. There were 300 million people with high-normal blood pressure. Compared with

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normotensives, the risk of hypertension and CVDs in people with high normal blood pressure increased by 3.2 and 1.74, respectively. Half of people with high-normal blood pressure will develop hypertension in 10 years.

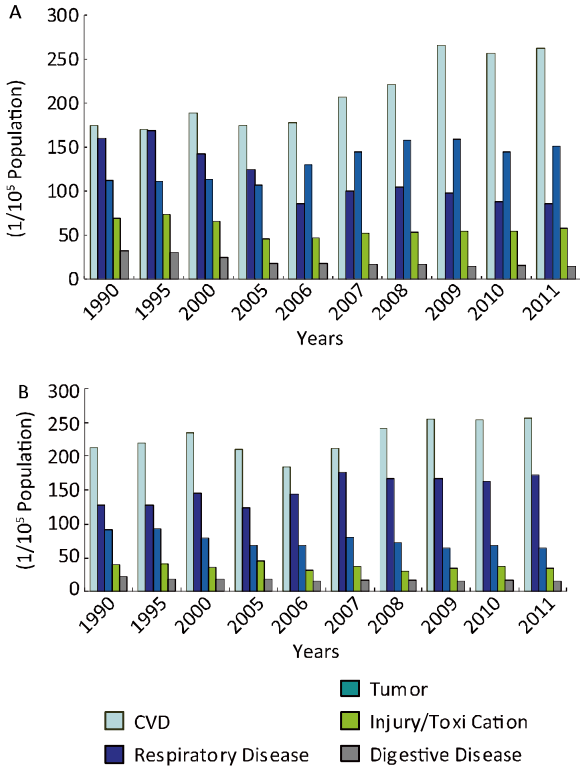


Figure 1. A: Mortality of major diseases in rural area in China, 1990-2011; B: Mortality of major diseases in urban area in China, 1990-2011.

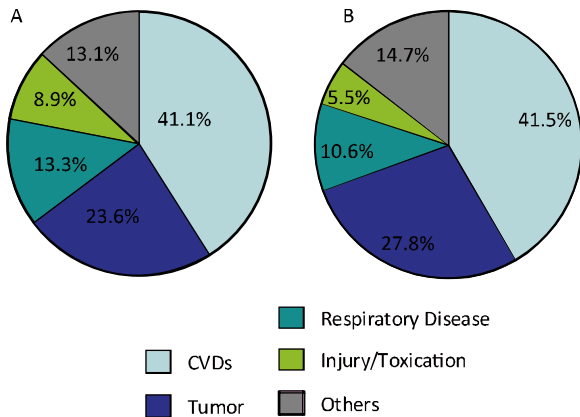


Figure 2. A: Death constituents of major diseases in rural area in China; B: Death constituents of major diseases in urban area in China.

3.1.4 Rate of awareness, treatment and control of hypertension According to a National Survey in 2002, the awareness, treatment and control rates of hypertension in China were 30.6%, 24.7%, and 6.1% respectively. The rate of blood pressure control reached 25% by treatment for hypertensive patients. The rates of awareness, treatment and control of hypertension were lower in rural area than those in urban area, and the differences among different areas were statistical significant. At the out-patient departments of cardiology, nephrology and endocrinology in tertiary hospitals, the rate of blood pressure control was only 30.6% in hypertensive patients aged >18 years.

3.1.5 The major risk factors of hypertension are high-salt diet, overweight/obesity, excessive consumption of alcohol, physical inactivity and chronic stress, etc.

3.1.6 Prevalence of hypertension in adolescents According to a survey conducted among Chinese children and adolescents aged 6-17 years in seven provinces, municipalities and autonomous regions, the prevalence of hypertension increased significantly from 7.1% in 1991 to 14.6% in 2004 with an annual increase of 0.58%.

3.1.7 Compared with children with normal body weight, the relative risk of hypertension among those who were overweight, obese or abdominal obese was 2.9, 6.0, and 4.6, respectively.

3.2 Cigarette Smoking

3.2.1 Prevalence of smoking Despite non-smoking rate increased slightly in people aged >15 years in recent years, China still faces significant challenges in smoking control. According to the report of the Global Adult Tobacco Survey (GATS) 2010, there are 350 million active smokers and 540 million passive smokers in China. The smoking rate has reached a plateau in males, but is slightly increasing in young females. During 2002-2010, the smoking rate among people aged 40-59 years showed an upward trend.

3.2.2 Trend in smoking cessation The proportion of people trying smoking cessation increased from 9.42% in 1996 to 11.5% in 2002, and up to 16.9% in 2010. The people who stopped smoking increased by 15 million. The rate of passive smoking didn't changed in recent 10 years.

3.2.3 Generally, smoking rate was significantly higher in rural residents than in urban residents (29.8% vs 26.1%). It was higher in rural males than in urban males (56.1% vs 49.2%). but it was significantly higher in urban females than that in

rural females (2.6% vs 2.2%).

3.2.4 The direct economic loss due to smoking was calculated to be 166.56 billion yuan RMB, the indirect economic loss was 86.111-120.501 billion yuan RMB, and the total economic loss was about 300 billion yuan RMB in 2005, accounting for 1.5% of Gross Domestic Product (GDP).

3.3 Dyslipidemia

3.3.1 The prevalence of dyslipidemia in Chinese shows an upward trend, and the increase in juveniles is of particularly concern. According to the National Health and Nutrition Survey in 2002, the prevalence of dyslipidemia was 18.6% in adults. Among the dyslipidemia cases, 2.9% was hypercholesterolemia [total cholesterol (TC ≥ 5.72 mmol/L)], 11.9% was hypertriglyceridemia (TG ≥ 1.70 mmol/L), 7.4% was low high-density-lipoprotein-cholesterol (HDL-C < 1.04 mmol/L). It is estimated that dyslipidemia affects at least 250 million people in China.

3.3.2 According to a survey conducted in 31 provinces and municipalities in 2002, the awareness rate of dyslipidemia (TC ≥ 5.72 mmol/L, and/or TG ≥ 1.70 mmol/L, and/or HDL-C < 0.91 mmol/L) in adults was only 3.2% (3.4% in males and 2.7% in females). The lipid examination rate was 6.4%. Two rates increased markedly with age and were higher in urban area than in rural area.

3.3.3 According to the National Health and Nutrition Survey in 2002, the prevalence of hypercholesterolemia [TC ≥ 220 mg/dL (5.72 mmol/L)] was 0.8% in children and adolescents (3-18 years), 1.4% in urban area and 0.6% in rural area. The prevalence of hypertriglyceridemia [TG ≥ 150 mg/dL (1.70 mmol/L)] was 2.8%, 2.5% in urban area and 2.9% in rural area.

3.3.4 According to a study of diabetes and abnormal metabolism in 14 provinces, municipalities and autonomous regions in China during 2007-2008, the prevalence of high level of LDL-C (4.14-4.91 mmol/L) and very high level of LDL-C (≥ 4.91 mmol/L) in adults was 3.5% and 3.0%, respectively.

3.4 Diabetes

3.4.1 According to a survey conducted among 46 239 adults aged >20 years in 14 provinces and municipalities by Diabetes Division of Chinese Medical Association during 2007-2008, the age-standardized prevalence of diabetes was 9.7%, 10.6% in males and 8.8% in females. The prevalence of diabetes increased with age and body weight. It was 3.2%, 11.5%, and 20.4% in people aged 20-39, 40-59, and ≥ 60 years, respectively. The prevalence of impaired glucose tolerance was higher than that of

impaired fasting glucose (11.0% vs 3.2% in males and 10.9% vs 2.2% in females).

3.4.2 The 20-year follow-up study in Daqing It has been confirmed that lifestyle interventions have a long-term effect on prevention of diabetes. The cumulative incidence of diabetes was 80% in intervention group and 93% in control group. For preventing 1 diabetes case, intervention should be given to 6 people. After adjusted by multiple factors, the incidence of diabetes in intervention group decreased by 43% compared with the control group. The disease course of the subjects in the intervention group was averagely 3.6 years shorter than that in the control group. In addition, the incidence of severe retinopathy (blindness or complication which need laser treatment) decreased by 47% due to lifestyle improvement.

3.4.3 Multicenter intervention study over 3 years with combination of lifestyle improvement and drug treatment showed that the annual natural incidence of diabetes in people with impaired glucose tolerance was 11.6%, 8.2% in lifestyle improvement group, 4.1% in metformin plus lifestyle improvement group and 2.0% in acarbose plus lifestyle improvement group; these two drugs reduced the risk of diabetes by 76.8% and 87.8%, respectively.

3.5 Overweight/obesity

3.5.1 According to the National Health and Nutrition Survey in 2002, the prevalence of overweight (BMI 24-27.9 kg/m²) was 17.6% and the prevalence of obesity (BMI ≥ 28 kg/m²) was 5.6%. It is estimated that the number of overweight and obese people aged >18 years might be as high as 240 million and 70 million, respectively according to the population in 2006. The prevalence of overweight and obesity increased significantly.

3.5.2 The National Health and Nutrition Survey made a long term observation on Chinese diet and health status in 9 provinces and municipalities. The results indicated that in the past 20 years the prevalence of overweight/obesity in China was in an upward trend. The prevalence of overweight, obesity and central obesity (waist circumference ≥ 85 cm in males and ≥ 80 cm in females) was 30.0%, 8.7%, and 45.3%, respectively in 2009.

3.6 Physical Inactivity

3.6.1 The National Health and Nutrition Survey showed that the physical activities in residents aged 18-55 years were mainly conducted in workplace and at home. Leisure activities increased, while other forms of activities decreased. Compared with

1997, the total physical activities decreased by 27.8% in males and by 36.9% in females in 2006.

3.6.2 According to the data from the Third National Sports Exercises Survey, 28.2% of Chinese aged >16 years, including school students, took regular exercises (≥ 3 times per week, each time ≥ 30 min). Whereas, the rate of taking regular exercises in age group 20-49 years was significantly lower than those of other age groups.

3.7 Diet and Nutrition

3.7.1 In general, the Chinese dietary pattern has been markedly improved, but some diet habits are still problematic. The intake of grain decreased significantly, whereas the intake of fat increased dramatically. The daily intake of salt (more than 12 g/d) was much higher than the level recommended by dietary guidelines (<6 g/d). The consumption of vegetables and fruits was also not enough.

3.7.2 Long-term observation made by the National Health and Nutrition Survey in 9 provinces and municipalities in China showed that the total energy intake significantly declined, but the percentage of total energy from fat was much higher than the level recommended by the dietary guidelines (30%). While the percentage of total energy from carbohydrates decreased according to the dietary guidelines (55%-65%). The dietary cholesterol intake increased obviously. Although the dietary calcium intake increased slightly, it was only half of the recommended level (800 mg/d).

3.8 Chronic Kidney Diseases

The first national study on chronic kidney disease (CKD) in China recruited 47 204 subjects from 13 provinces and municipalities. CKD was defined as eGFR less than 60 mL/min per 1.73 m² or the presence of albuminuria. The result indicated that the overall prevalence of CKD was 10.8%, the adjusted prevalence of eGFR less than 60 mL/min per 1.73 m² was 1.7% and of albuminuria was 9.4%. The number of patients with CKD in China is estimated to be about 120 million. Among CKD patients, only 12.5% are aware of their disease status. Factors independently associated with CKD were age, sex, hypertension, diabetes, history of cardiovascular disease, hyperuricaemia, living area and economic status.

4. Mortality and Status of CVDs

In 2011, CVDs ranked first among all causes of death, higher than tumor and other diseases.

4.1 Coronary Heart Disease

4.1.1 The mortality of coronary heart disease was 86.34 per 100 000 in urban area and 69.24 per

100 000 in rural area in 2010. The mortality was higher in males than that in females.

4.1.2 The mortality of acute myocardial infarction increased dramatically in rural residents in recent years, which is close to the level of urban residents.

4.1.3 The age-standardized incidence of acute coronary heart disease was 166.4 per 100 000 in local residents in Beijing from 2007 to 2009 (218.5 per 100 000 in males and 115.2 per 100 000 in females). It was 144.3, 154.7, and 195.8 per 100 000 in urban, suburban and exurban areas, respectively. The age-standardized incidence increased by 8.1% in 2009 compared with 2007, the increase in males (11.1%) was greater than in females (2.5%). The incidence increased by 30.3% in 2009 compared with 2007. The highest increase was in males aged 35-44 years.

4.1.4 Based on the data from the fourth family health survey in 2008, the overall prevalence of ischemic heart disease was 7.7‰, 15.9‰ in urban area and 4.8‰ in rural area, indicating 7.70 million Chinese had ischemic heart disease. Compared with the data of the third survey in 2003 (4.6‰, 12.4‰ for urban residents and 2.0‰ for rural residents), the prevalence of ischemic heart disease increased considerably.

4.1.5 The 2007-2008 China National Diabetes and Metabolic Disorders Survey randomly recruited 46 239 adults aged >20 years, the prevalence of coronary heart disease was 0.74% in males and 0.51% in females.

4.2 Stroke

4.2.1 The mortality of cerebrovascular disease in 2010 was 125.15 per 100 000 for urban residents and 145.71/100 000 for rural residents. It was estimated that 833 000 urban residents and 982 000 rural residents died of cerebrovascular disease in 2010. In general, the death rate was higher in rural area than in urban area, and in males than in females.

4.2.2 The crude death rate of cerebrovascular disease in 2009 increased by 1.41 times in urban area, and by 1.44 times in rural area compared with 2006, but the rate declined in 2010 in both urban residents and rural residents compared with 2009.

4.2.3 The incidence of stroke is high in China. The number of patients who had stroke is 4-5 times of the number of patients who had myocardial infarction.

4.2.4 The prevalence of cerebrovascular disease

in China was 9.7‰ in 2008, indicating more than 9.7 million Chinese were afflicted with cerebrovascular disease.

4.2.5 From September 2007 to August 2008, 14 702 patients who had ischemic stroke were recruited in Chinese National Stroke Registry (CNSR) Study. Among 11 675 patients with known time of stroke onset, 2514 (21.5%) arrived at emergency departments within 3 h, 1 469 (12.6%) were eligible for thrombolytic treatment, and 284 (2.4%) were finally treated, 181 (1.6%) received intravenous rtPA. The median onset-to-needle time was 180 min (interquartile range, 150 to 228 min); the median door-to-needle time was 116 min (interquartile range, 70 to 150 min); the median imaging-to-needle time was 90 min (interquartile range, 60 to 129 min). Patients with younger age arrived at emergency departments more quickly. The patients with higher National Institutes of Health Stroke Scale scores, having higher income and higher education had a better chance of receiving intravenous rtPA. Approximately 1 of 5 stroke patients who arrived at emergency departments within 3 h received thrombolytic therapy. The onset-to-needle time, door-to-needle time and imaging-to-needle time were significantly longer than those in developed countries.

4.3 Atrial Fibrillation

4.3.1 The prevalence of atrial fibrillation is 0.65% in Chinese aged >30 years, indicating that about 4.20 million Chinese have atrial fibrillation. Among all atrial fibrillation patients, the prevalence of valvular atrial fibrillation, nonvalvular atrial fibrillation and isolated atrial fibrillation is 12.9%, 65.2%, and 21.9%, respectively. The incidence of stroke in patients with atrial fibrillation is significantly higher than that of patients without atrial fibrillation (12.1% vs 2.3%).

4.3.2 A retrospective study among hospitalized patients of cardiology departments in 22 provincial hospitals showed that the prevalence of arrhythmia was 26.8%. Among all arrhythmia patients, the rate of patients with atrial fibrillation was highest (35.0%), followed by paroxysmal supraventricular tachycardia (28.0%), sick sinus syndrome (11.9%) and ventricular premature beat (11.6%).

4.4 Sudden Cardiac Death

The annual incidence of sudden cardiac death (SCD) in China is 41.8 per 100 000, and it is higher in males than in females (44.6/100 000 vs 39.0/100 000). Significantly higher SCD incidence is observed in people aged >25 years (61.7/100 000 for

males and 53.3/100 000 for females). It is estimated that 544 000 sudden cardiac deaths occur annually in China.

4.5 Lower Extremity Arteriosclerosis Disease

The prevalence of lower extremity arteriosclerosis disease (LEAD) is 3.04% in China, but the awareness rate of LEAD was only 1.38%. The prevalence is about 25% among patients aged >50 years with coronary heart disease and diabetes. In Beijing, one fifth of people aged >60 years suffer from LEAD.

4.6 Heart Failure

The prevalence of heart failure is 0.9% in China (0.7% in males and 1.0% in females). The prevalence increases obviously with age ($p < 0.01$). It is higher in northern China than in southern China (1.4% vs 0.5%, $P < 0.01$) and higher in urban area than in rural area (1.1% vs 0.8%). In recent 30 or 20 years, the main cause of heart failure changed from rheumatic valvular heart disease to coronary heart disease.

4.7 Prevalence of Congenital Heart Disease

4.7.1 An survey conducted in several regions in China reported that the prevalence of congenital heart disease in perinatal fetus ranged from 6.8‰ to 14.39‰. If 8‰ was used for the estimation, there would be about 160 000 newborn babies with congenital heart disease each year in the mainland of China.

4.7.2 The monitoring report of birth defects in China indicates that the incidence of congenital heart disease is between 0.7‰ and 7.32‰ and increases over time.

4.7.3 Based on a cross-sectional study in some areas in China, the prevalence of congenital heart disease ranges from 1.30‰ to 17.0‰, usually 2‰-8‰.

5. Treatment for Cardiovascular Disease

5.1 Cardiac Surgery

Number of cardiac surgeries in China. The number of cardiac surgeries was 187 983 in 2011, an increase of 10.3% compared with 2010. Of these surgeries, 150 787 were performed on-pump. 156 heart transplant surgeries were conducted in 2011, an increase of 13.2% compared with 2010. The total number of oxygenator used in 2010 was 13 670, an increase of 88% compared with 2004.

A total of 2 541 patients who underwent coronary artery bypass grafting (CABG) in Beijing were followed up for 5 years, and the results showed that in comparison with non-smoking, persistent smoking after CABG was associated with higher rates of all-cause mortality, cardiovascular mortality, major adverse cardiovascular events and angina.

A retrospective study conducted in Beijing analyzed the post-operation data of 2 277 patients with rheumatic heart disease, the result indicated that age, mitral valve orifice area, left atrium diameter and atrial fibrillation were the major risk factors for left atrial thrombosis.

The validation study for Sino System for Coronary Operative Risk Evaluation (SinoSCORE) suggested that SinoSCORE seems to be more suitable than EuroSCORE in predicting postoperative mortality for off-pump coronary artery bypass patients in China.

5.2 Arrhythmia

5.2.1 Pacemaker implantation. The total numbers of pacemaker implantation continued to increase, 42 986 pacemakers were implanted in 2011, an increase of 10.9% compared with 2010, in which 50.6% were for sick sinus syndrome, 39.0% were for atrioventricular block.

5.2.2 Implantable cardioversion-defibrillator (ICD) implementation. Totally 1 288 cases received ICD implantation in 2011, an increase of 19.6% compared with 2010, 14.7% of them (179 cases) were dual chamber ICD implantation.

5.2.3 Cardiac resynchronization therapy (CRT) implantation. Totally 1822 cases received CRT implantation in 2011, an increase of 19.3% compared with 2010.

5.2.4 Radiofrequency ablation (RF ablation). Totally 63 355 cases received RF ablation in 2011, an increase of 16.1% compared with 2010, in which 56% were for supraventricular tachycardia, 26.5% were for atrial flutter and 13.9% were for atrial fibrillation.

6. Community-based Prevention and Treatment of CVDs

6.1 Prevention and treatment of CVDs in community

The prevention and treatment of CVDs in Capital Iron and Steel Company conducted by Fuwai Hospital in Beijing in 1969 was the first model of community-based healthcare program in China. The incidence of stroke was reduced by 50% via adequate BP control. The prevention and treatment of CVDs in China experienced a series of changes over past 4 decades and has gradually become a government-sponsored and multi-sectoral coordinated program.

6.2 Standardized Management for Hypertension in Community in Hebei Province

In April, 2007, physicians from communities in Hebei province were invited to participate the

program of 'National Community-based Standardized Management for Hypertension'. More than 1 100 doctors from 206 communities in 67 counties of 8 cities received the training. They were responsible for the management of 41 800 hypertension patients. The patients' BP decreased by 14.8/8.2 mmHg and the control rate increased from 8.9% to 77.3% after intervention.

7. Costs of CVDs

7.1 Number of Patients with CVDs Discharged from Hospital

7.1.1 A total of 12.896 million patients with CVDs were discharged from hospitals in 2011, which accounted for 12.0% of the total discharges. Of these, 6.709 million were heart disease patients and 6.187 million were cerebrovascular disease patients. Most CVDs patients discharged from hospitals in 2011 had ischemic heart disease (4.463 million, including 297 000 AMI) and cerebral infarction (3.726 million), accounting for 34.6% and 28.9% of total CVDs patients, respectively. The other discharged patients had hypertension (2.016 million), diabetes mellitus (2.127 million), cerebral hemorrhage (1.199 million) and rheumatic heart disease (0.23 million).

7.1.2 The average annual increase in the number of CVDs patients discharged (9.4%) during 1980-2011 was higher than that of all diseases (6.00%). The average annual increase in discharge rates was highest for diabetes mellitus (14.1%), followed by cerebral infarction (12.3%), ischemic heart disease (11.6%), cerebral hemorrhage (10.5%), AMI (8.9%), hypertension (8.1%), hypertensive heart disease and renal disease (5.2%).

7.2 Costs of Hospitalization for CVDs

The cost of hospitalization in 2011 was 4.99 billion yuan RMB for AMI, 14.16 billion yuan RMB for cerebral hemorrhage, and 22.3 billion yuan RMB for cerebral infarction. The expenditure for each hospitalization was 16 793 yuan RMB for AMI, 11 802 yuan RMB for cerebral hemorrhage, and 7 325 yuan RMB for cerebral infarction. The annual increase in expenditure for each hospitalization due to the above diseases since 2004 was 7.0%, 5.4%, and 1.6%, respectively.

7.3 Cost of Medicines for CVDs

The total cost of medicines in hospitals with >100 beds was 366 billion yuan RMB in 2011, in which 46 billion yuan was spent on medicines to treat CVDs. The first five classes of medicine were those to improve cerebral circulation, myocardial nutrition and coronary circulation, i.e. calcium antagonists, lipid modifiers and angiotensin II receptor

blockers.

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