

Dietary fat consumption and non-communicable chronic diseases in China

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Fat consumption at a national level is largely determined by the economic development of a country. Based on the data of nationwide nutrition surveys undertaken in China in 1982 and 1992, the average intake per capita per day of meat increased from 62.6 to 100.5 g in urban areas and from 22.9 to 37.6 g in rural areas. The consumption per capita per day of eggs increased from 15.5 to 29.4 g in urban areas and from 3.8 to 8.8 g in rural areas. The daily consumption of cooking oil was 12 g in 1982 and reached 22.4 g in 1992, while the consumption of animal fat remained stable. The average fat intake accounted for 18.1% of total energy intake in 1982 and 22.0% in 1992. The daily fat intake of Beijing urban residents was 92.9 g per capita per day in 1992, accounting for 32.7% of total energy intake, which was beyond the top limit suggested by the World Health Organisation. The change of disease patterns in Chinese people has been great during the past two decades. The mortality rate due to cerebro-cardiovascular disease accounted for 12.07% of deaths in 1957, and increased to 40.72% in 1994. The non-communicable chronic diseases (NCCD) accounted for approximately 70% of total deaths. Twenty-five percent of the total population and 60% of day care patients suffered from chronic diseases. The risk factors of NCCD are increasing in China and more attention should be given to the prevention and intervention of NCCD in the future.

Key words: food intake, fat consumption, nutrition, non-communicable chronic diseases, China, Beijing, urban, rural, cerebrovascular disease, cardiovascular disease, diabetes, cancer.

Dietary fat plays an important role in improving the sensory properties of meals and contributing to the pleasure of eating. Fat consumption at the national level is largely determined by the economic development of a country. The typical Western dietary pattern, which includes excess fat, has been associated with a higher rate of obesity and an increase in chronic degenerative diseases such as coronary heart disease, stroke, diabetes mellitus and cancer.

Changes in dietary fat consumption in China from 1982 to 1992

The results from nationwide nutrition surveys conducted in 1982¹ and 1992² showed that the consumption of meat, eggs and cooking oil increased considerably during this period. The meat intake of an adult reference man was 42.3 g/day in 1982; this increased to 58.9 g/day in 1992. The change in food consumption for people living in urban areas was more significant than for those living in rural areas.

The consumption of eggs in particular increased. Egg consumption per capita per day increased 13.9 g for urban residents. Egg consumption in rural areas in 1992 was 8.8 g, which was twice the consumption of 3.8 g in 1982. The average consumption of vegetable oils per capita per day was only 12 g in 1982 but reached 22.4 g in 1992. The consumption of animal oil remained stable and even decreased 0.5 g in urban areas. In contrast to the consumption of vegetable oil, which increased 11.1 g from 1982 to 1992 in urban areas, the consumption of animal fat and vegetable oil in rural areas increased 2.7 g and 8.2 g, respectively, between 1982 and 1992.

As well as changes in the consumption of dietary fat from food sources, fat consumption also changed. The average fat intake of a reference man per capita per day was 49 g in 1982, accounting for 18.1% of total energy intake. The consumption of fat in 1992 was 58.3 g, accounting for 22.0% of total energy at the national level. The fat consumption of people divided into the three income levels of low, medium and high was 40.0, 55.2 and 79.6 g, respectively. This accounted for 15.6, 21.3 and 29.0% of total energy, respectively. Moreover, the fat consumption of urban residents reached 77.7 g in 1992, accounting for 28.4% of total energy and close to the top limit of 30% of total energy intake suggested by the World Health Organisation (WHO). The fat intake of rural residents was 39.6 and 48.3 g, accounting for 14.2 and 18.6% of total energy in 1982 and 1992, respectively. The daily fat intake of Beijing urban residents was 92.9 g in 1992, accounting for 32.7% of total energy intake. The dietary fat intakes accounted for 30.6, 33.5 and 33.8% of total energy intake in the low, medium and high tertiary income levels, respectively; all of these levels were beyond the top limit of 30% of total energy intake suggested by WHO.

The high fat diet in China's big cities has become an important risk factor for certain chronic degenerative diseases but the dietary fat intake in poor rural areas is still

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inadequate. The results showed that the change in fat consumption in China was great, but that there was a big difference between urban and rural areas. The difference is comparable with the pattern of socio-economic development. The fat consumption of residents in cities reached the top limits suggested by WHO, but fat consumption in poor rural areas was still rather low. There is a great difference between these two ends.

Looking at the source of dietary fat, average animal fat contributed 40.3% of total fat intake in 1982 and 37.2% in 1992, which was a small decrease over the 10-year period. Therefore, although the fat consumption of residents increased, the proportion of animal fat to vegetable oil did not change significantly. It appears that most Chinese residents still maintain the traditional dietary pattern of giving priority to plant foods.

The data from the United Nations Food and Agriculture Organization (FAO) balance sheet by Drewnowski showed that fat consumption as a percentage of total energy in Chinese people is in the mid-range among the surveyed countries.³ Now is a good time for Chinese nutritionists to work on appropriate nutrition education and intervention programs to improve the health of residents in relation to fat intake.

Nutrition scientists have paid more attention to dietary fatty acids. The fatty acid composition of diet in the 1992 Nationwide Nutrition Survey in China showed that the average daily intake of saturated fatty acids was 15.4 g, while for monounsaturated fatty acids it was 21.0 g and for polyunsaturated fatty acids it was 16.7 g.² The S:M:P ratio was 1:1.36:1.08 (Table 1). The ratio of fatty acid in the urban and rural areas was almost the same. The proportion of mono-unsaturated fatty acids in the Chinese diet is higher than the S:M:P ratio of 1:1:1 suggested by some foreign nutrition scientists. The results of recent studies have suggested benefits from mono-unsaturated fatty acids in the prevention of cardio- and cerebro-vascular diseases.

Reports on the fatty acid composition of Chinese diets are few; the data in this report were selected from the 1992 Nationwide Nutrition Survey compiled by Ge Keyou *et al.*² and calculated by the Chinese Food Composition. A new version of The Composition of Chinese Foods was published by

Table 1. Average fatty acid pattern intake (g per capita per day) in 1992

Food	Saturated fatty acid	Unsaured fatty acid		
		18:1	18:2	18:3
Cereals	1.59	2.39	1.92	0.08
Beans	0.12	0.19	0.43	0.07
Nuts	0.22	0.53	0.52	0.01
Pork	4.93	5.89	1.41	0.12
Other meats	0.60	0.44	0.04	0.01
Organs	0.06	0.03	0.03	0.0001
Poultry	0.28	0.31	0.18	0.02
Dairy	0.42	0.25	0.05	0.02
Eggs	0.50	0.60	0.20	0.001
Aquatics	0.18	0.18	0.06	0.02
Vegetable oils	3.47	7.03	10.03	0.79
Animal oils	3.03	3.13	0.63	0
Total	15.4	20.96	15.50	1.15

The data are cited from Ge Keyou *et al.*²

the International Life Sciences Institute (ILSI) Press in 1997, Washington DC, USA.

Based on nutritional status and deaths due to cancer, Fan WX *et al.* reported a correlation between fatty acid in red blood cells and cardiovascular diseases in male and female farmers aged between 35 and 64 years from 65 counties.⁴ There was an inverse correlation of red blood cell phosphatidylcholine (RBC-PC) oleic acid with deaths due to cardiovascular diseases.

In the China Total Diet Study led by Chen JS and Fan WX, it was reported that the intake of mono-unsaturated fatty acids in the south of China was higher than in the north of China, these two regions contributing 48 and 36% of total dietary fat, respectively. The intake of polyunsaturated fatty acid was lower in the South than in the North, that is, 23 and 35%, respectively. The S:M:P ratio was 1:1.7:0.8 in the South and 1:1.4:1.2 in the North. The mortality rate from cardiovascular diseases was lower in the South and higher in the North. It is considered that mono-unsaturated fatty acid is a contributing factor for cardiovascular diseases. Based on the situation in China, Professor Fan WX suggested that the appropriate S:M:P ratio would be 1:1.5:1. Current investigations into the relationships between dietary fat and health in China will clarify this view.

Change in disease patterns

The change in disease patterns in Chinese people has been great during the past two decades. The incidence of tuberculosis and infectious diseases were decreased remarkably but the prevalence of cardiovascular and cerebrovascular diseases and other chronic degenerative diseases increased significantly (Table 2).

Based on statistics from the Ministry of Health in 1957, the number of deaths caused by stroke per 100 000 people per year was 39, while for cardiovascular diseases it was 47.2. The deaths from both factors accounted for 12.07% of the total number of deaths from all causes. By 1994, these figures had increased to 129.6 people per 10⁵ for stroke and 87.5 people per 10⁵ for cardiovascular disease. The deaths from both causes in that year accounted for 40.72% of all deaths. These diseases affected approximately 5 to 6 million people in China and 75% of these people were disabled in different degrees. The rates of bleeding and thrombosis were approximately 40 and 60%, respectively.

Ruth Bonita indicated that the mortality rate due to stroke was 136.0/10⁵ of males and 92/10⁵ of females in Singapore and 106.9/10⁵ and 60.4/10⁵ in Japan, respectively.⁵ The

Table 2. The mortality rate from cardiovascular disease, stroke and cancer in China (per 10⁵)

Time	CVD	Stroke	Cancer
1988	84.0	116.6	119.1
1989	91.9	122.0	128.9
1990	92.2	121.8	128.0
1991	82.4	166.5	123.9
1993	85.6	124.2	126.5
1995	90.1	130.5	128.6
1996	98.9	134.6	130.9

CVD, cardiovascular disease. Source: The Ministry of Health.

mortality rate due to stroke in China is similar to that in Singapore and higher than that in Japan.

Based on the statistics of the Ministry of Health and the Disease Monitoring Program conducted by the Chinese Academy of Preventive Medicine, the mortality rate from CHD was $38.6/10^5$ in 1980 and $47.5/10^5$ in 1990 in urban Chinese, while for rural Chinese it was $18.4/10^5$ in 1980 and $22.8/10^5$ in 1990. Thus, the mortality rate from CHD in both urban and rural areas increased in that 10 year period. There were great area differences on the incidence rate for CHD. Zhou BF⁶ indicated in a survey among 14 groups of people aged approximately 25–74 that the adjusted incidence of CHD was approximately $1-83/10^5$ in males and approximately $0-113/10^5$ in females. There were no accurate figures on the prevalence of CHD in the whole of China because there are no standardised and unified criteria for the diagnosis of CHD. Nevertheless, the incidence of and death rates from CHD have been low in China compared with developed countries.

Three nationwide surveys of the prevalence of hypertension were conducted by Professor Liu LS.⁷ The prevalence of hypertension among people above 15 years of age increased 51% in the 20 years from 1959 to 1979 and 54% in the 10 years from 1979 to 1991. The prevalence of hypertension of subjects in the third survey in 1991 was 11.9%.

The prevalence of diabetes mellitus has been increasing in China in recent years. A survey conducted in 1979 showed that the prevalence was 0.67% in 13 provinces and cities for subjects over 15 years of age. Based on a survey of 17 provinces in 1995, the prevalence of diabetes was 2.3%, which was almost three times that recorded in 1979 in a group of people aged approximately 20–64 years.

The total mortality rate has decreased in China in recent years, although the mortality rate due to cancer has been increasing. In fact, it has increased 11.6% during the past two decades. A high fat intake is a risk factor for some kinds of cancer in China, especially breast cancer. However, recent evidence has shifted the importance of specific nutrients, for example fat, in favour of food, for example meat prepared in certain ways.

The risk factors for non-communicable chronic diseases

A high intake of fat may lead to obesity. The Nationwide Nutrition Survey conducted in 1992 showed a close correlation between dietary fat and body mass index (BMI); that is, the more dietary fat consumed, the higher the BMI.

A study on a group of 12 755 males and females aged approximately 35–59 years reported by Wu YF *et al.* showed that the prevalence of hypertension, high serum triglycerides, low HDL-cholesterol and hyperglycemia increased with the increase of BMI.

The 1992 National Nutrition Survey analysis of Chinese adults aged 20–45 found that the proportion of BMI greater than 25 in urban residents was 14.9%, while in rural residents it was 8.4%. The proportion of overweight adults was the highest in Beijing.

Zhou BF reported that in the 10 year follow-up study of 10 groups of people, the systolic blood pressure (SBP) and diastolic blood pressure (DBP) increased in 8 of the groups. BMI increased in 8 groups and total cholesterol increased in 6 groups.⁶

In general, the intake of both fat and cholesterol in China was lower than that of Western developed countries and the TC was also lower. Thus, the prevalence of cardiovascular diseases was relatively low in China. However, the incidence of chronic diseases have been progressively increasing during the past two decades and this has been associated with increases in fat intake.

Prevention of and intervention to reduce non-communicable chronic diseases

Based on an epidemiological study undertaken in the mid-1980s, Cheng XM *et al.* conducted an intervention and prevention trial.⁸ Two communities were selected in each of seven cities and every community was divided into an intervention group and a control group. After 4 years of intervention, the incidence of stroke decreased by approximately 30% in the intervention group and the death rate decreased by approximately 50%.

Our department conducted a comprehensive study on the prevention of non-communicable chronic diseases in Beijing. After a 5-year intervention trial, the salt intake decreased 3 g/capita/day, the administration for hypertension improved, and the knowledge of people for disease prevention advanced; however, the fat intake could not be cut-down (29.2% energy in 1986 and 33.9% energy in 1994). The cooking oil per capita per day was 25 g in 1986, which increased to 36 g in 1994.

The comprehensive measures for prevention of hypertension conducted in the USA from the 1960s onwards have achieved very successful results. The death rate from CHD has decreased 40–50%, while the death rate from stroke has decreased 48%. The prevalence of hypercholesterol has decreased by approximately 30%. A project to prevent CHD in Finland has led to a significant change in dietary habits. In turn, the death rate from CHD has decreased by about 50–60%. A similar example can be found in Japan. The fat intake of Japanese has been maintained at less than 30% of total energy and the death rate from CVD is among the lowest in developed countries.

China is a developing country. The economy is developing and the lifestyle is changing. The intake of dietary fat and animal food is increasing. Based on data from Kong LZ, the cost for the treatment of chronic diseases was 41.9 billion Chinese Yuan in 1994.⁹ The average increment is approximately 17.2% per year. Comprehensive measures should be taken to prevent non-communicable chronic diseases. The promotion of a reasonable diet is particularly important.

Diets rich in fat tend to have more flavour and variety but are also high in energy. Excessive fat consumption has been associated with higher prevalences of obesity. Obesity is a risk factor for non-communicable chronic diseases. The question is whether the barriers to behavioural change can be surmounted by appropriate nutrition education and intervention programs.

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