

Review Article

Tobacco Control and Lung Cancer Prevention in China

Xiu-Yi Zhi^{1*}, Xiao-Nong Zou², Mu Hu¹, Yuan Jiang³ and You-lin Qiao⁴

¹Department of Thoracic Surgery Xuanwu Hospital, Capital Medical University, China

²National Office for Cancer Prevention and Control, Cancer Institute/Hospital, China

³Office of Tobacco Control, Chinese Center for Disease Control and Prevention, China

⁴Department of Epidemiology, Chinese Academy of Medical Sciences, China

Special Issue on

Lung Cancer China

*Corresponding author

Xiu-Yi Zhi, Department of Surgery, University of Capital Medical Sciences, China

Submitted: 02 April 2014

Accepted: 24 April 2014

Published: 30 April 2014

Copyright

© 2014 Zhi et al.

OPEN ACCESS

Keywords

- Lung cancer
- Mortality
- Tobacco control
- Health policy

Abstract

In recent decades the age-specific mortalities of lung cancer in China have been increased to 9 times in men and women and it become one of the most important public health issues. The high prevalence of smoking in men and more than 70% of nonsmokers, both men and women, could be the biggest contributable factor for those consequences. While the abundant evidence on the health risks of exposure to smoking were available in both international and domestic studies the awareness on the health hazards from tobacco use were quit low in Chinese peoples, even in the health providers. Changes in the contents and the process of the tobacco products in Chinese tobacco product markets were accompanied by increased numbers of the lung cancer cases, increased adenocarcinoma and decreased squamous cell carcinoma of the lung, rather than reducing the overall lung cancer cases. Those suggested that comprehensive smoking-free policy should be implemented in all public places and the process of smoking-free legislation should put forward to create the legal environment and provide effective protection for reducing the incidence of lung cancer. Popularized health education should be also enhanced to raise the public awareness on smoking hazards.

INTRODUCTION

Tobacco epidemic has been one of most important public health issues in China which kills more than 1.2 million deaths per year [1-3]. Lung cancer mortality in China, used to be ranked at sixth in 1970s with the age-adjusted (by world population) mortality of 7.41 per 100 000, has led the cancer mortalities in the new century. The age-adjusted (by world population) mortality of lung cancer increased incidence were 49.81 per 100 000 and 42.01 per 100 000 for the urban and rural residents of men, respectively, and 23.35 per 100 000 and 19.45 per 100 000 per 100 000 for the urban and rural residents of women in 2009 in the registration areas of China [2,4,5].

Since the 1950s, abundant research data have documented the unequivocal causal relationship between cigarette smoking and lung cancer in developed and developing countries, including China [6-10]. In many cities in China, the regulations of smoking ban in public places have been issued since 1990s. Strict regulations of smoking ban have been well performed in the most public transportation tools across mainland China. However, the epidemic of the tobacco use in Chinese, particularly the cigarette smoking did not have great substantial reduction in the last 40 decades [1,11]. The overall current smoking rates in Chinese adults were reported as 33.7% in 1996, 28.5% in 2002

and 27.9% in 2010 while in Chinese males adults, the rates were reported as 63.0% in 1996, 57.4% in 2002, and 54.0% in 2010. In most public sites and indoor working areas smoking free policies had not been well implemented [11]. The awareness on the health hazards of tobacco use was generally low in the public audience [12,13].

In this paper we present our analysis on the status of the research related to the control of tobacco use and the lung cancer risks in Chinese population.

Lung cancer incidence in Chinese urban and rural population are rising rapidly

On the data from National Cancer Registration, the age-specific incidence rates of lung cancer showed substantially increased over the ages in both the urban and rural areas of China (Table 1). In the males, the rates in the high age groups were always higher than the immediate low groups, from 17% (80-84 years versus 75-79 years) to 225% (40-44 years versus 35-39 years) while in the females, those were from 15% (40-44 years versus 35-39 years) to 211% (45-49 years versus 40-44 years). The rates of lung cancer in the males aged at 45 years or older of the urban residents (except 60-64 years), were 10% to 81% higher compared to the rates of the male rural residents. The

male to female ratios were from 1.18 to 2.85 in the urban, and 1.18 to 2.80 in the rural, reflecting the much higher risks for lung cancer in the males than the females regardless the residential classes.

Compared with the two national surveys in last century, the age-specific mortalities of lung cancer in China had been experienced continuous increases in both male and female population, shown in table 2. The mortalities in the ages of 25-79 years or older in 1990-1992 were higher in all same ages in 1973-1975, increased by 98% (35-39 years) to 362% (75-79 years) in males, and from 97% (35-39 years) to 267% (75-79 years) in females. Continued increases were found again in 2004-2005 when compared to the rates in 1990-1992, increased by 6% (45-49 years) to 132% (80-84 years) in males of 35-84 years, and 7% (35-39 years) to 115% (75-79 years) in female aged in 35-44 years and 50-54 years or older. Those changes in the age-

specific rates of lung cancer could not be well explained by the contribution from aging alone. Environmental exposure must play important roles in the development and increase of lung cancer mortalities in Chinese population, particularly from the long term and highly epidemic exposures.

Changes in histological subtypes of lung cancer in Chinese

In a recent report, changes of histological subtypes of lung cancer in Chinese males 2000 to 2012, increased Adenocarcinoma (ADC) and decreased Squamous Cell Carcinoma (SCC), had been observed in the cases from different residential areas, including Beijing, Hebei, Neimengu, Shandong, Heilongjiang, Shanxi, Henan, Liaoning, and Jilin in China, shown as figure 1 [14]. While the cases with SCC were decreased from 39.11% to 32.23%, the cases with ADC were increased from 21.96% to 43.36% from 2000-2002 to 2009-2012. These histological changes of lung cancer

Table 1: Age-specific incidence of lung cancer in Chinese population, 2009.

| year | All areas | | Urban areas | | Rural areas | |
|------|-----------|--------|-------------|--------|-------------|--------|
| | Male | Female | Male | Female | Male | Female |
| 25- | | | | | 1.24 | |
| 30- | 1.73 | 1.12 | 1.44 | 1.18 | 2.26 | 1.03 |
| 35- | 3.88 | 3.29 | 3.92 | 3.33 | 3.80 | 3.21 |
| 40- | 12.60 | 3.79 | 12.17 | 6.21 | 13.46 | 7.97 |
| 45- | 24.52 | 11.8 | 25.42 | 12.38 | 22.45 | 10.50 |
| 50- | 54.39 | 22.67 | 55.71 | 21.46 | 50.79 | 25.77 |
| 55- | 91.32 | 35.26 | 93.52 | 32.86 | 86.22 | 41.18 |
| 60- | 142.14 | 57.24 | 141.23 | 55.99 | 144.05 | 60.05 |
| 65- | 231.06 | 87.55 | 246.42 | 94.95 | 201.72 | 72.17 |
| 70- | 370.06 | 174.74 | 386.39 | 191.37 | 331.97 | 133.64 |
| 75- | 530.35 | 231.68 | 563.67 | 257.99 | 442.23 | 164.42 |
| 80- | 619.54 | 281.74 | 677.90 | 315.50 | 464.62 | 199.48 |
| 85+ | 602.55 | 243.00 | 684.16 | 279.89 | 377.22 | 150.05 |

(Data: National Cancer Center [1])

Table 2: The age-specific mortalities of lung cancer in China from 1973 to 2005.

| Year | 1973-1975 | | 1990-1992 | | 2004-2005 | |
|------|-----------|--------|-----------|--------|-----------|--------|
| | Male | Female | Male | Female | Male | Female |
| 25- | 0.60 | 0.46 | 1.43 | 1.10 | 1.16 | 0.63 |
| 30- | 1.28 | 0.93 | 2.91 | 1.84 | 2.62 | 1.63 |
| 35- | 2.96 | 1.90 | 5.87 | 3.74 | 6.59 | 3.99 |
| 40- | 5.98 | 3.42 | 12.14 | 6.55 | 13.33 | 7.75 |
| 45- | 11.43 | 5.96 | 22.44 | 11.61 | 23.80 | 10.49 |
| 50- | 18.99 | 9.09 | 40.57 | 19.23 | 54.82 | 21.18 |
| 55- | 28.66 | 12.21 | 71.92 | 28.77 | 93.55 | 36.01 |
| 60- | 38.34 | 15.71 | 122.82 | 43.32 | 137.53 | 55.51 |
| 65- | 46.68 | 19.55 | 145.33 | 53.49 | 199.88 | 77.84 |
| 70- | 49.04 | 21.21 | 186.50 | 69.65 | 300.11 | 122.29 |
| 75- | 40.15 | 19.07 | 185.54 | 69.98 | 370.37 | 150.32 |
| 80- | 29.08 | 16.17 | 172.63 | 84.65 | 400.06 | 168.38 |
| 85+ | | | 170.96 | 83.53 | 340.19 | 205.92 |

(Data source: Chen WQ [4])

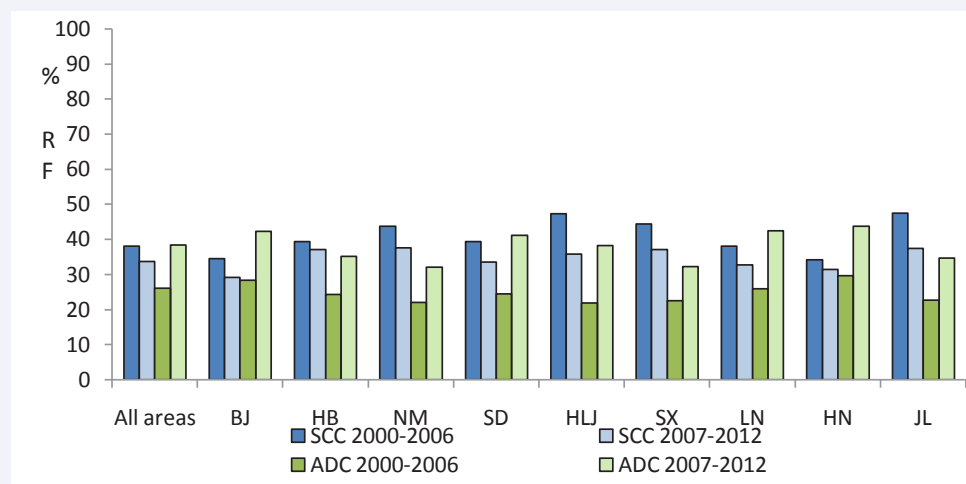


Figure 1 Changes of histological subtypes of lung cancer in the males identified in CIHCAMS from 2000 to 2012 (Data source: Zou XN [14]).

Table 3: Scores of awareness of tobacco control among smoking and non-smoking staff.

| Awareness questions | Average score ¹ (±standard deviation) | | Comparison of smokers with non-smokers | | |
|---|---|-------------|---|--------|--|
| | Smokers | Non-smokers | Z | P | |
| Smoking behavior | | | | | |
| Less smoking and little harm | 0.6±0.3 | 0.8±0.3 | 4.69 | <0.001 | |
| Lower tar means less harmful | 0.5±0.3 | 0.8±0.3 | 4.11 | <0.001 | |
| Passive smoking is less harmful | 0.8±0.3 | 0.9±0.2 | 3.57 | 0.004 | |
| Patients with a long time smoking should smoking less rather quit | 0.5±0.3 | 0.5±0.3 | 1.04 | 0.297 | |
| As a chronic disease, smoking addiction needs medical treatment | 0.6±0.3 | 0.7±0.3 | 1.71 | 0.087 | |
| Smokers with quit will could quit succeed | 0.5±0.3 | 0.4±0.3 | -1.24 | 0.216 | |
| Physicians should set the example to refuse smoking | 0.8±0.3 | 0.9±0.2 | 2.71 | 0.007 | |
| Smoking should be completely forbid in every hospitals | 0.8±0.2 | 0.9±0.2 | 2.25 | 0.025 | |
| Smoking could be fine when staffs have no direct contacts with patients | 0.7±0.3 | 0.9±0.2 | 4.87 | <0.001 | |
| Health risks of active smoking | | | | | |
| Prostatitis | 0.6±0.3 | 0.7±0.2 | 2.19 | 0.028 | |
| Hypertension | 0.7±0.3 | 0.8±0.2 | 2.29 | 0.022 | |
| Osteoarthritis | 0.5±0.2 | 0.6±0.2 | 2.38 | 0.017 | |
| Lung cancer | 0.8±0.2 | 0.9±0.2 | 3.46 | 0.005 | |
| Ischemic heart disease | 0.6±0.3 | 0.7±0.4 | 0.66 | 0.508 | |
| Sexual dysfunction | 0.7±0.3 | 0.8±0.2 | 2.13 | 0.033 | |
| Tuberculosis | 0.7±0.3 | 0.8±0.3 | 0.86 | 0.390 | |
| Type II diabetes | 0.5±0.2 | 0.6±0.2 | 1.83 | 0.067 | |
| Acute gingival necrosis or ulceration | | | | | |
| Emphysema | 0.7±0.3 | 0.8±0.2 | 1.55 | 0.122 | |
| Health risks of passive smoking | | | | | |
| Leukemia | 0.5±0.2 | 0.7±0.3 | 2.81 | 0.005 | |
| Lung cancer | 0.8±0.3 | 0.9±0.1 | 3.05 | 0.002 | |
| Ischemic heart disease | 0.6±0.3 | 0.7±0.3 | 1.79 | 0.073 | |
| Bronchitis | 0.8±0.3 | 0.8±0.2 | 1.57 | 0.117 | |
| Stroke | 0.6±0.3 | 0.7±0.2 | 2.81 | 0.005 | |
| bronchiolitis | 0.7±0.3 | 0.8±0.2 | 1.61 | 0.107 | |
| Asthma | 0.8±0.3 | 0.8±0.2 | 1.26 | 0.209 | |

¹ The ideal value is 1.0.

in Chinese males were more likely the following the western countries where the changes of cigarette design, as the filtered cigarette or the low-tar cigarettes were more popular among the smokers [7-10]. Changing the designs of the tobacco products did not reduce the risks of lung cancer in western population and need to be confirmed in the Chinese.

Exposure to passive smoking was consistently critical

Passive smoke contains hundreds of kinds of ingredients harmful to human body, of which at least 69 species of carcinogens. Passive smoke harm to the health of people is very serious, temporary contact will cause harm to the body. Indoor comprehensive smoking free is the most effective method from second-hand smoke. According to news reports, February 20, 2014-25 PM2.5 concentrations, Beijing continues to be up to 583 micrograms per cubic meter, pollution is very serious, caused the public great attention and concern. Studies show that one cigarette can make indoor PM2.5 concentrations of up to 800 micrograms per cubic meter; three cigarettes more make indoor PM2.5 concentrations reach 1700 microgram/cubic meter. The vast majority of secondhand smoke generated particles will be PM2.5, including a large number of polycyclic aromatic hydrocarbon compound Content, arsenic and benzene and high carcinogenic nitrosamines. When Smoking, indoor PM2.5 stems mainly from second-hand smoke. In 2010 global Grass investigation, aged 15 and over 15 non-smokers, 72.4% are suffering from secondhand smoke exposure in China. According to this estimates, China has 560 million adult non-smokers in secondhand smoke exposure, while there are 180 million adolescents as well. Public places are worst for secondhand smoke exposure. In restaurants the exposure rate is as high as 89%; 67% in the family; 58% in the government building; about 35% in schools, hospitals, transportation. In addition, hotels, bars, workplace secondhand smoke exposure is also very worrying. National smoke-free environment legislation should not be delayed.

In 2010, the prevalence of exposure to Second Hand Smoking (SHS) was particularly high among Chinese nonsmoking adults, 72.4% reported exposed to SHS in the past 30 days and 38.0% being exposed almost every day [5]. Exposure to SHS was especially high among leaders of organizations (85.8%), and business and service employees (83.1%). Then, in China, there could be more than 500 millions nonsmokers had exposed to SHS at least once a week. No significant difference had been found in the prevalence of exposure to SHS between men (74.1%) and women (71.6%), nor between the residents in rural (74.2%) and urban (70.5%).

AWARENESS ON HEALTH HAZARDS OF TOBACCO USE WAS GENERALLY LOW

We conducted a survey on the awareness of health hazards of tobacco use in the staff in a cancer institution at Beijing in 2010. Analysis on the data from 159 responds showed that the scores of the tobacco knowledge were lower in the smokers than the nonsmokers for a number of questions, including concerning the quantities of smoking, low-tar cigarettes, passive smoking, and awareness the health consequences of tobacco use, such as prostatitis, hypertension, Osteoarthritis, shown in Table 3. Of 26 questions interviewed, only 7 had scores higher than 0.9 (full

score is 1.0) in nonsmokers and none in smokers, suggested that the health hazards of tobacco use should be highlight and put as an important priorities of the health education programs for both the public and the health providers in China.

Actions against the tobacco use in China should be widely strengthened

Since the Framework Convention on Tobacco Control (FCTC) was ratified in China, there has been a strong push for national legislation, and progress is being made at both the municipal and national levels. But there are some limitations: including banning smoking in limited places; the executive bodies of the law are not clear; and most laws are difficult to implement, the executive bodies of the law are not clear; no any punishment and most laws are difficult to implement. Since 2008, several cities have enacted smoke-free legislation and more are actively drafting such legislation. Currently, none of the mainland cities are in compliance with Article 8, but there is growing confidence in the public acceptance of this legislation and the feasibility of enforcement. At the national level, in 1991, the Ministry of Health issued the Implementation Guidelines of the Regulation on Public Places Health Management and Smoking in which implementation guidelines banned smoking in 13 types of public places. Based on these guidelines, industry specific regulations for smoke free public places have been developed and implemented since 1997. The most important national achievement is that in 2009 the Ministry of Health joined three other national health authorities to issue a Decision on smoke-free health facilities. The Minister of Education and the Ministry of Health jointly issued a similar Decision on smoke-free schools in 2010. Though not legally binding, these decisions and guidelines are being implemented and enforced with rigour. The most impressive measures of smoke free legislation and policies include: the Ministry of Health taking the lead and setting an example by building a smoke-free Ministry of Health; continued support of the smoke-free facilities efforts in various regions in partnership with the Central Government Subsidy to Regional Tobacco Control Projects; expert supervision of the building of a regional smoke-free health care system; implementation of China tobacco control mass media communication campaigns; third-party professional survey conducting inquiries into the nationwide building of smoke-free health care institutions. Although efforts were made, major breakthroughs still needed in the development and implementation of policies, regulations and laws on banning smoking in all indoor public places in China.

REFERENCES

1. National Cancer Center, Disease Prevention and Control Bureau of Ministry of Health (2012). Chinese Cancer Registry Annual Report. Military Medical Science Press, Beijing. 2012; 28-39, 72-75.
2. Liu BQ, Peto R, Chen ZM, Boreham J, Wu YP, Li JY, et al. Emerging tobacco hazards in China: 1. Retrospective proportional mortality study of one million deaths. *BMJ*. 1998; 317: 1411-1422.
3. The Ministry of Health of the People's Republic of China (edit). Report on Third national retrospective sampling death survey. Beijing: Peking Union Medical College Press. 2008; 10-29.
4. Chen WQ. The lung cancer. In The National Office for Cancer Prevention and Control, National Central Cancer Registry, The Disease Prevention and Control Bureau of Ministry of Health (edit). China Death Report

- Third National Retrospective Sampling Survey on the Mortality. Beijing: Peoples' Health Press. 2010; 24-36.
5. Chinese Center for Disease Control and Prevention, the Center for Chronic Disease Control of Chinese Center for Disease Control and Prevention. Report on chronic disease risk factor surveillance in China 2010. Military Medical Science Press, Beijing. 2012. 8-36.
 6. Wang CP, Ma SJ, Xu XF, Wang JF, Mei CZ, Yang GH. The prevalence of household second-hand smoke exposure and its correlated factors in six counties of China. *Tob Control*. 2009; 18: 121-126.
 7. Sansone G, Fong GT, Hall PA, Guignard R, Beck F, Mons U, et al. Time perspective as a predictor of smoking status: findings from the International Tobacco Control (ITC) Surveys in Scotland, France, Germany, China, and Malaysia. *BMC Public Health*. 2013; 13: 346.
 8. Thun MJ, Day-Lally CA, Calle EE, Flanders WD, Heath CW Jr. Excess mortality among cigarette smokers: changes in a 20-year interval. *Am J Public Health*. 1995; 85: 1223-1230.
 9. Giovino GA, Mirza SA, Samet JM, Gupta PC, Jarvis MJ, Bhalra N, et al. Tobacco use in 3 billion individuals from 16 countries: an analysis of nationally representative cross-sectional household surveys. *Lancet*. 2012; 380: 668-679.
 10. Khuder SA, Dayal HH, Mutgi AB, Willey JC, Dayal G. Effect of cigarette smoking on major histological types of lung cancer in men. *Lung Cancer*. 1998; 22: 15-21.
 11. International Agency for Research on Cancer. Tobacco smoke and involuntary smoking. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, IARC Scientific Publications. 2004; 83: 171-172.
 12. Jiang Y, Ong MK, Tong EK, Yang Y, Nan Y, Gan Q, et al. Chinese physicians and their smoking knowledge, attitudes, and practices. *Am J Prev Med*. 2007; 33: 15-22.
 13. Guo YM, Zhang FQ, Yan HY, Wang HJ. Investigation of Medical staff's smoking status, knowledge, attitude and behavior related to tobacco control. *Chinese J of Epidemiology*. 2009; 30: 289.
 14. Zou XN, Lin DM, Wan X, Chao A, Feng QF, Dai Z, et al. Histological subtypes of lung cancer in Chinese males from 2000 to 2012. *Biomed Environ Sci*. 2014; 27: 3-9.

Cite this article

Zhi XY, Zou XN, Hu M, Jiang Y, Qiao YL (2014) Tobacco Control and Lung Cancer Prevention in China. *J Cancer Biol Res* 2(1): 1044.