

Evaluation on Current Lung Cancer Situation in China

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Abstract. Lung cancer has been a serious problem all around the world. Especially in China, lung cancer has been listed as one of the top cancers which leads to a high prevalence rate and mortality. This paper aims to give a brief conclusion on various origins of lung cancer for different crowds in China. Moreover, the paper gave a conclusion on current treatment and new theories for both small cell lung cancer and non-small cell lung cancer. At the end of this paper, constructive suggestions were put forward for reducing the prevalence rate of lung cancer and the death rate it causes.

Keywords: Lung Cancer, Environmental Pollution, Drugs, Smoking, Household Pollution.

1. Introduction

Lung cancer is regarded as the most common cancer that appears in both new cases and death rate around the world [1]. It is also the primary cause of incidence rate and mortality in male cancer patients, whereas the third place in females, and caused an estimated 1.8 million death cases (18%) in 2020 [2] and a 70% increase in the rate of related deaths at the year of 2027 [3]. Meanwhile, in the past few decades, lung cancer has shown an increased rate of incidences around the world, especially in developing countries [1]. China, as one of the biggest developing countries, happens to have more than 30% of newly diagnosed cases and almost 40% of total death cases worldwide [4, 5].

Environmental pollution keeps continuously to be one of the most significant factors for the infection of lung cancer. In China, as a country that still takes industry as one of its main gross domestic product (GDP) constituents [6], dust pollution is a severe phenomenon in cities and surroundings. Factories and industries are vital factors that lead workers to be caught in dust pollution and lung cancer. Occupational exposure, along with environmental pollution is strongly linked with lung cancer [7]. From the outdoors to the inside, air pollution exposure is limited to an area near a certain industrial site [8], resulting in an increase in lung cancer cases among workers and people nearby.

In addition, the incidence rate of lung cancer rates largely reflects the tobacco epidemic degrees in regions and countries [9]. It has been proved that higher lung cancer rates in males in China are reflected in a high smoking rate [10]. Smoking contributes to around 75 percent of male lung cancer cases in China, whereas 18 percent in females [11].

Moreover, other potential factors like household air pollution, which is caused by household burning of solid fuels, such as biomass and coal also lead to a higher rate of lung rate in the population, especially for females [12, 13].

Moreover, in many developing countries, including China, a number of cancer patients are already in the advanced or metastatic stage when discovered [14]. The health care for lung cancer in China is not complete and needs to be improved. At the same time, it was found that platinum-based chemotherapy medicines are commonly used in clinics in China, however, their efficacy, along with price varies [15], which causes an unfaith and unbalanced situation in curing lung cancer in current China.

According to this review, the main factors which lead to lung cancer in different groups of people in China would be figured out and given a general conclusion. Moreover, we want to summarize typical policies for intervention and treatment methods that have been worked already in current China and give suggestions on new intervention and treatment means.

2. Origin

For a long period, lung cancer has long been a primary cause of cancer-related fatalities worldwide. Non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC) are the two histological groups of human lung cancer. NSCLC, which can be further split into adenocarcinomas, squamous cells, bronchioalveolar, and large cell carcinomas four subtypes, is now found in 80% of lung cancer cases [16].

China has contributed a huge proportion to the total lung cancer cases all over the world. The high rate of morbidity and mortality has seriously affected the daily lives of the public, and it has greatly increased the domestic medical burden. The health care system and community health system are suffering continuous impact force, which makes them unable to provide long-term treatment and daily health maintenance for a huge number of patients. Improving the cure number of lung cancer and the prevention of cancer has been regarded as an urgent problem, which has aroused the common and extensive concern of different social groups.

Multiple factors lead to the appearance of lung cancer and its spread, and different social groups are corresponding to different factors. Smoking, or tobacco use, is regarded as the most prevalent reason for cancer, and, rising smoking rates have led to a rising number of lung cancers. Tobacco use is attributed to more than 70 % of lung cancer cases worldwide and is the provenance of about 20 malignancies nowadays [17]. Even though China had taken action against tobacco control, the China Tobacco Control Report in 2015 still presented grim data of a high adult male smoking rate, which is well anastomosed with the high prevalence rate of lung cancer in Chinese males [17]. Moreover, secondhand smoking (SHS) stays the most important factor in females in China suffering from lung cancer. Household air pollution has been the biggest factor for the female population to be caught lung cancer in rural areas of China. Although China is experiencing a fast urbanization revolution, there are still more than 60% of the population is rural [18]. Solid biomass fuels are used for domestic cooking and heating for many people who live in the countryside and rural areas [13]. The use of soft coal for interior activities like cooking and heating presents to raise the risk of exposure to lung cancer in previous epidemiological and experimental studies [19], which is leading to a serious lung health issue for women, especially women in rural areas, and causing a higher rate of infection.

In addition, industries and occupation exposures are another significant reason for a higher rate of morbidity around its neighborhood. Exposure to industrial and manufacturing chemicals, companying with exposure to harmful pesticides can compose a series of factors that have been presented in people's daily living and working environments [8]. The dust and ash produced by industry would directly infect the health level of the workers inside the factory. Workers' workshops, as well as the production, processing, and packaging of products, are accompanied by a large amount of dust. Even though many factories currently require workers to dress in protective suits, such as wearing masks, overalls, and dust masks, workers are still the first contact and the first victim of the dust generated by the operation of the factory. A large amount of dust is deposited in the lungs by workers after unconscious inhalation which finally leads to the generation of lung cancer. At the same time, environmental justice issues arising from factory processing are also worthy of attention. The factory brings not only dust pollution inside the factory but also pollution to the surrounding environment. The living environment index of the surrounding residents declines. When the surrounding environment continues to deteriorate, there is a larger exposure risk of lung cancer and a spike in the rate of lung cancer patients in the metaphase and terminal stages by the lack of timely respite and further protection.

As mentioned, NSCLC and SCLC are two different subtypes of lung cancers. The general treatments for these two subtypes are similar, which is through radiochemotherapy. The data collected by most of the developed countries and part of developing countries has proved that radiochemotherapy is now a standard approach in both SCLC and locally NSCLC [14]. For NSCLC, radiochemotherapy is not suggested to be used as the best treatment plan for patients in phases I and II, instead, these patients would prefer only radiotherapy or surgery for healthier patients [20]. But for patients in phase III, or advanced phase, studies have shown that concurrent radiochemotherapy

is regarded as the best treatment choice for stage III [14]. Meanwhile, this method has been introduced in the treatment of SCLC, instead of simple chemotherapy, the clinic data indicates a better consequence of radiochemotherapy in terms of both improved local control and survival [14]. In most industrialized and developing nations, the use of combination of chemotherapy and radiotherapy has emerged as the most effective treatment for lung cancer.

The data displayed that public education on the smoking-related issue in China is far behind most western countries [11]. In China, up to now, it is common for people to share a common office or workspace. Even when a smoking ban does exist, people rarely fully enforce it indoors. At the same time, as a kind of indoor social activity, smoking is carried out in a number of indoor entertainment places. Small, crowded and poorly ventilated indoor environments lead to the spread of second-hand smoke, increasing the exposure possibility of lung cancer. Moreover, the current smoking policy does not give a clear ban or age limits for adolescence to buy cigarettes and smoke, which leads to the phenomenon that the smoking population is getting younger.

What's more, since the current energy structure in China is still based on fuel energy instead of clean energy, the smoke created by burning or heating indoors is gradually infecting the health of people. The study indicated that individuals who burn solid fuel for cooking would have four times higher risk of exposure to lung cancer, compared with those who use clean energy indoors [11]. The current policy in China encouraged people to use clean energy instead of traditional solid fuel, however, due to the high price and cost that clean energy now presents in the energy market, it has not yet shown significant success in its promotion.

3. Challenges

Although scientists have studied and done a series of research on the origin and current situation of smoking crowd in China and a branch of problems have been discovered and focused on, the current lung cancer situation is still rigorous among the public. Challenges for lower the prevalence rate of lung cancer and decreasing the risk of illness are still be regarded as a significant problem that has to be settled urgently for both the government and the whole society, but still, different conditions and situations should be taken into consideration and their unlike origins of the lung cancer disease compel each situation to face different challenges, which need to be categorized and discussed separately.

A general challenge that most Chinese people are now facing is the unpopularized awareness of the dangerous extent of smoking. In the first place, the current education for stopping adolescence smoking in multiple levels of schools is still in its infancy [21]. Anti-smoking education has not yet been widely spread and paid much attention to. Even though in some areas in China, the anti-smoking education has been written down in the official textbook resource and has included clear physical and mental harms of smoking, it does not mention about the actions that students can take while facing the temptation of smoking by others. In other words, the social skills about how to reduce and prevent adolescence from being attracted to smoking [21]. Moreover, many restrictions are now being played on most campuses in China, like checking bags before having classes, patrolling, and anti-smoking class meetings, but the studies have shown that they are not considered as effective ways for students since the cognitive changes from these education methods do not really make any impact on students to really change their actions and intention to smoke in the future [22]. For adults, cigarettes are gradually becoming a way to express stress and release bad emotions. Also, some movie cultures have brought a baddish influence on the formation of social values. As has been considered in the society, smoking in China is ubiquitous and presented as a kind of behavior that shows certain machismo to other people [21], which is leading to a misunderstanding of the smoking action and setting wrong values and codes of conduct for teenagers. This ecological environment brought by this certain art format in movies also explains one of the reasons for the long-term ineffective outcomes of anti-smoking interventions. Tobacco and alcohol culture, as a unique culture of making friends in China, to some extent expands the spread of tobacco and increases the number of smokers. From the

last century to the present, tobacco and various kinds of alcohol have become the best choice for Chinese people to give gifts. Good tobacco and cigarettes can even sell for more than good alcohol, making them a great gift for people considering giving them to others because of their lightness and high value. High-value cigarettes are also considered as a manifestation of social status, economic status, and entitlement. Such an idea further aggravates the purchase and dissemination of tobacco and cigarettes, which greatly reduces the effectiveness of prevention measures for smoking. Since the frequency of smoking is directly related to the morbidity of lung cancer, a more widely spreading smoking situation actually makes the prevention of smoking to be worse.

Another serious challenge in China for reducing the prevalence rate of lung cancer happens in the factories. As mentioned above, as a developing country, the industry still plays an important role in China's economic production. Handicraft, chemical, and manufacturing industries still exist in large numbers. These factories bring huge economic benefits, but also continue to pollute the surrounding ecological environment. At the same time, the health of workers in the workshop is also under great threat. Industrial dust problems have been the cause of the majority of lung cancer symptoms in workers who work long hours. It is true, though, that the government has been issuing new restrictions aimed at improving working conditions and protecting workers' health by raising the standards of qualified production in workshops. However, as there are still a large number of unqualified factories that have not been closed down, the number of lung cancer is still rising, facing a huge challenge.

Household coal is also a significant reason for people, especially people living in rural areas to be caught in lung cancer. For those people, what matters most is how to change the energy structure of rural areas and gradually reduce the use of household coal. Most rural families continue to utilize soft fuels like wood and crop waste in stoves that are rarely vented and produce severe indoor air pollution [23]. Whether more rural households can use anthracite as soon as possible, or whether more households can change the way of heating, so that the indoor air pollution index can be significantly reduced and stable at a low level all year round, is the biggest challenge to significantly reduce lung cancer cases in rural areas.

4. Solutions

For interventions, a sound management system should be set up, along with clear regulations on underage smoking, to guide teenagers to develop a correct value of tobacco and the behavior of smoking and treat this behavior in a correct way. What's more, it is necessary for the public to pay more attention to the non-tobacco risk factors, as lung cancer in non-smoking crowds is becoming a more and more severe problem for the public. The factories that have high-risk groups should meet the government's policies to constantly improve the factory workshop environment, reduce the occurrence of dust, and organize regular lung examinations for factory workers. In this way, early detection and early treatment could be realized and the number of deaths caused by lung cancer that is already advanced when discovered and cannot be treated in time would be lowered.

In addition, more research should be focused on the study measuring the severity of the air pollution, along with seasonal lung cancer changes. As environmental pollution will increase the lung cancer incidence rate, the government should take action to reduce the pollution levels. Data monitoring, along with the evaluation of multiple cancer risk factors, should be put in the first place. Policies that would restrain the production environment standard in factories should be used in the industries of chemicals and business and product launches are permitted for manufacturers that fulfill the criterion.

Moreover, the screening methods which are used for screening people for possible lung cancer need to be improved. It is well acknowledged that developments in multidetector computed tomography (CT) have made it possible to examine people in only one breath-hold while exposing them to safe levels of radiation by providing high-resolution volumetric imagery [24]. However, the CT screening would cause damage to people's health. Nowadays, studies have recognized a new optimized CT therapy named low-dose computed tomographic screening, which is used for

diagnosing lung cancer in large areas with as little harm to the patient's health as possible. The current data showed that the rates of both death from lung cancer and other diseases have presented a significant reduction with CT screening in low-dose [25]. Despite the fact that the cost of low-dose CT screening involves not only the test of screening but also diagnostic the following treatment, and that the benefit of early lung cancer screening must be weighed against the risk and cost of positive screening findings and overdiagnosis, the researchers feel that low-dose CT scans may be advantageous to some extent in early lung cancer screening and lowering lung cancer fatalities.

In the meanwhile, a series of advanced treatment methods have been developed and studied aiming to better treat lung cancer people. Many new drugs are now being studied and used in treating people, especially those people who are in advanced stage of lung cancer or have been entered the second or even third line of therapy.

Some improved treatments for NSCLC are being studied and published. Epidermal growth factor receptor (EGFR) gene mutation is playing a crucial part in tumor development since it has been found in 10%–15% of Western patients and up to 50% of Asian patients [15]. The tyrosine kinase inhibitors (TKIs) in EGFR have been the most widely used medicine for treating lung cancer caused by EGFR. However, since it has been found that an EGFR T790M mutation would happen after a period of treatment in the majority of patients, another medicine is introduced to the public as a secondary choice for treatment. Osimertinib, as a third-generation EGFR-TKI which works for selection for both T790M and EGFR resistance mutations, is now being tested for its efficiency [15]. A greater progression-free survival (PFS) period has been proven to exist in this type of medicine. Also, it can provide an objective response over standard chemotherapy among patients who failed to treat with original EGFR-TKI therapy and become advanced “EGFR T790M–positive NSCLC”.

Another new therapy to treat NSCLC is by using Dieckol to inhibit NSCLC cells' proliferation and migration [3]. Dieckol is a polyphenolic medicine made from brown algae that have been shown to have antioxidant and anti-inflammatory properties. Signaling affects a series of living cell actions like cell proliferation, differentiation, and cellular metabolism, leading to cancer cell survival under the action of PI3K/AKT/mTOR [3]. The deregulated pathway of PI3K/AKT/mTOR is a significant reason for people to be caught in lung cancer. Under the circumstances, the studies have now proved that Dieckol has potential as an herbal drug in targeted cancer therapy. Migration, accompanying with invasion, could be controlled by inhibiting epithelial-to-mesenchymal transition (EMT) signaling molecules. Moreover, apoptosis could be induced by inhibiting signaling molecules on PI3K/AKT/mTOR pathway [3].

And for SCLC, which is a type of cancer that has rapid growth, strong invasiveness, and rapid development of drug resistance, is harder to treat compared with NSCLC. It has been discovered that few options that can be chosen for treatment, especially in patients who are at least two lines of chemotherapy, would work under the condition of relapsing. A new drug containing anlotinib is introduced for treating people with SCLC. After estimating the utility of PFS, comparing measurement of costs, and analyzing cost-effectiveness and sensitivity, the researchers believe anlotinib could be a strategy that has a more effective cost, compared with other drugs like placebo which have been used widely in clinics for Chinese patients who had been treated with at least two lines of chemotherapy and need further treatment [26].

5. Conclusion

The various and complex causes of lung cancer contribute to the annual rise in the population of lung cancer cases in China and gradually become a disease with a high fatality rate among people of different classes, which needs to be primarily prevented and treated. After researchers investigated and counted all sides, the main causes of lung cancer in China were classified, which are smoking in education and culture, environmental pollution caused by factories, household coal use, and occupation exposures. Moreover, the current therapy for lung cancer mainly focuses on the efficacy of radiotherapy and chemotherapy combined with adjuvant therapy with specific drugs, which is

available for most patients who are diagnosed in the primary phase or phase II. However, the collected data shown from the hospitals presented a crueler fact that a number of patients are diagnosed in the late phase, in other words, the advanced stage, which leads to a harder situation for treatment.

How to treat people who are in advanced lung cancer or the one who has antibiotic for normal drugs are a serious challenge for the public. In the solution section, three different therapies have been offered to help with the current dilemma. The low-dose CT screening, drugs like EGFR TKIs, and Dieckol are now introduced to the treatment field and are worth trying for curing people in the soup.

Lung cancer has become a stumbling block in people's pursuit of health due to its increasing number of cases and deaths and its difficulty to cure. According to China's national conditions, it should not only improve the means of treatment for cancer but lung cancer caused by smoking should be reformed and taught in the cultural education on the correct guidance as well. At the same time, the government is positively encouraged to promote the reform of the environment of the factory and spread the popularity of rural new energy instead of household coal. On such prevention means, the risk and possibility of lung cancer in China would be reduced and they all would help people to have a healthier future.

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