Awareness and Knowledge of Lung Cancer Prevention Strategies among College Students

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Abstract. Background: Lung cancer is a growing health concern. Early detection and treatment are crucial. Preventing lung cancer is a priority. Recent surveys show an alarming increase in lung cancer deaths. This study aims to aims to analyse the knowledge, attitudes, behaviours, and health education needs of college students regarding lung cancer prevention and treatment. **Methods**: This research is a cross-sectional study that surveyed college students from all 34 provinces, municipalities, and autonomous regions in China. We used a convenient sampling method to gather data from eight universities nationwide through an online survey. A total of 1390 valid questionnaires were obtained, resulting in a validity rate of 96.86%. The questionnaire consisted of three parts: basic information, knowledge of lung cancer, and lung cancer screening and early diagnosis. Participants' understanding of lung cancer was categorized as "limited," "partial," or "well understanding" based on their correct answers to the questionnaire. **Results**: The analysis of the awareness rate of lung cancer among undergraduate students revealed that 23.4% had little knowledge about lung cancer, 46.7% had partial understanding, and 29.9% had a basic understanding. Factors such as gender, grade, region, major, monthly living expenses, and family cancer status were found to have statistically significant differences in the level of understanding of lung cancer-related knowledge. These findings suggest that there are variations in knowledge levels among different groups. For example, male respondents were more likely to have a basic understanding compared to females. Students in the eastern region had the highest proportion of those with a basic understanding, while those in the central and western regions had a higher proportion of those who were not very familiar. Non-medical majors had a higher proportion of students with a basic understanding, and respondents with higher monthly living expenses also had a higher proportion of those with a basic understanding compared to those with lower expenses. Furthermore, respondents with a family history of cancer had a higher proportion of those with a basic understanding. A linear regression analysis was conducted using the level of understanding of lung cancer-related knowledge as the dependent variable, and statistically significant variables such as gender, grade, region, major, monthly living expenses, and the presence of cancer patients in the household as independent variables. The results indicated that gender, grade, region, major, and monthly living expenses were found to be factors that significantly influenced the level of understanding of lung cancer-related knowledge. **Conclusion**: This survey explores the knowledge and

awareness of lung cancer among college students, providing insights into the current state of health education in universities and the need for improvement.

Keywords: lung cancer, awareness and knowledge, influencing factor.

1 Introduction

1.1 Background

Lung cancer is becoming increasingly harmful to human health. Research shows that the prognosis, detection, and treatment of lung cancer are closely related to the timing. Preventing lung cancer before it occurs has become an issue of increasing concern [1]. The first retrospective mortality survey conducted in China in the mid-1970s showed that the lung cancer mortality rate was 5.47/100,000, ranking fifth among cancer deaths [2]. However, the third retrospective mortality survey conducted in the 21st century showed that the lung cancer has become the leading cause of cancer death. Therefore, the death rate of lung cancer has been gradually increasing in recent years[3]. It is important to improve the awareness of lung cancer prevention and treatment among college students. This article aims to analyse the knowledge, attitudes, behaviours, and health education needs of college students regarding lung cancer prevention and treatment.

1.2 Objectives

Cancer is a serious chronic disease that poses a major threat to human health. Among them, lung cancer is one of the most common malignant tumors in the world[4]. In most countries, the incidence and death of lung cancer are showing a significant upward trend, and it is also the malignant tumor with the highest incidence and mortality rate in our country. The treatment of lung cancer requires a combination of surgical, chemotherapy, and radiation therapy, and the treatment cycle of the disease is relatively long, which brings a considerable economic burden[5]. The modern concept of disease control believes that the prevention of cancer should be greater than treatment[5]. Therefore, conducting a survey of college students' awareness of lung cancer is one of the most important measures for lung cancer prevention[6].

2 Methods

2.1 Study Population and Measurement

This research used a cross-sectional study method. The survey targeted college students from all 34 provinces, municipalities, and autonomous regions in China. On May 9, 2023, a convenient sampling method was used to conduct a survey on the awareness and knowledge of lung cancer. We recruited college students from about eight universities nationwide and conducted an online survey through word of mouth. We collected

a total of 657 samples in the eastern region, 243 samples in the central region, 282 samples in the western region, and 208 samples in the northeastern region. A total of 1435 college students participated in the questionnaire survey, and after excluding 45 invalid questionnaires, 1390 valid questionnaires were obtained, resulting in a validity rate of 96.86%. The survey utilized a self-made questionnaire and consisted of three main parts: basic information survey, basic knowledge of lung cancer, and lung cancer screening and early diagnosis. The questionnaire design included a total of 18 questions. One point was scored for each correct answer, zero for incorrect ones or "unknown". Participants who answered 0-11 questions correctly were categorized as having "limited understanding" of lung cancer-related knowledge, those who answered 12-14 questions correctly were categorized as having "partial understanding," and those who answered 15-18 questions correctly were categorized as having a "well understanding".

After the questionnaire design was completed, we conducted a pre-survey on 30 individuals in order to determine the approximate amount of time required to complete the questionnaire and to serve as a reference for screening the quality of the responses.

The awareness rate of lung cancer-related knowledge was calculated as the number of correctly answered questions by all respondents divided by the total number of questions answered by all respondents, multiplied by 100%.

2.2   Statistical Method

Data analysis was conducted using R Studio. Mean ± standard deviation was used for quantitative data, while rate and composition ratio were used for qualitative data. Chi-squared test was used for count data. A difference was considered statistically significant if $P<0.05$. In this study, 1435 questionnaires were collected. Among them, 5 questionnaires were found to have logic errors and were therefore excluded. Additionally, 40 questionnaires were deemed to have insufficient answering time, indicating careless answering, and were also excluded. Furthermore, 37 questionnaires were missing entries in the age section, and we supplemented the missing values by taking the average age of the same grade.

3   Results

3.1   Basic Information

1390 valid questionnaires were collected in this survey. The participants were aged between 17 and 25, with a median age of 20. There were 772 males (44.5%) and 618 females (55.5%) among the respondents. The majority of respondents were in their sophomore year (30.5%). Geographically, the distribution was mainly concentrated in the eastern region of China (47.3%). Non-medical majors accounted for the majority of respondents (68.3%). The majority of respondents had a monthly living allowance ranging from 1000 to 1500 yuan (39.6%). Most of the respondents did not have family members suffering from cancer (95.3%)(Table 1).

Table 1. Characteristics of college student.

	N	%			N	%
Gender			**Major**			
Male	772	44.5		Medical	441	31.7
Female	618	55.5		Non-medical	949	68.3
Grade						
First year	406	29.2	**Monthly living expenses**			
Second year	424	30.5		<1000	96	6.9
Third year	298	21.4		1000~1499	551	39.6
Fourth year	163	11.7		1500~1999	537	38.6
Fifth year	99	7.1		2000~2499	149	10.7
				2500~3000	32	2.3
				>3000	25	1.8
Area						
East	657	47.3				
Middle	243	17.5	**Any cancer patients in the family**			
West	282	20.2		Yes	66	4.7
Northeast	208	15.0		No	1324	95.3

*East: Hebei, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan, and the municipalities of Beijing, Tianjin, and Shanghai.

*Middle: Shanxi, Anhui, Jiangxi, Henan, Hubei, and Hunan.

*West: Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Chongqing, Inner Mongolia, Guangxi, Tibet, Ningxia, and Xinjiang.

* Northeast: Liaoning, Jilin, and Heilongjiang

3.2 Lung Cancer Awareness

Results of a survey on university students' awareness of lung cancer show that, among the basic knowledge of lung cancer, the awareness rate of the respondents on "reasonable diet and nutrition as a lifestyle to prevent lung cancer" and "cancer can occur not only in older people" is relatively high, at 82.9% and 82.7%, respectively. However, the awareness rates on "the first-degree relatives with cancer is also a risk factor for lung cancer" and "lung cancer is not contagious" are relatively low, at only 58.6% and 51.2%. In terms of knowledge related to lung cancer screening and early diagnosis and treatment, the awareness rate on "low-dose spiral CT is a more effective way to detect early-stage lung cancer" is the lowest, at only 10%, and the awareness rate on "China's lung cancer screening and early diagnosis and treatment guidelines recommend that people over the age of 50 should regularly undergo lung cancer screening" is also only 12.9%(Table 2).

Table 2. Content and accuracy of the questionnaire.

Question	Correct (n)	%
Q1. Do you think cancer only occurs in elderly people?	1149	82.7
Q2. Do you believe that a reasonable diet and nutrition are lifestyle factors for preventing lung cancer?	1152	82.9
Q3. Do you believe that physical exercise is a lifestyle factor for preventing lung cancer?	1092	78.9
Q4. Do you believe that smoking is a risk factor for lung cancer?	1135	81.7
Q5. Are you aware that second hand smoking is a risk factor for lung cancer?	1111	79.9
Q6. Are you aware that the formaldehyde substances generated from newly decorated houses are risk factors for lung cancer?	1119	80.5
Q7. Do you believe that lung cancer is contagious?	712	80.5
Q8. Do you believe that having a first-degree relative with cancer is also a risk factor for lung cancer?	815	58.6
Q9. Do you think that a history of occupational exposure is also a risk factor for lung cancer? (Occupational exposure history: silica, cadmium, asbestos, arsenic, beryllium, diesel exhaust, nickel, coal smoke, and coal ash)	1109	79.8
Q10. Do you think that chronic obstructive pulmonary disease (COPD) is also a risk factor for lung cancer? (COPD: a chronic bronchitis and emphysema with airflow obstruction)	1048	75.4
Q11. Do you believe that air pollution increases the likelihood of developing lung cancer?	1092	78.6
Q12. Are you aware that early-stage lung cancer often has no apparent symptoms?	894	64.3
Q13. Do you think that lung cancer can be detected early?	932	67.0
Q14. Have you heard of the concept of "early detection, early diagnosis, and early treatment" for lung cancer?	1104	72.9
Q15. Do you know that regular check-ups are a way to detect lung cancer early?	1057	76.0
Q16. May I ask which method you think is the most effective for detecting early-stage lung cancer?	139	10.0
Q17. According to the guidelines for lung cancer screening and early diagnosis and treatment in China, at what age should people undergo regular lung cancer screening?	180	12.9
Q18. Are you aware that early treatment for lung cancer has better outcomes?	1068	76.8

3.3   Difference Analysis of Lung Cancer Awareness Rate

Through the analysis of the awareness rate of lung cancer among undergraduate students, the results showed that 326 people (23.4%) had little knowledge about lung cancer, 649 people (46.7%) had partial understanding of lung cancer, and 415 people (29.9%) had a basic understanding of lung cancer.

Analysis of various related factors revealed that the level of understanding of lung cancer-related knowledge varies among survey respondents of different genders,

grades, regions, majors, monthly living expenses, and family cancer status, with statistically significant differences (P>0.05). Among 772 male respondents, 46.9% had "partial understanding" of lung cancer-related knowledge, while 23.8% had "basic understanding." Among 618 female respondents, 46.5% had "partial understanding" of lung cancer-related knowledge, while 34.7% had "basic understanding.

In grade grouping, all groups had more than half of the respondents who had a "partial understanding" or above of lung cancer-related knowledge. In terms of regional distribution, 42.9% of the respondents in the eastern region had a "basic understanding" of lung cancer-related knowledge, which had the highest proportion. In the central and western regions, 31.3% and 33.7% of the respondents respectively had a relatively high proportion of "not very familiar" with lung cancer-related knowledge. Non-medical majors had the highest proportion of respondents (30.0%) who had a "basic understanding" of lung cancer-related knowledge. In terms of monthly living expenses, 45.9% of the respondents with monthly living expenses of 2000-2499 yuan had a "basic understanding" of lung cancer-related knowledge, which had the highest proportion, while 38.5% of the respondents with monthly living expenses of less than 1000 yuan had the highest proportion of "not too familiar" with lung cancer-related knowledge. In terms of whether there were cancer patients in their families, 51.5% of the respondents with such situation had a relatively high proportion of "basic understanding" of lung cancer-related knowledge. However, more than half of the respondents without cancer patients in their families had reached the level of "partial understanding" or above (Table 3).

Table 3. Analysis of the difference of awareness rate of lung cancer among the population

Characteristics		Lung cancer awareness			*p-value*
		A little bit (n=326) n(%)	Somewhat (n=649) n(%)	Quite a bit (n=415) n(%)	
Gender	Male	181(29.3)	290(46.9)	147(23.8)	<0.001
	Female	145(18.9)	359(46.5)	268(34.7)	
Grade	First year	91(22.4)	184(45.3)	131(32.3)	<0.001
	Second year	68(16.0)	203(47.9)	153(36.1)	
	Third year	79(26.5)	131(44.0)	88(29.5)	
	Fourth year	48(29.4)	86(52.8)	29(17.8)	
	Fifth year	40(40.4)	45(45.5)	14(14.1)	
Area	East	98(14.9)	277(42.2)	282(42.9)	<0.001
	Midland	78(31.3)	119(49.0)	48(19.8)	
	West	95(38.7)	146(51.8)	41(14.5)	
	Northeast	57(27.4)	107(51.4)	44(21.2)	
Major	Medical	142(32.2)	169(38.3)	130(29.5)	<0.001
	Non-medical	184(19.4)	480(50.6)	285(30.0)	
Monthly living expenses	<1000	37(38.5)	36(37.5)	23(24.0)	<0.001
	1000~1499	133(24.1)	257(46.6)	161(29.2)	
	1500~1999	115(21.4)	281(52.3)	141(26.3)	
	2000~2499	26(17.4)	56(37.6)	67(45.0)	
	2500~3000	11(34.4)	10(31.3)	11(34.4)	
	>3000	4(16.0)	9(36.0)	12(48.0)	
Any cancer patients in the family	Yes	7(10.6)	25(37.9)	34(51.5)	<0.001
	No	319(24.1)	624(47.1)	381(28.8)	

* The p-value referred to in this table to the p-value obtained from conducting a chi-square test.

Using the level of understanding of lung cancer-related knowledge as the dependent variable, the aforementioned single-factor analysis was conducted with statistically significant variables, including gender, grade, region, major, monthly living expenses, and the presence of cancer patients in the household as independent variables for linear regression analysis. The results showed that gender, grade, region, major, and monthly living expenses were factors affecting the level of understanding of lung cancer-related knowledge(Table 4).

Table 4. Linear regression analysis of influencing factors of lung cancer related knowledge

Characteristic	AOR (95% CI)*	p-value
Gender		
Male	Ref	Ref
Female	0.93(0.54~1.33)	<0.001
Grade		
First year	Ref	Ref
Second year	-0.14(-0.71~0.42)	0.6163
Third year	-1.18(-1.90~-0.47)	0.0011
Fourth year	-1.68(-2.61~-0.77)	<0.001
Fifth year	-2.06(-3.23~-0.89)	<0.001
Area		
West	Ref	Ref
Middle	-1.04(-1.65~-0.43)	<0.001
West	-1.24(-1.84~-0.66)	<0.001
Northeast	-1.32(-1.92~-0.71)	<0.001
Major		
Medical	Ref	Ref
Non-medical	0.62(0.16~1.08)	0.0077
Monthly living expenses		
<1000	Ref	Ref
1000~1499	0.99(0.17~1.81)	0.0175
1500~1999	1.56(0.73~0.81)	<0.001
2000~2499	1.41(0.45~2.38)	0.0040
2500~3000	0.63(-0.87~2.12)	0.4109
>3000	2.67(1.03~4.32)	0.0014
Any cancer patients in the family		
Yes	Ref	Ref
No	-0.70(-1.64~0.24)	0.1426

*AOR = adjusted odds ratio, CI = confidence interval

4   Discussion

Lung cancer is one of the most common malignant tumors in the world. In most countries, the incidence and mortality of lung cancer are showing a significant upward trend,

which poses a great threat to human health. The level of knowledge about cancer prevention and treatment is an indication of residents' health literacy. It is an important indicator for assessing the effectiveness of cancer prevention and treatment efforts.

The results of this study indicate that the overall awareness rate of college students regarding lung cancer-related knowledge is 67.46%. College students have a relatively good understanding of basic knowledge about lung cancer and its related risk factors, which may be attributed to the promotion and education on lung cancer within schools. Meanwhile, college students have a higher understanding of smoking and air pollution as risk factors for lung cancer, which is consistent with a study conducted in Nigeria[7]. However, their knowledge about lung cancer screening and early diagnosis and treatment is relatively low. Research has shown that low-dose spiral CT screening can effectively detect early-stage lung cancer[8], thereby reducing the mortality rate of lung cancer. However, in this survey, many participants were unaware of the screening methods for early-stage lung cancer, with an awareness rate of only 10%. Therefore, it is necessary to strengthen the education on lung cancer screening and early diagnosis and treatment among college students and improve their level of health education.

Meanwhile, in the results of the multifactor analysis, gender, region, grade, major, and monthly living expenses are all important factors affecting college students' knowledge of lung cancer. It can be seen that females in college pay more attention to lung cancer-related knowledge, and have a higher degree of understanding than males. Research has shown that low-dose spiral CT screening can effectively detect early-stage lung cancer2, thereby reducing the mortality rate of lung cancer. However, in this survey, many participants were unaware of the screening methods for early-stage lung cancer, with an awareness rate of only 10%. Therefore, it is necessary to strengthen the education on lung cancer screening and early diagnosis and treatment among college students and improve their level of health education[9]. This may be because males make up a larger proportion of the smoking population. Therefore, in later health education work, relevant lung cancer health education should be strengthened for male college students. Looking at the distribution by grade, the level of knowledge of lung cancer-related knowledge among first to fifth year students shows a downward trend. This may be due to more general courses in the first and second years, while students in the fourth and fifth years have more professional courses and are unable to effectively learn health knowledge in a timely manner. Therefore, in future campus lung cancer-related education, all grade levels of students should be considered. From the perspective of monthly living expenses, the higher the living expenses of college students, the higher their knowledge of lung cancer-related knowledge. This may be because living expenses reflect the economic level of the family, and families with higher economic levels pay more attention to student health education. Research has shown that low-dose spiral CT screening can effectively detect early-stage lung cancer2, thereby reducing the mortality rate of lung cancer. However, in this survey, many participants were unaware of the screening methods for early-stage lung cancer, with an awareness rate of only 10%. Therefore, it is necessary to strengthen the education on lung cancer screening and early diagnosis and treatment among college students and improve their level of health education[7][10]. At the same time, the results also showed that the speed of obtaining lung cancer-related knowledge varies among different regions and

majors. The most surprising result is that there is not a significant gap between medical and non-medical college students. From the results, we can see that non-medical students have a higher awareness of lung cancer-related knowledge compared to medical students. Although the difference is not obvious, it reminds us that there may be deficiencies in the education of common knowledge issues for medical students in universities, which should be emphasized in the future. Therefore, in future lung cancer education, peer-to-peer health education should be strengthened to ensure that every student can acquire useful knowledge.

5   Conclusion

This study is a survey on the knowledge and awareness of lung cancer among college students. The inclusion of a wide range of participants in this survey allows the research findings to describe to a certain extent the current status of health education for college students in universities and the need for improvement. This study provides a scientific basis for developing strategies for health education in the prevention and control of lung cancer.

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