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Analysis of the Prevalence Characteristics of Lung Nodules and Their Influencing Factors in The Health Check-Up Population

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Abstract: *Objective:* To study the prevalence characteristics of pulmonary nodules and their influencing factors in the health check-up population. *Methods:* A total of 500 cases of health checkups were selected for the data study to analyze the detection and prevalence characteristics of pulmonary nodules. The influencing factors between the pulmonary nodules group and the no pulmonary nodules group were analyzed. Results: A total of 209 cases were detected, of which there were more males than females, and for female patients, the detection rate increased with age ($P < 0.05$). The distribution of gender, age, smoking, respiratory symptoms, and exposure to kitchen fumes between the two groups was compared ($P < 0.05$). The multifactorial analysis concluded that risk factors include, respiratory symptoms, older age, exposure to kitchen fumes, and smoking. In addition, patients who exercised more had a lower risk of developing lung nodules. *Conclusion:* The detection rate of pulmonary nodules was high in the health check-up population and the influencing factors analyzed involved the presence of respiratory symptoms, older age, kitchen fume exposure, and smoking, while the positive influencing factor was increased exercise.

Keywords: Health check-up population; Pulmonary nodules; Prevalence characteristics; Influencing factors

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1. Introduction

Lung nodules are common in clinical practice and may occur singly or in multiples. They have an insidious onset and are easily detected during health checkups, where the probability of detecting them has increased recently. Lung nodules have the possibility of developing into precancerous lesions, early lung cancer, and invasive lung cancer in young patients, and the nodule size positively correlates with the risk of malignant tumors. Hence, it is crucial to analyze the independent risk factors for malignant lung nodules in the female population, especially if the size of the nodule is more than 10 mm in diameter [1]. Lung cancer patients are common in China. This paper proposes that the early detection of lung nodules is crucial to control and prevent

lung cancer. In this paper, 500 cases of health checkups were selected to study the prevalence characteristics of lung nodules in the health checkup population and their influencing factors.

2. Information and methods

2.1. General information

A population of 500 health checkups was selected for the data study and the selection period was from January to December 2023.

2.2. Methods

Data were collected and lungs were scanned using a multislice 64-row spiral CT with tube voltage, tube current, scan thickness, and scan length of 120 kVp, 35 mAs or less, 0.6 mm, and 512 mm, respectively. Using the moderate convolutional kernel T20f, a layer thickness of 1 or 10 mm was reconstructed, including a layer spacing of 1 or 10 mm. A single breath-hold at the end of expiration was performed from the tip of the patient's lungs to the angle of the costal diaphragm.

2.3. Statistical analysis

Data analysis was carried out using the SPSS 25.0 statistical software. Measurement data were expressed as mean ± standard deviation and the count data were expressed as %. Measurement data were analyzed using a *t*-test, and count data were analyzed using a chi-squared (χ^2) test. Results were considered statistically significant at $P < 0.05$.

3. Results

In this study, 209 cases were detected, in which there were more males than females. For female patients, the detection rate increased with age ($\chi^2 = 45.5598$, $P < 0.05$). The distribution of gender, age, smoking, respiratory symptoms, and exposure to kitchen fumes between the two groups were compared ($P < 0.05$). The multifactorial analysis concluded that the presence of respiratory symptoms, older age, exposure to kitchen fumes, and smoking, were risk factors. Additionally, patients who exercise regularly have a lower probability of developing pulmonary nodules. These data are shown in **Table 1** to **Table 3**.

Table 1. Detection of lung nodules

Age (years)	Cases, *n*	Detected	Male	Female
Up to 40	214	67	48	19
40–49	119	52	37	15
50–59	107	56	35	21
60–69	44	26	14	12
> 70	16	8	5	3
Total	500	209	139	70

Table 2. Distribution of gender, age, smoking, respiratory symptoms, and exposure to kitchen fumes between the two groups

Group	Cases, *n*	Age (years)	Gender		Respiratory symptoms		Smoking		Exposure to kitchen fumes		Regular exercise	
			Male (*n* = 317)	Female (*n* = 183)	Yes (*n* = 64)	No (*n* = 436)	Yes (*n* = 125)	No (*n* = 375)	Yes (*n* = 412)	No (*n* = 88)	Yes (*n* = 189)	No (*n* = 311)
Lung nodule group	209	46.92 ± 5.98	123	122	36	174	61	94	180	20	118	43
No lung nodules group	291	41.27 ± 5.48	194	61	28	262	64	281	242	58	71	268
t/χ^2		3.7512	36.0500		6.1181		24.6875		7.9394		127.2252	
P		< 0.05	< 0.05		< 0.05		< 0.05		< 0.05		< 0.05	

Table 3. Multi-factor analysis

Variables	β-value	SE	Wald	*P*	OR	95% CI
Sex						
Male					1	
Female	-0.121	0.158	4.846	< 0.05	0.886	0.650–1.207
Age (years)						
< 40					1	
40-49	0.931	0.163	35.041	< 0.05	2.537	1.843–3.492
50-59	1.064	0.165	39.082	< 0.05	2.898	2.097–4.004
60-69	1.276	0.218	26.850	< 0.05	3.582	2.336–5.491
> 70	1.233	0.353	9.895	< 0.05	3.432	1.718–6.854
Respiratory symptoms						
No						
Yes	0.554	0.225	10.943	< 0.05	1.740	1.119–2.704
Smoking						
No						
Yes	1.316	0.260	19.467	< 0.05	3.728	2.240–6.06
Exposure to kitchen fumes						
No						
Yes	0.831	0.177	26.525	< 0.05	2.296	1.623–3.248
Exercise regularly						
No						
Yes	1.294	0.232	24.041	< 0.05	3.648	2.315–5.747

4. Discussion

Lung nodules are often detected during health checkups and are of clinical concern, especially for males aged 18–69 years [2]. In this study, 209 cases out of 500 were detected, in which there were more males than females.

For female patients, the detection rate increased with age ($\chi^2 = 45.5598$, $P < 0.05$). The distribution of gender, age, smoking, respiratory symptoms, and kitchen fume exposure between the two groups were compared ($P < 0.05$). The multifactorial analysis yielded that the presence of respiratory symptoms, older age, exposure to kitchen fumes, and smoking were risk factors, and increased exercise in patients can lower the probability of developing pulmonary nodules.

The above analysis concluded that increasing age increases the probability of developing lung nodules, whereas smoking-related lung cancer development is also associated with lung nodules [3–5]. Harmful substances in kitchen fumes can cause a one-second drop in forceful expiration, and respiratory symptoms are associated with the development of lung nodules, such as coughing up sputum and inflammation. Physical exercise can reduce the occurrence of various diseases [6–8]. This is because exercise-induced myokines will strengthen the immunity of the patient's body and prevent the growth of lung nodules. The Chinese medical treatment of unhealthy diseases also suggests that exercise can regulate the body's qi, blood, yin, and yang, and improve the prognosis of the patients [9,10].

5. Conclusion

The detection rate of pulmonary nodules in the health checkup population is high. Risk factors included respiratory symptoms, old age, exposure to kitchen fumes, and smoking, whereas exercise acted as the positive factor.

Disclosure statement

The authors declare no conflict of interest.

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