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Meta Analysis

Factors Influencing the Lung Cancer Incidence in China: A Meta-Analysis

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Abstract

AIM: The aim of the study was to systematically evaluate the main factors associated with lung cancer incidence in China and provide reference for developing successful lung cancer interventions and accelerating progress against cancer.

METHODS: All publications related to the influencing factors of lung cancer incidence were retrieved from four databases from their date of inception through September 2022. Eight Medical Subject Headings and corresponding keywords were utilized to identify eligible trials in China National Knowledge Infrastructure (CNKI), Wanfang Database, Chinese Scientific Journals Database (VIP), and China Biology Medicine Database (CBM). The heterogeneity test and meta-analysis were conducted using Review Manager (RevMan, version 5.4) software. This study was designed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols.

RESULTS: Fourteen studies, published from 2000 to 2019, have been chosen and incorporated in a meta-analysis. The mean total quality score across the included studies was 7, with a range of 6–8. The findings of the meta-analysis demonstrated that smoking (odds ratio=2.46, 95% confidence interval: 1.94-3.11), passive smoking (odds ratio=2.44, 95% confidence interval: 2.13-2.80), lung/respiratory disease (odds ratio=2.66, 95% confidence interval: 1.82-3.89), family history of tumor (odds ratio=2.79, 95% confidence interval: 1.80-4.32), oil fume (odds ratio=1.91, 95% confidence interval: 1.50-2.43), and psychological factor (odds ratio=2.27, 95% confidence interval: 1.89-2.73) were risk factors for lung cancer, while more fruits and vegetables (odds ratio=0.51, 95% confidence interval: 0.35-0.75), exercise (odds ratio=0.55, 95% confidence interval: 0.43-0.72), and tea drinking (odds ratio=0.52, 95% confidence interval: 0.32-0.83) were protective factors for lung cancer. Funnel plot analysis demonstrated the absence of any apparent publication bias.

CONCLUSION: The risk and protective factors influencing the lung cancer incidence are diverse. Considering the research limitations, we should have more research projects to explore the factors that affect lung cancer incidence and explain the research results. *Keywords:* Influencing factor, lung cancer, meta-analysis, review, risk factor

Introduction

Cancer is a critical public health issue worldwide. The International Agency for Research on Cancer (IARC) estimated that approximately 19.3 million individuals received a new cancer diagnosis, and 10.0 million cancer-related deaths occurred globally in 2020 (Sung et al., 2021). Among all malignancies, lung cancer ranks high in incidence and mortality (Ferlay et al., 2019), with around 2.2 million new cases and 1.8 million deaths worldwide in 2020, accounting for 11.4% of total cancer incidence and 18.0% of all cancer fatalities (Sung et al., 2021). In the USA, 238340 new cases of lung/bronchus cancer and 127070 deaths from lung/bronchus cancer were projected to occur in 2023 (Siegel et al., 2023). In Japan, an estimated 125424 new cases of lung cancer arose in 2016 with 74328 resulting in death in 2018, comprising 12.6% of all detected cases of cancer and 19.9% of all cancer-related deaths (Cancer Information Service, National Cancer Center, Japan, 2022). In China, lung cancer accounted for 17.9% of all cancer cases and 23.8% of all cancer deaths (Liu et al., 2020). Although the incidence and mortality of lung cancer vary across regions/countries, the five-year survival rate for patients with lung cancer worldwide is only 10–20%, and lung cancer remains the leading cause of cancer-associated mortality (IARC, 2020). Therefore, timely prevention, diagnosis, and treatment are crucial for lung cancer patients to ensure their better prognosis and survival (Ansar et al., 2023; Leiro-Fernández et al., 2019).

Evidence suggests that despite the exploration and implementation of multiple treatment measures to combat cancer, the success or failure of tertiary prevention and new diagnosis and

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treatment methods for lung cancer, to some extent, depends on the study of its epidemiological characteristics and related risk factors (Yao & Liu, 2014). Hence, numerous studies have measured the factors influencing the incidence of lung cancer. The research on pathogenic factors of lung cancer has been started since the early 1950s, and the earliest manuscript was published in 1954 (Wynder, 1954). Since 1984, the number of manuscripts published has increased, and there is a rapid upward trend from 2006 to 2020. The first study examined the correlation between smoking and lung cancer, and the findings demonstrated that the mortality of lung cancer patients increased with the increase of smokers (Wynder, 1954). Recently, numerous studies have found that unfavorable environmental factors, behavioral factors, and genetic susceptibility play a role in the onset and advancement of lung cancer. For example, Kanwal et al. (2017) confirmed that the primary causes of lung cancer were smoking and air pollution, with an increased risk for those with a family history of lung cancer. Yang et al. (2018) found that in the East Asian population, two single-nucleotide polymorphisms of CLPTM1L could affect susceptibility to lung cancer by regulating the expression of TERT.

It is expected that by 2030, 75% of global cancer deaths will be in low and middle-income countries/regions (Shah et al., 2019). As a developing country, China has an extremely high incidence of lung cancer (Cao et al., 2022). The earliest research on the factors of lung cancer in China was conducted in 1987 (Jiang & Liao, 1987). Yao and Liu (2014) found that smoking, genetic factors, environmental pollution, occupational exposure, and unhealthy eating habits were risk factors affecting the lung cancer incidence. Shen et al. (2021) demonstrated that a higher socio-economic status was related to a lower risk of lung cancer. Ding et al.'s (2021) study showed that the changes in smoking behavior might be the most practical and direct measure to reduce the risk of lung cancer, and this behavior can be influenced by other risk factors, particularly obesity. Although these studies filled the gap in the association and causation between lung cancer and common factors in China, these results still show some differences and further exploration should be conducted. For example, there has been disagreement on whether dietary intake or chronic obstructive pulmonary disease had a causal relationship with lung cancer. Therefore, our study aims to synthetically explore factors associated with lung cancer incidence in China by using the metaanalysis method. The following questions have been raised to address the aim.

Research Questions

- 1. What commonly reported factors were related to the occurrence of cancer among patients with lung cancer?
- 2. What were the common protective factors for preventing lung cancer?

Methods

Study Design

This study adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) for designing and reporting (Moher et al., 2015).

Search Strategy

A reasonable search strategy was formulated according to PICOS principle (Joanna Briggs Institute [JBI], 2014). The PICOS in this study was described as follows:

P (population): The target population in this study was patients with lung cancer.

I (intervention): This study emphasized the evaluation of the relation between various factors and increased lung cancer incidence.

C (comparison): The identified studies were compared in terms of evaluating the impact of various factors on lung cancer incidence.

O (outcome): The outcome studied in this study was the increase in lung cancer incidence.

S (study design): Studies that used a case-control trial design were integrated into the meta-analysis.

To identify correlative publications, we searched a range of databases from their date of inception through September 2022, which included China National Knowledge Infrastructure (CNKI), Wanfang Database, Chinese Scientific Journals Database (VIP), and China Biology Medicine Database (CBM). Eight Medical Subject Headings (MeSH), and corresponding keywords, such as "lung cancer," "lung neoplasms," "influencing factor," and "risk factor," were used to identify potential publications. Titles and abstracts of the retrieved publications were downloaded and screened, and only studies that met the inclusion and exclusion criteria were selected.

Inclusion and Exclusion Criteria

The following inclusion criteria were applied: i) participants: patients with definite diagnosis of lung cancer; ii) form of outcome: lung cancer incidence; iii) influencing factors: smoking, passive smoking, lung/respiratory disease, and family history of tumor, etc.; iv) research design: a case-control study; v) literature type: published periodical literature; and v) language category: Chinese. Studies were excluded if they i) had partial data; ii) were conference announcements; and iii) duplicates.

Study Selection, Data Extraction, and Analysis

The information extracted from the retrieved publications using Microsoft Office Excel 2019 included study ID, region, sample size, and factors. The quality of each selected study was assessed using the Newcastle–Ottawa Scale (NOS), which evaluated the following issues: selection, comparability, and exposure (Ottawa Hospital Research Institute, 2021; Stang, 2010). The overall score for NOS varied between 0 and 9 points. Studies with a score of \geq 6 points were included in the meta-analysis.

Statistical Analysis and Synthesis

Review Manager (RevMan, version 5.4) software was employed to conduct a meta-analysis. The odds ratio (OR) was used as the effect index for two categorical variables. The pooled OR value and a 95% confidence interval (CI) were then calculated. The heterogeneity test was conducted by I^2 values. Depending on

the values obtained, a fixed-effect model was used for metaanalysis when p > .10 or $l^2 \le 50\%$, indicating low heterogeneity among study results. Otherwise, the source of heterogeneity was analyzed, and a random effects model was used. Sensitivity analysis was performed using the transformed data effect model, so as to test the stability of meta-analysis results. If the change of the pooled *OR* value and 95% *CI* obtained after transforming the effect model was not obvious, we considered the sensitivity to be low and the meta-analysis results were robust and reliable. The possible publication bias of the study was tested by funnel plots. The level of significance for metaanalysis was set at $\alpha = 0.05$.

Results

Literature Search Results

Initially, 548 records were retrieved, and 534 studies were excluded due to following causes: duplicates (286 studies), title or abstract was not related to the research topic (208 studies), conference announcements (18 studies), full text was not reached (11 studies), and low quality (11 studies). Fourteen studies were finally included for the meta-analysis (Fang et al., 2019; Han et al., 2005; 2008; Huang & Liu, 2006; Liang et al., 2009; Lin et al., 2010; Liu et al., 2000; Lu et al., 2004; Ma et al., 2012; Su et al., 2013; Xu & Cai, 2013; Xu et al., 2015; Zhang et al., 2008; Zhao et al., 2013). Figure 1 depicts the process and results of literature screening.

Characteristics of the Included Studies

The 14 studies included in this meta-analysis were published in Chinese journals from 2000 to 2019. The studies estimated the effect of smoking, passive smoking, lung/respiratory disease, family history of tumors, oil fume, psychological factor, pollution near the residence, more fruits and vegetables, exercise, and tea



Figure 1.

Preferred Reporting Items for Systematic Reviews and Meta-Analyses Flowchart. drinking. The sample size varied from 262 to 2459 participants, with a pooled sample size of 13399. See Table 1 for details on the included studies.

Quality Evaluation of the Included Studies

The total quality scores ranged from 6 to 8, with a mean of 7. Among the three evaluation indicators, the highest (selection) and lowest (exposure) average scores were 3.2 and 1.7 respectively. Table 2 displays the quality evaluation of the studies.

Meta-Analysis Results

Smoking

Twelve studies (Fang et al., 2019; Han et al., 2005, 2008; Huang & Liu, 2006; Liang et al., 2009; Liu et al., 2000; Lu et al., 2004; Su et al., 2013; Xu & Cai, 2013; Xu et al., 2015; Zhang et al., 2008; Zhao et al., 2013) with a combined total of 12,583 participants were analyzed to investigate the effect of smoking on

Table 1.

Characteristics of the Included Studies

Study ID	Region	Sample Size (CG ¹ /CG ²)	Factors
Fang et al. (2019)	Shaoxing,	1061	(1) (3) (4) (6)
	China	(461/600)	(8)
Han et al. (2005)	Xi'an, China	511 (248/263)	(1) (3) (4) (5) (6)
Han et al. (2008)	Jiangsu,	2447	(1) (4) (5) (8)
	China	(523/1924)	(10)
Huang and Liu (2006)	Shanghai, China	542 (271/271)	(1) (5) (6) (8)
Liang et al. (2009)	Zhuhai,	262	(1) (3) (4) (5)
	China	(131/131)	(8)
Lin et al. (2010)	Fujian,	416	(2) (4) (5) (8)
	China	(208/208)	(9) (10)
Liu et al. (2000)	Shanghai,	700	(1) (3) (5) (6)
	China	(350/350)	(8)
Lu et al. (2004)	Foshan, China	240 (120/120)	(1) (3) (4) (5) (6) (7) (8) (9)
Ma et al. (2012)	Dalian, China	400 (200/200)	(4) (9)
Su et al. (2013)	Taiyuan, China	861 (396/465)	(1) (5) (10)
Xu and Cai (2013)	Fujian,	2459	(1) (2) (3) (4)
	China	(1225/1234)	(7) (10)
Xu et al. (2015)	Yangzhou, China	850 (425/425)	(1) (3) (6) (8)
Zhang et al. (2008)	Changzhou,	1034	(1) (3) (4) (6)
	China	(505/529)	(8)
Zhao et al. (2013)	Guangzhou,	1616	(1) (2) (3) (4)
	China	(808/808)	(8)

Note: (1) Smoking; (2) Passive smoking; (3) Lung/respiratory disease; (4) Family history of tumor; (5) Oil fume; (6) Psychological factor; (7) Pollution near the residence; (8) More fruits and vegetables; (9) Exercise; (10) Tea drinking.

CG1 = Case group; CG2 = Control group.

Table 2.			
Quality Evaluation	of the	Included	Studies

			_	Total
Study ID	Selection	Comparability	Exposure	Score
Fang et al. (2019)	3	2	2	7
Han et al. (2005)	3	2	1	6
Han et al. (2008)	4	2	2	8
Huang and Liu (2006)	3	2	1	6
Liang et al. (2009)	3	2	2	7
Lin et al. (2010)	3	2	2	7
Liu et al. (2000)	4	2	2	8
Lu et al. (2004)	3	2	1	6
Ma et al. (2012)	3	2	2	7
Su et al. (2013)	3	2	2	7
Xu and Cai (2013)	3	2	2	7
Xu et al. (2015)	3	2	1	6
Zhang et al. (2008)	4	2	2	8
Zhao et al. (2013)	3	2	2	7

lung cancer incidence. A random effects model was employed for meta-analysis as the 12 studies showed a high level of heterogeneity (l^2 =89%, p < .001). The pooled effect size indicated smoking as a risk factor for lung cancer (OR=2.46, 95% CI: 1.94–3.11).

Passive Smoking

Three studies (Lin et al., 2010; Xu & Cai, 2013; Zhao et al., 2013), including 4,491 participants, investigated the effect of passive smoking on lung cancer incidence. A minimal degree of heterogeneity was noted among the three studies ($l^2=0\%$, p=.86), and thus, a fixed-effect model was chosen for meta-analysis. The analysis revealed that exposure to passive smoking increased the risk of developing lung cancer (OR=2.44, 95% CI: 2.13–2.80).

Lung/Respiratory Disease

Nine studies (Fang et al., 2019; Han et al., 2005; Liang et al., 2009; Liu et al., 2000; Lu et al., 2004; Xu & Cai, 2013; Xu et al., 2015; Zhang et al., 2008; Zhao et al., 2013), involving 8733 participants, investigated the effect of lung/respiratory disease on lung cancer. Remarkable heterogeneity was found among the studies ($l^2 = 86\%$, p < .001), which led to the utilization of a random-effect model for meta-analysis. The results showed that lung/respiratory disease significantly associated with an increased risk of lung cancer (OR = 2.66, 95% Cl: 1.82–3.89).

Family History of Tumor

Ten studies (Fang et al., 2019; Han et al., 2005, 2008; Liang et al., 2009; Lin et al., 2010; Lu et al., 2004; Ma et al., 2012; Xu & Cai, 2013; Zhang et al., 2008; Zhao et al., 2013), involving 10 446 participants, investigated the effect of family history of tumor on lung cancer. The studies displayed a significant amount of heterogeneity (l^2 =90%, p < .001), leading to the adoption of a

random-effect model for meta-analysis. The results indicated that family history of tumor was a risk factor for lung cancer (OR=2.79, 95% CI: 1.80–4.32).

Oil Fume

Eight studies (Han et al., 2005, 2008; Huang & Liu, 2006; Liang et al., 2009; Lin et al., 2010; Liu et al., 2000; Lu et al., 2004; Su et al., 2013), including 5979 participants, investigated the effect of oil fume on lung cancer. A significant level of heterogeneity existed among the eight studies ($l^2 = 70\%$, p = .001), and thus, a random-effect model was applied. The findings showed that exposure to oil fume was a risk factor for lung cancer (OR = 1.91, 95% CI: 1.50–2.43).

Psychological Factor

Seven studies (Fang et al., 2019; Han et al., 2005; Huang & Liu, 2006; Liu et al., 2000; Lu et al., 2004; Xu et al., 2015; Zhang et al., 2008), including 4949 participants, examined the influence of psychological factors on lung cancer. The studies showed low heterogeneity ($l^2=28\%$, p=.22); thus, a fixed-effect model was selected. The results indicated that psychological factors increased the risk of developing lung cancer (OR=2.27, 95% CI: 1.89–2.73). The results are shown in Figure 2.

More Fruits and Vegetables

Ten studies (Fang et al., 2019; Han et al., 2008; Huang & Liu, 2006; Liang et al., 2009; Lin et al., 2010; Liu et al., 2000; Lu et al., 2004; Xu et al., 2015; Zhang et al., 2008; Zhao et al., 2013), including 7232 participants, investigated the effect of more fruits and vegetables on lung cancer. A high degree of heterogeneity was observed among studies ($l^2 = 92\%$, p < .001), leading to the selection of a random effect model. The results showed that a higher intake of fruits and vegetables might be protective against lung cancer (OR=0.51, 95% CI: 0.35–0.75).

Exercise

Three studies (Lin et al., 2010; Lu et al., 2004; Ma et al., 2012) with 1056 participants investigated the effect of exercise on lung cancer. A low level of heterogeneity was observed across studies ($l^2=0\%$, p=.53), leading to the selection of a fixed-effect model. The results indicated that exercise served as a protective factor against lung cancer (OR=0.55, 95% CI: 0.43–0.72).

Tea Drinking

Tea drinking was investigated in a total of four studies (Han et al., 2008; Lin et al., 2010; Su et al., 2013; Xu & Cai., 2013), comprising 6183 participants, to determine its effect on lung cancer. There was significant heterogeneity between studies (l^2 =91%, p < .001), and thus, a random-effect model was chosen. The findings indicated that tea drinking was a protective factor for lung cancer (OR=0.52, 95% CI: 0.32–0.83). The results are shown in Figure 3.

Sensitivity Analysis and Risk of Bias of the Included Studies

After transforming the effect model, we acquired pooled OR values and 95% CIs under two effect models, as displayed in Table 3. The analysis showed a minimal shift in the results for nine factors, suggesting that the results were relatively robust and reliable. Funnel plot analysis was conducted on three

٨		6	-	Canta			Odda Batia		Odda Batia
~	Study or Subgroup	Lase	S Total	Contro	Total	Weight	M H Random 95% Cl		M H Bandom 95% Cl
-	Liu et al 2000	236	350	161	350	84%	2 43 [1 79 3 30]		
	Lu et al., 2004	83	120	34	120	6.4%	5.67 [3.26, 9.88]		
	Zhang et al., 2008	172	505	143	529	8.7%	1.39 [1.07, 1.82]		
	Xu et al., 2015	288	425	105	425	8.5%	6.41 [4.75, 8.65]		
	Fang et al., 2019	303	461	256	600	8.8%	2.58 [2.00, 3.31]		
	Liang et al., 2009	95	131	55	131	6.7%	2.60 [1.55, 4.35]		
	Sulet al., 2013	200	390	181	400	8.0%	2.84 [2.15, 3.75]		-
	Sulet al. 2013	506	808	386	808	9.3%	2.88 [2.52, 5.53]		-
	Han et al., 2008	284	523	757	1924	9.2%	1.83 [1.51, 2.23]		-
	Han et al., 2005	163	248	141	263	8.0%	1.66 [1.16, 2.37]		
	Huang and Liu, 2006	162	271	132	271	8.2%	1.57 [1.11, 2.20]		
	Total (95% CI)		5363		7120	100.0%	2.46 [1.94, 3.11]		-
	Lotar events	3323 0.15: Chi	z _ 00 (2889 02 df = 1	1 /D ~ 0	000043-1	Z - 000	+	
	Test for overall effect :	7 = 7.46	P < 0.0	00,01-1	1 (1 - 0	.00001),1	- 03 10	0.05	0.2 1 5 20
	restror overall energy	2-1.40 (Favours (cases) Favours (controls)
в		Case	es	Contr	ols		Odds Ratio		Odds Ratio
_	Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% Cl		M-H, Fixed, 95% Cl
	Liu et al., 2000	120	208	72	208	11.4%	2.58 [1.73, 3.83]		
	Xu et al., 2015	599	1225	354	1234	67.2%	2.38 [2.01, 2.81]		_ ■
	Zhao et al., 2013	163	808	72	808	21.4%	2.58 [1.92, 3.48]		
	Total (95% CI)		2241		2250	100.0%	2.44 [2.13, 2.80]		▲
	Total events	882		498					
	Heterogeneity Chi ² =	0.30 df=	: 2 (P =	: 0.86) [.] P	= 0%			+	
	Test for overall effect	Z = 12.84	5 (P < 1	0.00001	0.0			0.05	0.2 1 5 20
	. Sation overall ellett.	- 12.00	-11 -1						Favours [cases] Favours [controls]
С	:	Cases	s	Contro	Is		Odds Ratio		Odds Ratio
2	Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl		M-H, Random, 95% Cl
	Liu et al., 2000	113	350	54	350	12.6%	2.61 [1.81, 3.77]		
	Lu et al., 2004	53	120	22	120	10.7%	3.52 [1.96, 6.33]		
	Zhang et al., 2008	100	505	16	529	10.6%	2.68 [1.48, 4.87]		
	Au et al., 2015	37	461	40	425 600	10.0%	4 28 [2 20 8 30]		
	Liang et al., 2009	9	131	2	131	4.2%	4.76 [1.01, 22.46]		
	Xu and Cai, 2013	177	1225	108	1234	13.4%	1.76 [1.37, 2.27]		-
	Zhao et al., 2013	134	808	86	808	13.2%	1.67 [1.25, 2.23]		-
	Han et al., 2005	102	248	94	263	12.7%	1.26 [0.88, 1.80]		+-
	Total (95% CI)		4273		4460	100.0%	266[192 390]		•
	Total (95% CI)	847	4213	439	4400	100.0%	2.00 [1.02, 3.09]		•
	Heterogeneity: Tau ² = 1	0.26; Chi	= 57.2	29. df = 8	(P < 0.0	0001); l ² :	= 86%	+	
	Test for overall effect 2	04 /						0.02	0.1 1 10 50
	restion overall enect a	2 = 5.04 (i	P < 0.0	0001)				0.02	Eavoure (caese) Eavoure (controle)
	restror overall enect 2	2 = 5.04 (P < U.U	0001)				0.02	Favours [cases] Favours [controls]
_	restion overall enect 2	Case	P < U.U	0001)			Odda Patio	0.02	Favours [cases] Favours [controls]
D	Study or Subgroup	Case	P <uu IS Total</uu 	Contro	ols	Weight	Odds Ratio	0.02	Favours [cases] Favours [controls] Odds Ratio M.H Bandom 95% Cl
D	Study or Subgroup	Case Events 24	P < 0.0 s <u>Total</u> 120	Contro Events	ols <u>Total</u> 120	Weight 8.5%	Odds Ratio M-H, Random, 95% CI 3.08.11.37.6.951	0.02	Favours [cases] Favours [controls] Odds Ratio M.H. Random, 95% Cl
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2008	Case Events 24 119	P < 0.0 s <u>Total</u> 120 505	Contro Events 9 80	ols <u>Total</u> 120 529	Weight 8.5% 11.4%	Odds Ratio M-H, Random, 95% CI 3.08 [1.37, 6.95] 1.73 [1.26, 2.37]	0.02	Favours (cases) Favours (controls)
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2019	Case Events 24 119 104	P < 0.0 s <u>Total</u> 120 505 461	0001) Contro Events 9 80 18	Total 120 529 600	Weight 8.5% 11.4% 10.3%	Odds Ratio M-H, Random, 95% Cl 3.08 [1.37, 6.95] 1.73 [1.26, 2.37] 9.42 [5.61, 15.80]	0.02	Favours [cases] Favours [controls] Odds Ratio M.H. Random, 95% CI
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2010	Case Events 24 119 104 44	P < 0.0 s <u>Total</u> 120 505 461 208	0001) Contro Events 9 80 18 32	Total 120 529 600 208	Weight 8.5% 11.4% 10.3% 10.4%	Odds Ratio <u>M-H, Random, 95% Cl</u> 3.08 (1.37, 6.95) 1.73 (1.26, 2.37) 9.42 (5.61, 15.80) 1.48 (0.89, 2.44)	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% Cl
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2019 Linag et al., 2009	Case Events 24 119 104 44 19	P < 0.0 s <u>Total</u> 120 505 461 208 131	0001) Contro Events 9 80 18 32 9	Total 120 529 600 208 131	Weight 8.5% 11.4% 10.3% 10.4% 8.4%	Odds Ratio <u>M-H, Random, 95% CI</u> 3.08 [1.37, 6.95] 1.73 [1.26, 2.37] 9.42 [5.61, 15.80] 1.48 [0.89, 2.44] 2.30 [1.00, 5.29]	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2010 Liang et al., 2009 Xu and Cai, 2013	Case Events 24 119 104 44 19 235	r < 0.0 s <u>Total</u> 120 505 461 208 131 1225	Contro Events 9 80 18 32 9 195	Total 120 529 600 208 131 1234	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8%	Odds Ratio <u>M.H. Random, 95% C1</u> 3.08 (1.37, 6.95) 1.73 (1.26, 2.37) 9.42 (5.61, 15.80) 1.48 (0.89, 2.44) 2.30 (1.00, 5.29) 1.26 (1.03, 1.56) 4.20 (1.00, 1.00)	0.02	Favours (cases) Favours (controls) Odds Ratio MH, Random, 95% CI
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2018 Lin et al., 2019 Lin et al., 2010 Liang et al., 2010 Xu and Cai, 2013 Zhao et al., 2013	Case Events 24 119 104 44 19 235 106 27	P < 0.0 s <u>Total</u> 120 505 461 208 131 1225 808 522	Contro Events 9 80 18 32 9 195 73 22	bis <u>Total</u> 120 529 600 208 131 1234 808 1924	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 11.8%	Odds Ratio <u>MH, Random, 95% CI</u> 3.08 (1.37, 6.95) 1.73 (1.26, 2.37) 9.42 (5.61, 1.580) 1.48 (0.89, 2.44) 2.30 (1.00, 5.29) 1.26 (1.03, 1.56) 1.52 (1.11, 2.08) 4.74 (2.66, 9.23)	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Line tal., 2010 Liang et al., 2010 Zhao et al., 2013 Han et al., 2005	Case <u>Events</u> 24 119 104 44 19 235 106 27 57	P < 0.0 s <u>Total</u> 120 505 461 208 131 1225 808 523 248	Contro Events 9 80 18 32 9 195 73 22 23 33	DIS Total 120 529 600 208 131 1234 808 1924 263	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 10.0% 10.6%	Odds Ratio M.H. Random, 95% CI 3.08 (1.37, 6.95) 1.73 (1.26, 2.37) 9.42 (5.61, 15.80) 1.48 (0.89, 2.44) 2.30 (1.00, 5.29) 1.26 (1.03, 1.56) 1.52 (1.11, 2.08) 4.71 (2.66, 8.33) 2.08 (1.30, 3.33)	0.02	Favours (cases) Favours (controls) Odds Ratio M.H. Random, 95% CI
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2010 Liang et al., 2010 Xu and Cai, 2013 Zhao et al., 2003 Han et al., 2008 Han et al., 2012	Case <u>Events</u> 24 119 104 44 19 235 106 27 57 59	P < 0.0 ss <u>Total</u> 120 505 461 208 131 1225 808 523 248 200	Contro Events 9 80 18 32 9 195 73 22 33 4	Total 120 529 600 208 131 1234 808 1924 263 200	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 10.0% 10.6% 7.2%	Odds Ratio <u>MH, Random, 95% CI</u> 3.08 (1.37, 6.95) 1.73 (1.26, 2.37) 9.42 (5.61, 15.80) 1.48 (0.89, 2.44) 2.30 (1.00, 5.29) 1.26 (1.03, 1.56) 1.52 (1.11, 2.08) 4.71 (2.66, 8.33) 2.08 (1.30, 3.33) 2.08 (1.30, 3.85, 57.75)	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI
D	Study or Subaroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2010 Liang et al., 2010 Xu and Cal., 2013 Zhao et al., 2013 Han et al., 2008 Han et al., 2005 Ma et al., 2012	Case Events 24 119 104 44 19 235 106 27 57 59	P < 0.0 ss <u>Total</u> 120 505 461 208 131 1225 808 523 248 200	Contro Events 9 80 18 32 9 195 73 22 33 4	Total 120 529 600 208 131 1234 808 1924 263 200	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 11.8% 11.8% 10.0% 10.6% 7.2%	Odds Ratio <u>M.H. Random, 95% CI</u> 3.08 (1.37, 6.95) 1.73 (1.26, 2.37) 9.42 (5.61, 15.80) 1.48 (0.88), 2.44) 2.30 (1.08, 2.44) 2.30 (1.08, 2.44) 1.26 (1.03, 1.56) 1.52 (1.11, 2.08) 4.77 (1.266, 3.33) 2.0.8 (1.30, 3.33) 2.0.50 (7.28, 57.75)	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI
D	Study or Subgroup Lu et al., 2004 Zhang et al., 2009 Lin et al., 2019 Lin et al., 2010 Linag et al., 2010 Linag et al., 2010 Xu and Cai, 2013 Han et al., 2005 Ma et al., 2012 Total (95% CI)	Case <u>Events</u> 24 119 104 44 19 235 106 27 57 59	P < 0.0 ss <u>Total</u> 120 505 461 208 131 1225 808 523 248 200 4429	Contro Events 9 80 18 32 9 195 73 22 33 4	Total 120 529 600 208 131 1234 808 1924 263 200 6017	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 11.8% 11.4% 10.0% 10.6% 7.2% 100.0%	Odds Ratio <u>M.H. Random, 95% CI</u> 3.00 (1 37, 685) 1.73 (1 26, 2.37) 9.42 (5 61, 15 60) 1.48 (0 89, 2.44) 2.30 (1.03, 529) 1.52 (1 1.1, 2.08) 4.71 (2 68, 6.33) 2.08 (1 30, 3.33) 2.08 (1 30, 3.33) 2.05 (7, 28, 57.75) 2.79 (1.80, 4.32]	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI
D	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Enag et al., 2019 Lin et al., 2019 Lin et al., 2019 Zhao et al., 2013 Zhao et al., 2013 Thao et al., 2008 Han et al., 2018 Ma et al., 2012 Total eyents	Case <u>Events</u> 24 119 104 44 19 235 106 27 59 794	P < 0.0 Total 120 505 461 208 131 1225 808 523 248 200 4429	Contro Events 9 80 18 32 9 195 73 22 33 4 475	Total 120 529 600 208 131 1234 808 1924 263 200 6017	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 11.4% 10.0% 10.6% 7.2% 100.0%	Odds Ratio <u>M.H. Rantom</u> . 95%.C. 1 3.08 (1.37, 6.85) 1.73 (1.26, 2.37) 9.42 (26, 81, 15.60) 1.48 (0.89, 2.44) 2.30 (1.00, 5.24) 1.26 (1.03, 1.56) 1.52 (1.11, 2.08) 4.71 (26, 6.8.33) 2.08 (1.30, 3.33) 20.50 (7.28, 57.75) 2.79 (1.80, 4.32) - 007	0.02	Favours (cases) Favours (controls)
D	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Ling et al., 2019 Ling et al., 2019 Ling et al., 2019 Xu and Cai, 2013 Zhao et al., 2013 Man et al., 2005 Ma et al., 2012 Total (95% Ct) Total seens Heterogeneity, Target	Case <u>Events</u> 24 119 104 44 19 235 106 27 59 794 0.41; Chi	P < 0.0 Total 120 505 461 208 131 1225 808 523 248 200 4429 P = 87	Contro <u>Events</u> 9 800 18 32 9 195 73 22 33 4 475 45, df = 9 20001	Total 120 529 600 208 131 1234 808 1924 263 200 6017 (P < 0.1	Weight 8.5% 11.4% 10.3% 10.4% 11.8% 11.8% 11.4% 10.0% 10.6% 7.2% 100.0%	Odds Ratio MH, Random, 95%, CI 3.08 [13,7659] 9.42 [651,1580] 1.48 [0.89,244] 2.30 [10,0529] 1.26 [13,169] 1.52 [11,26] 4.71 [268,633] 2.08 [13,0333] 2.08 [13,0333] 2.05 [7,26,57.75] 2.79 [1.80,4.32] = 90%	0.02	Favours (cases) Favours (controls)
	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Ling et al., 2019 Ling et al., 2019 Xu and Cal, 2013 Zhao et al., 2013 Han et al., 2008 Han et al., 2012 Total (95% CI) Total events Heterogenethy: Tau*= Test for overall effect	Case <u>Events</u> 24 119 104 44 19 235 106 27 59 794 0.41; Chi Z = 4.60 (P < 0.0 ss <u>Total</u> 120 505 461 208 131 1225 808 523 248 200 4429 P = 87. (P < 0.0	Contro <u>Events</u> 9 80 18 32 9 195 73 22 33 4 475 45, df = 9 00001)	Total 120 529 600 208 131 1234 808 1924 263 200 6017 (P < 0.1	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 11.8% 10.0% 10.6% 7.2% 100.0% 00001); I ²	Odds Ratio MH, Random, 95% CI 3.08 (1 37, 6.86) 1.73 (1.26, 2.37) 9.42 (25, 1, 15, 00) 1.48 (0.89, 2.44) 2.20 (1.00, 5.23) 1.26 (1.03, 1.56) 1.52 (1.03, 1.56) 4.71 (2.66, 8.33) 2.06 (1.20, 3.33) 2.05 (1.72, 62, 7.75) 2.79 (1.80, 4.32) = 90%	0.02	Favours (cases) Favours (controls) Odds Ratio MH, Random, 95% CI
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Ē	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Ling et al., 2019 Ling et al., 2019 Xu and Cai, 2013 Zhao et al., 2019 Man et al., 2005 Ma et al., 2012 Total (95% Ct) Total seents Heterogeneity: Tau# = Test for overall effect.	Case <u>Events</u> 24 119 104 44 19 235 106 27 57 59 794 0.41; Chi Z = 4.60 (Case	P < 0.0 Total 120 505 461 1225 808 131 1225 808 523 248 200 4429 P = 87. (P < 0.0 \$	Contro Events 9 9 195 73 22 33 4 4 475 45, df = 9 00001) Contro	Total 120 529 600 208 131 1234 808 1924 263 200 6017 (P < 0.1)	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 11.8% 11.4% 10.0% 10.6% 7.2% 100.0%	Odds Ratio M.H. Random, 95%, CI 3.08 [13,7659] 9.42 [651,1580] 9.42 [651,1580] 1.48 [0.89,244] 2.30 [100,529] 1.26 [13,26] 4.71 [265,03] 4.71 [265,03] 2.050 [7.26,57.75] 2.79 [1.80,4.32] = 90%	0.02	Favours (cases) Favours (controls) Odds Ratio M.H. Random, 95% Cl + + + + + + + + + + + + +
E	Study of Subgroup Le et al., 2004 Zhang et al., 2009 Enag et al., 2019 Lin et al., 2019 Lin et al., 2019 Yu and Cal, 2013 Zhao et al., 2013 Han et al., 2001 Han et al., 2012 Total events Heterogenethy: Tay ² = Test for overall effect Study or Subgroup	Case <u>Events</u> 24 119 104 44 19 235 106 27 59 794 0.41; Chi Z = 4.60 (Case <u>Events</u>	s <u>Total</u> 120 505 461 1225 808 131 1225 808 523 200 4429 ₽ = 87. (P < 0.0 s <u>Total</u>	Contro Events 9 80 18 322 9 195 73 3 22 33 4 4 475 45, df = 9 00001) Contro Events	Total 120 529 600 208 131 1224 263 200 6017 (P < 0.)	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.8% 11.8% 10.0% 10.6% 7.2% 100.0%	Odds Ratio <u>M.H. Random, 95%, CI</u> 3.06 (137, 6.69) 1.73 (1.26, 2.37) 9.42 [5.61, 15.60) 1.48 (0.08, 2.44) 2.30 (1.00, 5.24) 1.26 [1.03, 1.56] 1.52 [1.11, 2.06] 4.71 [2.66, 8.33] 2.08 [1.30, 3.33] 2.08 [1.30, 3.33] 2.09 [1.30, 3.33] 2.79 [1.80, 4.32] 2.79 [1.80, 4.32] = 90%	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI + + + + + + + + + + + + +
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D	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2019 Lin et al., 2019 Lin et al., 2019 Yu and Cal, 2013 Han et al., 2005 Ma et al., 2012 Total events Heterogeneity. Tau ² = Test for overall effect Study of Subgroup. Huang and Lu, 2006 Han et al., 2006	Case <u>Events</u> 24 119 104 44 19 235 106 27 59 794 0.41; Chi Z = 4.60 (Case <u>Events</u> 48 131 199	rs <u>Total</u> 120 505 505 461 208 131 1225 808 808 808 808 223 248 200 4429 7 807 8 7 8 808 8 808 8 808 8 808 8 808 8 808 8 808 8 808 8 8 808 8 8 808 8 8 808 8 8 8 8 8 8 8 8	Contro Events 9 80 188 32 9 195 73 22 33 4 4 475 45, df = 9 00001) Contro Events 22 105 672	Total 120 529 600 208 131 14 808 1924 263 200 6017 (P < 0.	Weight 8.5% 11.4% 10.3% 10.4% 8.4% 11.4% 10.0% 10.6% 7.2% 100.0% 100001); ² Weight 9.9% 13.8% 17.1%	Odds Ratio M.H. Randorn, 95%, CI 3.08 (1 3.7, 6.86) 1.73 (1 26, 237) 9.42 (8 6; 1, 6 500) 1.48 (0 99, 2.44) 2.30 (1 00, 5 24) 1.26 (1 0.3, 1.56) 1.52 (1 0.3, 1.56) 1.52 (1 0.3, 1.56) 4.71 (2 6, 6.33) 2.05 (07, 26, 25, 1.56) 2.79 (1.80, 4.32) 2.79 (1.80, 4.32) 2.79 (1.80, 4.32) 3.24 (1 4.3, 4.16) 1.64 (1 4.3, 4.16) 1	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI + + + + + + + + + + + + +
E -	Study or Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2019 Lin et al., 2019 Lin et al., 2019 Xu and Cal, 2013 Han et al., 2008 Ma et al., 2013 Ma et al., 2018 Heterogeneity, Tau ² = Test for overall effect Study of Subgroup Huang and Lu, 2006 Han et al., 2006	Casee Events 24 119 104 44 19 235 104 44 44 19 235 59 794 40.41; Chi Casee Events X = 4.60 (Casee 131 149 149 149 149 149 149 149 14	rs <u>Total</u> 120 505 461 208 131 1225 808 523 248 200 4429 * =87. (P < 0.0 * * * * * * * *	0001) Contro 9 80 18 32 9 195 73 22 33 4 475 45, df = 9 00001) Contro Events 22 105 572 131	Total 120 529 600 208 131 1234 263 200 6017 (P < 0.1	Weight 8.5% 11.4% 10.3% 8.4% 11.8% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.0% 10.	Odds Ratio <u>MH Random 95% CI</u> 3.09 (1 37, 6 69) 1.73 (1.26, 2.37) 9.42 (5 8, 1, 15, 60) 1.42 (5 8, 9, 2.44) 2.30 (1.00, 5.24) 1.26 (1.03, 1.56) 1.52 (1.11, 2.08) 2.79 (1.80, 4.32) 2.79 (1.80, 4.32) = 90% Odds Ratio <u>MH Random, 95% CI</u> 2.44 (1.43, 4.16) 1.68 (1.19, 2.59) 1.41 (1.9, 1.64) 1.68 (1.19, 2.59) 1.41 (1.9, 1.64) 1.68 (1.19, 2.59) 1.41 (1.9, 1.64) 1.68 (1.19, 2.59) 1.41 (1.9, 1.64) 1.64 (1.19, 2.69) 1.64 (1.19, 2.6	0.02	Favours (cases) Favours (controls) Odds Ratio M.H. Random, 95% CI 0.1 1 10 100 Favours (cases) Favours (controls) Odds Ratio M.H. Random, 95% CI
E -	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Ling et al., 2019 Ling et al., 2019 Ling et al., 2019 Xu and Cai, 2013 Yahan et al., 2001 Man et al., 2001 Man et al., 2001 Hear of al., 2001 Hear of al., 2005 Hear of al., 2005 Hear of al., 2006 Han et al., 2006 Han et al., 2006 Han et al., 2006 Su et al., 2008	Casee <u>Events</u> 24 119 104 44 44 49 235 106 235 106 27 57 59 794 40.41; Chi Casee <u>Events</u> 131 189 149 71	rs <u>Total</u> 1200 505 461 208 131 1220 808 523 248 200 4429 r² = 87. (P < 0.0 s <u>Total</u> 271 248 523 396 131	0001) Contrr Events 9 9 9 9 9 9 9 195 73 22 23 33 4 4 475 573 4 4 5,00001) Contro Events 22 23 23 23 4 4 5,0000 18 5,73 22 23 23 4 4 5,73 4 5,73 4 5,73 4 5,73 5,73 4 5,73 5,73 4 5,73 5,73 5,73 4 5,73 5,73 5,73 4 5,73 5,73 5,73 5,73 5,73 4 5,73 5,72 5,7	Total 120 529 600 208 131 1234 808 1924 263 (P < 0.)	Weight 8.5% 11.4% 10.3% 8.4% 11.4% 10.4% 8.4% 10.0% 10.6% 10.0% 10.0% 100.0% 100.0% 100.0% 100.0% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.4% 10.5% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.5% 10.5% 10.5% 10.5% 10.5% 10.6%	Odds Ratio MH, Random, 95%, CI 3.08 (13.7, 6.96) 1.73 (12.6, 237) 9.42 (6.61, 15.60) 1.42 (10.0, 6.29) 1.26 (10.3, 15.60) 1.26 (11.2, 6.2, 6.33) 2.05 (17.2, 6.2, 6.7.75) 2.79 (1.80, 4.322) = 90% Odds Ratio MH, Random, 95%, CI 4.24 (14.3, 4.16) 1.84 (11.9, 2.63) 1.34 (10.9, 184) 1.34 (10.9, 184) 1.34 (10.9, 184) 1.34 (10.9, 184)	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% Cl + + + - - - - - - - - - - - - -
E	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2019 Lin et al., 2019 Lin et al., 2019 Yu and Cal, 2013 Han et al., 2008 Ma et al., 2008 Ma et al., 2008 Heterogeneity: Tau*= Study of Subgroup Huang and Liu, 2006 Han et al., 2008 Han et al., 2008	Cases Events 24 119 104 44 4 4 4 4 4 4 4 4 9 235 57 57 57 57 57 57 57 79 4 0.41; Chi Cases Events 4 8 131 149 71 131 149 74 149 179 76 77 76 77 76 77 76 77 76 77 77 76 77 77	P < 0.0 Total 120 505 461 121 208 808 523 248 200 4429 P = 87 P < 0.0 S Total 271 248 523 396 523 396 131 121 248 523 396 523 396 131 248 523 396 523 396 131 248 523 396 523 396 131 248 523 525 525 525 525 525 525 525	0001) Contra 9 9 00 18 32 9 195 73 22 33 4 475 545,df= 9 00001) Contra 22 105 572 131 61 155 572	Total 120 529 600 208 131 1234 208 1924 201 201 6017 (P < 0.1	Weintht 8.5% 11.4% 8.4% 11.8% 11.8% 11.8% 11.8% 10.0% 7.2% 100.0% 00001); P 9.9% 13.8% 10.9% 13.8% 10.3% 9.9% 13.8% 9.9% 10.9% 1	Odds Ratio <u>M.H. Random, 95% CI</u> 3.08 (1 37, 6 46) 1.73 (1 26, 2.37) 9.42 [56, 1, 5 60) 1.48 (0 169, 2.44) 2.30 (1 00, 5 24) 1.26 [1 0.3, 1.56] 1.25 [1 1.3, 1.56] 4.71 [2 66, 8.33] 2.05 0 [7.28, 57.75] 2.79 [1.80, 4.32] = 90% Odds Ratio <u>M.H. Random, 95% CI</u> 2.44 [1.43, 4.16] 1.88 [1 19, 2.39] 1.34 [1 0.9, 1.64] 1.54 [1 1.5, 2.05] 1.36 [0 84, 2.21] 3.61 [0 30, 642]	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI
D_	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2019 Lin et al., 2019 Lin et al., 2019 Xu and Cal, 2013 Han et al., 2008 Ma et al., 2013 Han et al., 2005 Ma et al., 2012 Total eyents Heterogeneity. Tay?= Test for overall effect Study of Subgroup. Huang and Lu, 2006 Han et al., 2006 Han et al., 2006 Su et al., 2013 Ling et al., 2004	Cases Events 24 119 104 44 44 109 235 106 27 57 59 794 40.41; Chick 24 48 101 235 57 59 794 40 41; Chick 48 131 189 79 48 131 189 79 48 131 189 79 48 131 189 79 79 48 199 794 48 199 794 48 199 797 794 48 199 794 48 199 797 794 48 199 797 797 797 797 797 797 797	P < 0.0 Total 120 505 461 1225 808 131 1225 808 208 131 1225 808 208 223 248 200 4429 ₽ = 87 (P < 0.0 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	0001) Contro Events 9 9 18 32 9 9 195 73 22 33 4 475 573 22 33 4 475 573 22 33 4 475 573 22 33 4 50 60 10 10 10 10 10 10 10 10 10 1	Total 120 529 600 208 131 1234 808 1924 263 200 6017 (P < 0.1	Weinhtt 8.5% 11.4% 8.4% 10.3% 10.4% 8.4% 11.8% 11.8% 10.6% 7.2% 100.0% 10.6% 13.8% 15.3% 10.3% 9.9% 9.3% 9.0%	Odds Ratio <u>MH, Random, 95%, C1</u> 3.08 [137, 6 56] 1.37 [6 56] 1.37 [6 56] 1.42 [6 61, 15 60] 1.48 [0 39, 2 44] 2.30 [10, 05 29] 1.26 [11, 20] 4.71 [2 68, 633] 2.08 [1 30, 333] 2.08 [1 30, 333] 2.05 [1 20, 353] 2.79 [1.80, 4.32] = 90% Odds Ratio <u>MH, Random, 95%, C1</u> 8.48 [1, 19, 239] 1.34 [1 0, 9], F44 1.54 [1, 15, 205] 3.36 [0.44, 2.21] 3.36 [0.34, 2	0.02	Favours (cases) Favours (controls) Odds Ratio M.H. Random, 95% CI 4 4 4 4 4 4 4 4 4 4 4 4 4
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D E =	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2019 Lin et al., 2019 Zhang et al., 2019 Zhang et al., 2019 Zhang et al., 2019 Zhang et al., 2013 Han et al., 2003 Man et al., 2014 Heterogeneity, Tau*= Test (67% Ct) Total events Heterogeneity, Tau*= Study of Subgroup Huang and Lu, 2006 Han et al., 2005 Han et al., 2005 Hen et al., 2006 Han et al., 2005 Han et al., 2005 Han et al., 2005 Han et al., 2006 Han et al., 2006 Han et al., 2006 Han et al., 2006 Han et al., 2001 Lu et al., 2000 Lin et al., 2000 Lin et al., 2000 Lin et al., 2000 Total eVCh	Case Events 244 119 104 119 104 119 104 119 104 119 106 27 59 794 40.41; Ch Case Events 48 131 106 27 59 794 40.041; Ch Case Events 48 131 106 27 59 794 40.041; Ch 27 59 794 40.041; Ch 27 59 794 40.041; Ch 27 59 794 40.041; Ch 27 59 794 40.041; Ch 28 28 29 109 109 109 109 109 109 109 10	P < 0.0 Total 120 505 4611 1225 208 131 1225 208 523 248 200 4429 P = 87 s Total 271 248 523 326 s Total 131 125 523 248 200 4429 S Total 271 278 278 277 278 278 278 278 278	Contrr 9 80 18 32 9 90 18 32 9 9195 73 22 33 34 475 545 6475 900001) Contract 22 105 572 131 161 155 23 161 155	Total 120 529 600 208 131 1234 8 1924 263 200 6017 (P < 0.)	Weight 8.5% 10.3% 10.3% 10.3% 10.3% 10.3% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.3% 0.0001); P Weight 10.3% 10.3% 10.3% 10.4% 10.3% 10.3% 10.4% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.4% 10.3% 10.3% 10.4% 10.3% 10.4% 10.3% 10.4% 10.3% 10.4% 10.3% 10.4% 10.3% 10.4% 10.3% 10.4% 10.4% 10.0% 10.4% 10.0% 10.	Odds Ratio <u>MH Rations</u> 3.08 (1 37, 6 46) 1.73 (1 26, 2.37) 9.42 (5 0.8), 2.44 2.30 (1 0.0, 5.24) 1.26 (1 0.3, 1.56) 1.52 (1 1.1, 2.06) 4.71 (2 66, 8.33) 2.08 (1 30, 3.33) 2.09 (1 30, 3.33) 2.79 (1.80, 4.32) 2.79 (1.80, 4.32) 9.0% Odds Ratio <u>MH Random</u> , <u>95% (1</u> 1.84 (1 4.3, 4.16) 1.88 (1 1.9, 2.39) 1.34 (1 0.9, 1.64) 1.54 (1 1.5, 2.05) 1.36 (1 0.3, 6.42) 2.77 (1 2.6, 4.09) 1.36 (1 0.3, 1.64) 2.77 (1 2.6, 4.09) 1.93 (1 1.9, 2.44) 1.91 (1 50, 2.43)	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% Cl 4 4 4 4 4 4 4 4 4 4 4 4 4
D -	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2019 Lin et al., 2019 Lin et al., 2019 Xu and Cai, 2013 Zhan et al., 2013 Han et al., 2004 Total (95% Ct) Total events Heterogeneiky, Tau? = Test for overall effect. Study of Subgroup Huan et al., 2008 Han et al., 2008 Lin ag and Lu, 2006 Han et al., 2008 Su et al., 2004 Lin ag et al., 2004 Lin et al., 2004	Cases Events 24 119 104 44 44 44 44 49 106 27 57 57 57 57 57 59 794 40.41; Chi Zz 4.60/ 0.41; Chi Zz 4.60/ 18 19 89 71 19 19 24 22 24 22 24 22 24 22	P < 0.0 Total 120 505 461 122 208 131 1225 208 523 248 200 4429 P = 87. 271 271 278 523 3966 523 3966 131 120 523 248 523 200 523 248 523 200 523 248 523 200 523 523 523 523 523 523 523 523	0001) Contro Events 9 80 18 32 9 9 195 73 22 33 4 4 475 45, df = 9 00001) Contro Events 22 105 52 131 61 155 23 31 155 23 151 155 23 155 23 155 23 155 23 155 23 155 23 23 255 255 255 255 255 255	Dis 1 Total 1 20 529 600 131 1234 208 131 1234 200 6017 (P < 0.)	Weight 8.5% 11.4% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.3% 10.9% 10.0% Weight 10.0% 10.9% 9.9% 9.9% 9.3% 9.0% 14.7% 10.0%	Odds Ratio MH, Random, 95%, CI 3.08 (13.7, 6.56) 1.73 (12.6, 237) 1.74 (13.6, 237) 1.75 (13.7, 6.57) 1.75 (13.1, 66) 1.52 (11.2, 65, 7.75) 2.79 (1.80, 4.32] = 90% Odds Ratio MH, Random, 95%, CI 8.44 (14.3, 4.16) 1.84 (11.9, 2.6) 1.34 (10.9, 184) 1.34 (10.9, 184	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% Cl + + + + + + + + + + + + +
D	Study of Subgroup Lu et al., 2004 Zhang et al., 2008 Fang et al., 2019 Lin et al., 2019 Lin et al., 2019 Lin et al., 2019 Zhang et al., 2019 Zhang et al., 2019 Lin et al., 2019 Han et al., 2003 Ma et al., 2004 Total events Heteropeneity, Tau*= Study of Subgroup Huang and Liu, 2005 Han et al., 2006 Han et al., 2006 Han et al., 2006 Lin et al., 2010 Lin et al., 2011 Lin et al., 2004 Lin et al., 2005 Han et al., 2006 Han et al., 2006 Han et al., 2006 Han et al., 2006 Lin et al., 2001 Lin et al., 2004 Lin et al., 2004 Total events Heteropeneity, Tau*=	Case Fvents 119 104 44 19 104 44 44 44 19 235 106 27 59 79 40.41; Chi 22 48 0.41; Chi 189 131 189 149 971 1900 42 242 242	P < 0.0 IS Total 120 505 461 208 131 1225 808 523 248 248 200 4429 P = 87. (P < 0.0 S Total 271 248 131 271 248 131 208 523 396 131 208 131 208 524 238 248 240 525 523 396 131 208 224 271 208 131 208 224 238 248 240 246 246 246 246 246 246 246 246	Control 9 80 18 9 80 18 22 33 4 475 573 33 4 45 500001) 100001) Controd Events 22 105 572 105 572 105 572 105 523 1061 1155 23 1061 12300 50, df= 7 7 12300 50, df= 7 7 12300 124 12300 124 12300 124 12300 124	Total 120 529 600 208 131 1234 808 1924 808 1924 6017 6017 (P < 0.1	Weight 8.5% 10.3% 10.3% 8.4% 11.3% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.0% 10.9% 9.9% 17.1% 15.3% 9.0% 14.7% 10.9% 9.0% 14.7% 10.9% 9.0% 14.7% 10.9% 9.1% 10.9% 9.1% 10.4% 10.4% 10.4% 10.8% 10.9% 10	Odds Ratio <u>M.H. Random, 95%, C.J.</u> 3.08 (1 37, 6 36) 1.37 (1 36, 237) 9.42 (5 6; 1 500) 1.48 (0 39, 2.44) 2.30 (1 00, 5.29) 1.26 (1 0.3, 1.56) 1.26 (1 0.3, 1.56) 4.71 (2 46, 8.33) 2.06 (1 2.0, 23, 33) 2.05 (1 7.2, 6 2, 43) 2.79 (1.80, 4.32) = 90% Odds Ratio <u>M.H. Random, 95%, C.J.</u> 2.44 (1 4.3, 4.16) 1.88 (1 19, 2.39) 1.34 (1 0.9, 1.64) 1.54 (1 1.5, 2.05) 1.36 (1 0.4, 2.21) 1.36 (1 0.24, 2.43) 1.36 (1 0.24, 2.43) 1.36 (1 2.03, 6.42) 2.71 (2.6, 0.23) 2.63 (1 9.3, 3.58) 1.91 (1.50, 2.43)	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% CI + + + + + + + + + + + + +
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D - E - F	Study of Subgroup Lu et al., 2004 Zhang et al., 2009 Eng et al., 2019 Lin et al., 2019 Lin et al., 2019 Lin et al., 2019 Xu and Cal, 2013 Han et al., 2008 Ma et al., 2013 Han et al., 2008 Ma et al., 2016 Martine Construction Heterogeneity: Tau*= Test for overall effect Study of Subgroup Muang and Lu, 2006 Han et al., 2008 Han et al., 2008 Suet al., 2010 Lin et al., 2010 Lu et al., 2000 Total events Heterogeneity: Tau*= Test for overall effect 2 Subgroup Subgroup Subgroup Subgroup Subgroup Heterogeneity: Tau*= Test for overall effect 2 Total events Heterogeneity: Tau*=	Case Events 24 119 104 44 44 44 19 104 235 106 27 57 59 794 0.01; Chi Case Events 48 131 189 149 104 242 242 242 242 242 242 245 245	P < 0.0 s <u>Total</u> 120 505 505 120 505 120 505 131 1225 808 808 2248 200 4429 P < 0.0 271 271 248 271 271 248 131 271 271 248 132 271 271 271 271 208 132 271 271 271 271 271 271 271 27	0001) Contro Events 9 9 9 9 9 9 9 9 9 9 9 9 9	Dis 120 529 600 208 131 1234 808 1924 808 1924 6017 (P < 0.1)	Weight 8.5% 11.4% 10.3% 8.4% 11.4% 11.0% 7.2% 100.0% 10.0% 10.0% 13.8% 9.9% 13.8% 9.9% 13.8% 9.9% 13.8% 13.4% 10.3% 9.9% 13.4%	Odds Ratio M.H.Random, 95%, CI 3.06 (1 37, 6 46) 1.73 (1 26, 2.37) 9.42 [56, 1, 560) 1.48 (0 89, 2.44) 2.30 (1 00, 5.24) 1.26 (1 0.3, 1.56) 1.52 (1 1.1, 2.06) 2.79 (1.80, 4.32) 2.05 0 [7.28, 57.75] 2.79 (1.80, 4.32] = 90% Odds Ratio M.H.Random, 95%, CI 2.44 (1.43, 4.16) 1.88 (1 19, 2.98) 1.34 (1 0.9, 1.64) 1.54 (1 1.52, 2.65) 1.36 (1 0.84, 2.21) 1.36 (1 0.30, 6.42) 2.77 (1.26, 4.09) 2.63 (1 93, 3.58) 1.91 (1.50, 2.43] 10%	0.02	Favours (cases) Favours (controls) Odds Ratio M-H, Random, 95% Cl 4 4 4 4 4 4 4 4 4 4 4 4 4
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D F F	Study of Subgroup Lu et al., 2004 Zhang et al., 2009 Fang et al., 2019 Lin et al., 2019 Lin et al., 2019 Lin et al., 2019 Zhang et al., 2019 Zhang et al., 2013 Han et al., 2013 Han et al., 2004 Man et al., 2015 Heterogeneity, Tau*= Test for overall effect. Study of Subgroup. Huang and Lu. 2006 Han et al., 2005 Han et al., 2005 Han et al., 2006 Hean et al., 2006 Hean et al., 2006 Han et al., 2005 Han et al., 2006 Han et al., 2006 Heat expendents Heat expendents Heat expendents Total events Heat expendents Total events Heat expendents Total events Heat expendents Total events Total events Heat expendents Total events Lu et al., 2000 Lu et al., 2004<	Case Events 24 119 104 44 4 19 2255 106 106 27 57 57 57 57 59 794 4 0.41; Chi Zase Events 10 6 27 75 75 79 4 0.41; Chi 22 4 8 131 190 42 22 20.08; Chi 19 19 20 22 20 20 20 20 20 20 20 20 20 20 20	P < 0.0 s Total 1200 505 505 461 1225 408 131 1225 408 132 208 808 523 200 8 7 7 1225 523 208 8 7 7 1225 7 1225 7 1225 8 7 7 1225 7 1225 8 7 7 1226 8 7 7 1226 8 7 7 1226 8 7 7 7 1228 8 7 7 7 7 7 7 7 7 7 7 7 7 7	Contrr Events 9 80 18 32 9 9 18 32 33 4 175 475 53 400001) 1000001 Contro 22 105 23 105 22 105 23 161 155 155 23 161 155 100001) 100001 1230 0.04 = 7 00001) 161 161 161 162 161 163 161 164 161 165 161 161 161 161 161 161 161 161 161 161 161 161 161 161 161 161 161 161 161 161 <	Is Total 120 529 600 208 131 808 1924 200 6017 6017 (P < 0.)	Weinhtt 8.5% 11.4% 10.3% 8.4% 10.4% 8.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 10.4% 9.9% 10.0% 9.9% 17.1% 9.9% 17.3% 9.5% 9	Odds Ratio <u>M.H. Random, 95%, C1</u> 3.06 (13, 76, 695) 1.73 (1, 26, 2.37) 9.42 (56, 1, 560) 1.48 (0, 89, 2.44) 2.30 (1, 00, 5.24) 1.26 (1, 03, 1.56) 1.42 (0, 89, 2.44) 2.12 (1, 03, 1.56) 1.42 (1, 03, 1.56) 1.42 (1, 03, 1.56) 2.79 (1.80, 4.32) 2.05 (1, 72, 85, 7.75) 2.79 (1.80, 4.32) 2.79 (1.80, 4.32) 3.05 (1, 12, 2.56) 3.61 (1.92, 54) 1.54 (11, 52, 2.55) 3.66 (1.94, 5.31) 3.42 (1, 96, 5.30) 3.42 (1, 48, 6.31) 2.03 (1, 42, 2.48) 2.03 (1, 42, 2.48) 3.42 (1, 96, 5.38) 3.42 (1, 48, 6.31) 2.03 (1, 42, 2.48) 2.03 (1, 43,	0.02	Favours (cases) Favours (controls) Odds Ratio M.H. Random, 95% Cl 4 0.1 10 10 100 Favours (cases) Favours (controls) M.H. Random, 95% Cl 4 Favours (cases) Favours (controls) 0 0 Cl Favours (cases) Favours (controls) 0 0 Cl Favours (cases) Favours (controls) 0 0 Cl Favours (cases) Favours (controls) 0 0 Cl Cl Cl Cl Cl Cl Cl Cl Cl Cl
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Figure 2.

Forest Plot of Comparison: Risk Factors Affecting the Incidence of Lung Cancer.

factors (\geq 10 studies). The shapes of the funnel plot for the primary "smoking" and "more fruits and vegetables" outcomes were approximately symmetrical, indicating that there was no obvious publication bias. Funnel plots are shown in Figure 4.

A Cases		Controls			Odds Ratio		Odds Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl		M-H, Random, 95% Cl	
Liu et al., 2000	180	350	250	350	10.9%	0.42 [0.31, 0.58]		-	
Lu et al., 2004	73	120	79	120	9.7%	0.81 [0.48, 1.36]			
Zhang et al., 2008	468	505	492	529	10.0%	0.95 [0.59, 1.53]			
Xu et al., 2015	79	425	86	425	10.8%	0.90 [0.64, 1.26]			
Fang et al., 2019	237	461	488	600	11.1%	0.24 [0.18, 0.32]		-	
Lin et al., 2010	88	208	144	208	10.4%	0.33 [0.22, 0.49]			
Liang et al., 2009	122	131	129	131	4.1%	0.21 [0.04, 0.99]			
Zhao et al., 2013	484	808	687	808	11.2%	0.26 [0.21, 0.33]		-	
Han et al., 2008	119	523	481	1924	11.3%	0.88 [0.70, 1.11]		-	
Huang and Liu, 2006	71	271	92	271	10.6%	0.69 [0.48, 1.00]		-	
Total (95% CI)		3802		5366	100.0%	0.51 [0.35, 0.75]		•	
Total events	1921		2928						
Heterogeneity: Tau ² =	0.33; Chi	i ² = 109	.02, df=	9 (P < I	0.00001);	I ² = 92%	+	01 1 10	-
Test for overall effect.	Z = 3.39 ((P = 0.0	1007)				0.02	Favours (cases) Favours (controls)	50
B	-								
D	Cas	es	Cont	rols		Odds Ratio		Odds Ratio	
Study or Subgroup	Events	Tota	Events	Tota	I Weigh	nt M-H, Fixed, 95% Cl		M-H, Fixed, 95% Cl	
Lu et al., 2004	29	120	4:	3 12	20.89	% 0.57 [0.33, 1.00]			
Lin et al., 2010	71	208	109	20	45.89	% 0.47 [0.32, 0.70]			
Ma et al., 2012	53	200	1 71	20	33.39	% 0.66 [0.43, 1.00]			
Total (95% CI)		528		52	3 100.09	% 0.55 [0.43, 0.72]		•	
Total events	153		223	3					
Heterogeneity: Chi ² =	1.25, df	= 2 (P =	= 0.53); P	= 0%			+		
Test for overall effect	Z= 4.51	(P < 0.	00001)				0.05	U.Z 1 5	20
								ravouis (cases) ravouis (controls)	
C	6	_	Contra			Odda Batta		odd- D-di-	
Study or Subaroup	Events	s Total	Events	Total	Weight	M-H. Random, 95% Cl		M-H. Random, 95% Cl	
Han et al., 2008	83	523	482	1924	25.9%	0.56 [0.44, 0.73]			
Xu and Cai. 2013	103	1225	288	1234	26.1%	0.30 [0.24, 0.38]			
Sulet al., 2013	157	396	203	465	25.6%	0.85/0.65/1.111			
Lin et al., 2010	41	208	69	208	22.4%	0 49 10 32 0 771		_ _	
		200				0.10 [0.02, 0.11]			
Total (95% CI)		2352		3831	100.0%	0.52 [0.32, 0.83]		-	
Total events	384		1042						
Heterogeneity: Tau ² =	0.21; Chi	² = 32.2	24, df = 3	(P < 0.	00001); F	² = 91%	0.05	02 1 5	20
Test for overall effect: 2	Z = 2.74 (P = 0.0	06)				0.05	Favours (cases) Favours (controls)	20
								· areas (cases) · avours (controls)	

Figure 3.

Forest Plot of Comparison: Protective Factors Affecting the Incidence of Lung ancer.

Discussion

Risk Factors Influencing the Lung Cancer Incidence

The results of meta-analysis showed that smoking, passive smoking, lung/respiratory disease, family history of tumors, oil fume, and psychological factors were risk factors for lung cancer. Firstl, as is well known, tobacco smoking is the leading risk factor for the development of lung cancer. Worldwide, China's cigarette production and tobacco consumption are both high. In 2017, the mortality rate of lung cancer related to smoking was reported to be 41.94/100,000 for males and 5.14/100,000 for females in China (Liu et al., 2020). The main cause of lung

Table 3.

Sensitivity Analysis of the Included Studies

Factors	OR (95% CI) Under FE	OR (95% CI) Under RE
Smoking	2.36 (2.19, 2.55)	2.46 (1.94, 3.11)
Passive smoking	2.44 (2.13, 2.80)	2.44 (2.13, 2.80)
Lung/respiratory disease	2.33 (2.05, 2.65)	2.66 (1.82, 3.89)
Family history of tumor	2.01 (1.78, 2.27)	2.79 (1.80, 4.32)
Oil fume	1.74 (1.54, 1.96)	1.91 (1.50, 2.43)
Psychological factor	2.27 (1.89, 2.73)	2.31 (1.85, 2.89)
More fruits and vegetables	0.48 (0.44, 0.54)	0.51 (0.35, 0.75)
Exercise	0.55 (0.43, 0.72)	0.55 (0.43, 0.72)
Tea drinking	0.50 (0.43, 0.57)	0.52 (0.32, 0.83)
Note: CI=Confidence inter ratio; RE=Random effect mo	val; FE=Fixed-effect odel.	model; OR=Odds



Figure 4.

Funnel Plot of Comparisons: Factors Affecting the Incidence of Lung Cancer.

cancer caused by smoking is that tobacco can produce tar and some carcinogens, such as nitrite, during the combustion process, which will cause lung lesions after long-term exposure to lung tissue (Du, 2019). Therefore, it is highly recommended to stop smoking. Second, in the Chinese population, frequent or high cumulative exposure to cigarette smoke is significantly associated with lung cancer (Tse et al., 2011). Passive smoking, which refers to the unintentional inhalation of cigarette smoke by people living and working near smokers, is the main source of this exposure (Peterson & Hecht, 2017). Previous studies showed that the main source of passive smoking mostly was family members, and spouse smoking was closely related to female lung cancer (Du, 2019). Additionally, the association between passive smoking and lung cancer appeared to be stronger than smoking, which is almost consistent with the synergistic effect between smoking and high cumulative cigarette smoke exposure in the living environment on lung cancer risk (Kurmi, 2022). Third, as proposed by Fang et al. (2019) and Han et al. (2005), smoking can easily induce chronic inflammation response in lungs and airways. Meanwhile, studies have shown that pulmonary chronic inflammation may enhance the interaction between hydroxyl radicals and DNA, thereby increasing the likelihood of mutations occurring during DNA replication (Schottenfeld & Beebe-Dimmer, 2006). Previous studies revealed that emphysema increased the relative risk of lung cancer by 2.44 times, chronic bronchitis by 1.47 times, tuberculosis by 1.48 times, and pneumonia by 1.57 times (Li & Yao, 2016). Fourth, it is undeniable that an individual's risk of developing lung cancer is mediated by a series of factors, and there is strong evidence to support the familial genetic composition of lung cancer. We can learn from biology that various carcinogenic factors may cause chromosome variation, which may be passed down to the next generation, thereby increasing the risk of lung cancer (Hua, 2010). Fifth, oil fume generates sulfur dioxide, nitrogen dioxide, acrolein, benzene, formaldehyde, and other volatile organic compounds (Lin et al., 2022). Many of these have been proved or suspected to be human carcinogens related to lung cancer (IARC, 2006). Previous studies of oil fume and lung cancer were based mainly on females. Due to the toxic smoke produced by hightemperature oil fumes that stimulate the eyes and throat for a long time and damage the cells and tissues of the respiratory system, and women have more daily exposure to oil fume than men, it has almost become a major risk factor for women to suffer from lung cancer (Lin et al., 2010). Finally, the World Health Organization indicates that "there is no health without mental health" (WHO, 2018), emphasizing the relationship between psychological and physical health. Many studies have found that psychological factors, such as depression, grief, and anxiety, are associated with the risk of lung cancer (Huang & Liu, 2006; Xu et al., 2015; Zhang et al., 2008), and this risk is related to physiological alterations in multiple systems, such as immune, neuroendocrine, and cardiovascular (Bomyea et al., 2012).

Protective Factors Influencing the Lung Cancer Incidence

The meta-analysis results revealed that more fruits and vegetables, exercise, and tea drinking were protective factors for lung cancer. There is evidence to suggest that factors, such as diet, nutrition, and physical activity, have a significant impact on cancer risk, so positive behavioral changes can to some extent reduce cancer burden (Gonzalez et al., 2010). Firstly, it is reported that consuming fruits and vegetables can protect against lung cancer (Ubago-Guisado et al., 2021). Studies have shown that intake of fresh vegetables and fruits can supplement multiple nutrients, especially heme iron, vitamin C, vitamin K2, and antioxidants, which are related to a lower risk of lung cancer (Ubago-Guisado et al., 2021). The World Cancer Research Fund/American Institute of Cancer Research report stated that consuming fruits and vegetables containing a certain amount of retinol or carotenoids may lower the chance of developing lung cancer (WCRF / AICR, 2018). Second, Su et al.'s (2022) study found that in the Chinese population, a high level of physical activity was negatively correlated with some subtypes of cancer. However, globally, the lack of physical activity is very common, with approximately 31% of residents in China and worldwide not reaching the recommended exercise levels (Hallal et al., 2012). Finally, tea is one of the most widely consumed drinks and has long been claimed to have multiple beneficial health benefits, but its relationship with cancer risk remains controversial. This meta-analysis found that drinking tea can effectively reduce lung cancer risk. Although tea components vary with various factors such as planting technology, tea variety, and climate, the most important component is tea polyphenols. An animal experiment revealed that tea polyphenols can reduce the risk of tumor formation and tumor size (Cabrera et al., 2003).

Study Limitations

Several possible limitations of this study ought to be recognized. First, the publications included meta-analysis only adopted the case-control study design, so potential publication bias cannot be ruled out. Second, some important confounding factors (such as age, gender, etc.) could not be controlled, and the interaction between these factors could not be analyzed. Third, the sample size of certain studies was limited, and additional investigation is necessary to scrutinize the outcomes of the meta-analysis.

Conclusion and Recommendations

In conclusion, several risk factors for lung cancer were identified, including smoking, passive smoking, lung/respiratory disease, family history of tumors, oil fume, and psychological factors. Furthermore, certain protective factors were identified, such as consuming more fruits and vegetables, exercise, and drinking tea. Findings from our study can provide a scientific reference for doctors, nurses, or community health managers to optimize lung cancer prevention and management decision-making. Due to the limitations, further studies are needed to support our findings.

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