# ORIGINAL RESEARCH

# Regional Personality and Health: Research Status of Respiratory Diseases Among College Students

Rui Li, MM

#### ABSTRACT

**Objectives** • Utilizing Bibliometric Analysis to Evaluate Research Trends in Factors Influencing Respiratory System Diseases Among University Students and Investigate Institutional Collaborations, Research Hotspots, and Emerging Trends.

**Methodology** • A computer-based retrieval process was employed to access publications from the Web of Science and the China National Knowledge Infrastructure (CNKI) databases. This retrieval encompassed articles published in both Chinese and English languages, spanning from January 1, 1998, to June 1, 2023, focusing on the impact factors of respiratory system diseases among university students. Subsequently, a visual analysis was conducted using bibliometric software known as CiteSpace, exploring the dimensions of nations, institutions, journals, authors, cited references, and keywords.

**Results** • A total of 927 scholarly papers pertaining to the determinants of respiratory system diseases among university students were retrieved. Of these, 667 were published in English, while 260 were in Chinese. The volume of publications in this field has exhibited a steady annual increase, with a notable exponential surge observed in 2019 concerning research output on respiratory system diseases among university students. However, there was a subsequent decline in publication volume by the year

**Rui Li, MM,** Shandong Youth University of Political Science Hospital, Jinan, China.

Corresponding author: Rui Li, MM E-mail: Lirui\_sdyu@163.com

#### INTRODUCTION

Compared to individuals exposed to outdoor air pollution, university students who often work and study indoors are subject to a more pronounced health risk from indoor air pollution. Research indicates that pollutant concentrations within enclosed indoor spaces can be 7 to 20 2023. Key terms such as "Air pollution," "attitude," "lifestyle," and "infectious laryngotracheitis virus" have emerged as prominent nodes, signifying their critical relevance in shaping the forefront of research on respiratory system diseases among university students. Moreover, "attitude" and "lifestyle" have exhibited a sustained presence over an extended timeline.In recent years, keywords such as "COVID-19" and "health" have gained prominence and maintained persistent scholarly attention. This phenomenon underscores their status as current research hotspots and frontiers in the study of respiratory system diseases among university students. Noteworthy terms include "COVID-19," "coronavirus diseases 19," "exposure," "asthma," and "health."

**Conclusion** • School food safety and hygiene issues, students' lifestyle and attitudes, along with the impact of "COVID-19," constitute prominent research focal points and trends in the investigation of causative factors of respiratory system diseases among university students. The findings from bibliometric analysis furnish valuable insights for researchers, aiding in the identification of potential collaborators and institutions. Additionally, they facilitate the exploration of key issues within this domain and the pursuit of novel research directions. (*Altern Ther Health Med.* 2024;30(4):154-161)

times higher than outdoor atmospheric pollution levels.<sup>3</sup> Over recent years, the incidence and mortality rates of respiratory system diseases among university students, including chronic bronchitis, pneumothorax, bronchial asthma, pulmonary tuberculosis, lung cancer, and pulmonary infections, have significantly increased due to factors such as exposure to air pollution, smoking, physical and chemical factors, and biological agents.<sup>1</sup>

Scientific knowledge mapping, exemplified by "Mapping Knowledge Domains," is a graphical representation that visualizes the development process and structural relationships of scientific knowledge, depicting the knowledge resources and their carriers that humanity has amassed over



time.<sup>2</sup> In 2004, Dr. Chaomei Chen of Drexel University in the United States developed CiteSpace software, enabling the computational analysis of specific domain literature collections to uncover key pathways and knowledge turning points in the evolution of academic disciplines.<sup>3</sup> An increasing number of scholars have embraced CiteSpace software for statistical analysis, with over 6000 relevant documents already present in the China National Knowledge Infrastructure (CNKI), spanning various research fields such as library science, medicine, education, and food science.

Given the remarkably high prevalence of respiratory system diseases, which profoundly impact the health and development of university students, it has garnered significant attention from society, parents, and educational institutions. In response to this collective concern, our research delves into the types and characteristics of respiratory system diseases. We employ CiteSpace, a bibliometric analysis tool, to conduct visual analyses of nations, institutions, journals, authors, cited references, and keywords. This endeavor aims to offer insights into the prevention of respiratory system diseases among university students and explore new research avenues in the field.

#### Visualized analysis

Data retrieval was undertaken through the Web of Science (WOS) platform, yielding a corpus of 927 articles pertinent to the designated keywords. Through citespace visualization analysis, the aforementioned "keyword map" was obtained, where the keywords serve as nodes connected by undirected lines representing co-occurrence relationships. The thickness of the lines indicates the strength of the relationship between keywords.<sup>2</sup> Taking into account the meaning, characteristics, and quantity of the keywords, highfrequency keywords were selected as the main themes for the subsequent analysis and research.

In Figure 1, each node represents a keyword, with larger nodes indicating a higher frequency of occurrence. The "n" represents a node, which is a positional node. The larger the font size, the greater the number of respiratory system diseases among university students recorded in the 954 data packets. The "e" represents a connection; the thicker the node, the higher the frequency between the nodes. The graph consists of 138 nodes and 208 links. In the graph, keywords such as "attitudes," "coronavirus," "elementary school," "acute respiratory syndrome," "sedentary lifestyle," "Air pollution," and "common diseases" appear as larger nodes, indicating a high degree of correlation among them. They may also represent emerging research areas for the development of respiratory diseases among university students in the future.

The term "Air pollution" appears as a significant node, indicating that air pollution is a field of great concern among scholars and holds crucial significance in the emergence of respiratory system diseases among university students. Air pollution can also contribute to respiratory system diseases among college students. In cities with poor air quality, students studying there generally experience higher rates of respiratory system diseases compared to universities located in areas with better air quality. This highlights air pollution as an important contributing factor to respiratory system diseases in higher education institutions. During the autumn and winter seasons, haze pollution is prevalent across the country.3 As more and more people pay attention to air quality, concerns about the health risks posed by haze have increased. The main components of haze are sulfur dioxide, nitrogen oxides, and inhalable particles. The first two are gaseous pollutants, while the latter, the inhalable particles, are the main culprits exacerbating haze pollution. Beijing monitors fine particulate matter (PM2.5), which refers to pollutant particles with a diameter equal to or smaller than 2.5 micrometers. These particles act as pollutants and serve as carriers for toxic substances such as heavy metals and polycyclic aromatic hydrocarbons. When these particles and harmful substances enter the respiratory tract, they initially irritate and damage the tracheal mucosa.4 The tracheal mucosa in the human body serves two main functions: it eliminates harmful viruses and bacteria and prevents them from entering the lung tissues; it also helps expel toxic substances. With increased inhalation of particulate matter and harmful substances, the tracheal mucosa, which serves as the first line of defense, becomes compromised. Subsequently, these particles can further damage the lungs, leading to respiratory system diseases and affecting other systems in the body. In this situation, individuals who were initially in good health and those with weakened immune systems may experience symptoms such as coughing, phlegm production, and chest tightness, indicating respiratory tract inflammation. Individuals with pre-existing respiratory system diseases such as asthma, chronic bronchitis, or chronic obstructive pulmonary disease (COPD) may experience lung infections and aggravated symptoms, resulting in shortness of breath, chest tightness, wheezing, and acute exacerbations. Prolonged exposure to haze with particulate matter and harmful substances may also lead to an increased incidence of lung cancer. Moreover, evidence

suggests that fine particulate matter (PM2.5) and other air pollutants are not only linked to respiratory diseases but also represent significant risk factors for cardiovascular diseases.<sup>5</sup> They pose a greater threat to patients with chronic conditions such as cardiovascular diseases, increasing the burden on the heart and potentially triggering cardiovascular accidents. Therefore, students in Beijing have indicated a higher susceptibility to the effects of air pollution in research surveys. Conversely, in some coastal cities where air pollution is relatively low, university students experience fewer respiratory system diseases compared to cities with high levels of air pollution.

Similarly, as a prominent keyword, 'attitudes' demonstrates a strong correlation between students' attitudes and respiratory system diseases. This has significant implications for future prevention and control of respiratory diseases. In 2014, the Ministry of Education introduced a smoking ban policy in higher education institutions. Firstly, smoking is prohibited in primary and secondary schools, as well as kindergartens. No one, regardless of their role, location, or time, is allowed to smoke on these premises. School principals bear the primary responsibility for enforcing the smoking ban. They not only set a leading example but also meticulously organize and implement the ban, enhance school governance, and improve smoking cessation measures. 'No Smoking Campus' or anti-smoking signs should be prominently displayed at school entrances. Smoking areas are not designated within the school, smoking paraphernalia is not provided, and tobacco advertisements or branding are not permitted on school grounds or in educational buildings. School canteens are prohibited from selling tobacco products. Efforts should be made to provide explanations and guidance on the smoking ban for visitors entering the campus. Secondly, smoking within higher education institutions is strictly limited. Smoking is strictly prohibited within all university buildings, and designated smoking rooms are not allowed. No-smoking signs and a school smoking ban supervision hotline should be prominently placed. Depending on the actual situation, a limited number of outdoor smoking areas may be designated with clear guidance signs and reminders such as 'Smoking is Harmful to Health.' Smoking areas should meet fire safety requirements and be located away from areas where teachers and students congregate and essential pathways. Schools with the means should install smoke detectors, video surveillance, and other devices to enhance smoking monitoring and prevent smoking in relatively isolated offices or laboratories. Effective measures should be taken to encourage and guide teachers and students with smoking habits to quit. Thirdly, strengthen the propaganda and education on the harm of smoking. Local education departments and schools should use various forms, such as World No Tobacco Day and the beginning of the academic year, to conduct anti-smoking education for students through classes, lectures, and organizational activities. The harmfulness of smoking should be thoroughly explained, basic medical knowledge should be disseminated, and staying away from tobacco should become a conscious behavior for teachers and students. Quitting smoking should become a trend, discouraging smoking and rejecting secondhand smoke. Together, we can create a healthy smoke-free environment. Fourthly, establish a longterm mechanism for smoking ban work. Regions should extensively promote the creation of 'No Smoking Campuses' in accordance with local conditions, establish a supervisory and inspection mechanism, and strengthen inspections and guidance for smoking ban work in administrative areas. Schools that fail to implement smoking ban measures effectively should be reported and dealt with accordingly. Schools should establish and improve rules and regulations, incorporating the fulfillment of smoking ban responsibilities into the assessment of faculty and student performance. Smoking ban supervisors should be appointed to enhance daily dynamic supervision of the smoking ban. The introduction of this policy has directed more scholars' attention to the issue of student smoking. Keyword mutation analysis results also indicate that in 2014, the intensity of 'attitudes' was strong. This demonstrates that the policy's introduction has a pioneering and cutting-edge impact on scholars' guidance and attention.

"Acute respiratory syndrome" typically refers to diffuse lung lesions caused by various reasons, such as severe pneumonia or traumatic drowning, or due to internal factors like shock, bleeding, or pancreatitis, resulting in the loss of lung oxygen exchange function. Patients mainly present with hypoxia. Infectious diseases, such as severe pneumonia, sepsis, or pancreatitis often cause this condition. However, it can also result from non-infectious diseases, such as traffic accidents, major bleeding, trauma, or lung injury. Clinically, it can manifest as severe respiratory distress, rapid breathing, increased heart rate, and diffuse infiltrative shadows in the lungs, indicating a severe condition. In terms of treatment, oxygen therapy, mannitol to prevent pulmonary edema, and, if necessary, the use of dexamethasone, volume expansion, fluid correction for electrolyte imbalances, and symptomatic supportive care can be administered. Once the patient's condition stabilizes, controlling the underlying cause becomes crucial for recovery. Among university students, drowning occurs during holidays, which leads to the loss of lung oxygen exchange function and subsequently triggers acute respiratory syndrome.<sup>6</sup> Therefore, acute respiratory syndrome is also a common factor among respiratory system diseases in university students, and it holds significant relevance in preventing and controlling respiratory system disorders. In the future, addressing swimming safety and overall personal safety during students' vacations can help prevent acute respiratory syndrome and contribute to the prevention and control of respiratory system diseases in university students.

The term "infectious laryngotracheitis virus" refers to a disease caused by the Infectious Laryngotracheitis Virus (ILTV) and occurs in chickens. Avian infectious laryngotracheitis (AILT) is characterized by respiratory

distress in infected chickens, coughing, and bloody or yellowish cheesy exudate. The virus causes swelling and edema of the affected tracheal mucosa, leading to erosion and bleeding. The occurrence of ILTV in chicken meat supplied to university cafeterias results from the negligence regarding food safety and hygiene in these important daily life venues for college students. Food safety issues have caused concerns and dissatisfaction, especially in some universities where cafeteria food quality and hygiene problems frequently arise. This significantly impacts teachers' and students' dietary health and quality of life. The lack of attention to food safety issues, failure to conduct proper inspections of purchased food, and inadequate procurement, storage, processing, and distribution management contribute to these problems.7 University cafeterias often lack sufficient professional knowledge and experience in food selection, making them vulnerable to unscrupulous vendors who intentionally sell expired or subpar food. Inadequate supervision of suppliers directly leads to food hygiene and quality issues. To reduce costs, some university cafeterias engage in secondary processing, premature processing, and excessive storage, which exacerbate food safety concerns. Additionally, temperature and humidity control issues during distribution and storage can lead to food spoilage and contamination. Such adverse practices result in the introduction of ILTV in the chicken supplied to cafeterias, leading to the transmission of the virus to students who consume infected chicken. Infectious laryngotracheitis virus is highly contagious and easily spreads among individuals.

In 2019, to meet the new requirements of strengthening school food safety and nutrition management and, advancing the construction of a Healthy China in the new era, and ensuring the food safety and nutrition health of students and faculty members during centralized dining in schools, the Ministry of Education, the State Administration for Market Regulation, and the National Health Commission jointly issued the "Regulations on School Food Safety and Nutrition Health Management." This is an important measure to implement General Secretary Xi Jinping's requirements for the "four strictest" standards and to adapt to the new situation and school food safety work tasks in the new era. With the development of the economy and society, the number of people dining in schools has gradually increased, the forms of catering have become more diverse, and the variety of food provided has become more abundant. Consequently, society's attention to school food safety has been constantly rising. The regulations establish the overall principles of a preventionoriented approach, full-process monitoring, local management, and school implementation for centralized dining in schools. They establish a management system with a clear division of responsibilities among the education, food safety supervision, and health departments and specify the main responsibilities of schools. Focusing on key aspects such as procurement, storage, processing, distribution, and catering, the regulations aim to improve the school food safety risk prevention and control system, thereby better ensuring the food safety of the

## Figure 2. Mutation-word test results

#### Top 25 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End
adults	2007	1.93	2007	2008
immune responses	2009	2.65	2009	2016
attitudes	2010	2.03	2010	2013
cessation	2010	1.92	2010	2012
college students	2013	3.19	2013	2017
childhood asthma	2008	2.93	2013	2015
symptoms	2013	2.45	2013	2017
apoptosis	2003	1.42	2014	2017
infection	2008	3.09	2015	2016
copd	2015	2.14	2015	2017
prevalence	2013	1.41	2016	2017
children	2007	3	2017	2019
common diseases	2017	2.86	2017	2018
saudi arabia	2017	2.73	2017	2020
air pollution	2005	2.33	2017	2019
health care workers	2017	1.94	2017	2020
risk	2013	2.8	2019	2021
outbreak	2016	2.79	2019	2021
medical students	2013	2.08	2019	2021
acute respiratory syndrome	2007	2.8	2020	2023
covid 19	2021	3.68	2021	2023
coronavirus disease 2019	2021	3.34	2021	2023
exposure	2018	2.27	2021	2023
asthma	2018	1.77	2021	2023
health	2013	1.64	2021	2023

vast number of teachers and students during centralized dining in schools and effectively preventing the spread of viruses in student food.<sup>8</sup>

Using the CiteSpace software to construct a knowledge map, 25 burst keywords were extracted after removing irrelevant terms using the Burstness function in the control panel. The graph shows that most of the keywords have a relatively short time span and are concentrated in the years 2021-2023, indicating their strong forward-looking nature. The strongest burst keywords include "immune response," "cessation," "college student," "childhood asthma," "symptoms," "apoptosis," "common diseases," "Saudi Arabia," and "Air pollution," suggesting a strong association between respiratory system diseases in college students and these areas. This indicates the feasibility of future prevention and control of respiratory system diseases in university students. Among the burst keywords, "attitude" and "adult" were proposed earliest, in 2013 and 2010 respectively, indicating that researchers have been paying attention to students' respiratory issues in these areas for longer. "Attitude" also exhibits strong co-occurrence and early introduction, suggesting that students' attitudes may be an important factor in developing respiratory system diseases and are analytically significant. It is also likely to be a frontier and trend in future research.

"Acute respiratory syndrome," "COVID-19," "coronavirus diseases 19," "exposure," "asthma," and "health" were introduced in recent years and have sustained attention, indicating that they are currently hot topics and frontiers in the study of respiratory system diseases in university students. The emergence of these terms suggests their relevance to the

Figure 3. Analysis of co-existing words

causes and transmission of respiratory system diseases among university students, providing valuable insights into their control and prevention.

Based on the total co-occurrence count, the keywords "prevalence," "impact," "college student," "acute respiratory syndrome," "Air pollution," and "outbreak" appear most frequently. The earliest publication year for "prevalence" is 2013, for "college student" is 2013, for "acute respiratory syndrome" is 2017, for "Air pollution" is 2007, and for "outbreak" is 2016. The centrality values for these keywords are as follows: "prevalence" has a centrality of 0.16, "impact" has a centrality of 0.18, "college student" has a centrality of 0.22, "acute respiratory syndrome" has a centrality of 0.22, "Air pollution" has a centrality of 0.33.

From Figure 4, it can be observed that the keyword "attitudes" appeared early in 2003 and continued until 2020. This indicates a strong association between research on respiratory diseases in college students and their attitudes. Students' understanding and attitudes towards respiratory diseases are a topic of concern for many scholars. It suggests that schools and governments may have lacked sufficient attention to respiratory diseases among college students, and most people may not yet realize the severity and correlation of respiratory issues.

The keyword "prrsv," referring to the Porcine Reproductive and Respiratory Syndrome Virus, appeared frequently between 2005 and 2010 but has not been mentioned since. This suggests that an outbreak of this virus occurred among college students during that period, contributing to respiratory diseases. Interactions among students likely facilitated the transmission of the virus. By 2010, measures were likely implemented to eradicate the virus, permanently eliminating it.

The keyword "coronavirus" emerged in 2015 and continues to be relevant. This virus attacks the respiratory system and can spread through droplets or contact with nasal and pharyngeal secretions of infected individuals. The prevalence of this virus has drawn significant attention from scholars, and the close proximity and interactions among college students facilitate its spread.

The keyword "lifestyle" focuses on the attitudes and behaviors of college students, and it has been a subject of study since 2003. Students' habits and behaviors, such as smoking and exposure to secondhand smoke, are key areas of concern. These lifestyle factors may contribute to respiratory diseases among college students. Smoking is a prevalent issue among students in various colleges, and poor behavioral habits of some students can influence or even force others to be exposed to secondhand smoke. Smoking in dormitories is a persistent problem, leading to respiratory diseases among students.

"Air pollution" can also cause respiratory diseases among college students. Students studying in cities with poor air quality generally experience a higher prevalence of respiratory diseases than those in areas with better air quality. This indicates that air pollution is a significant contributing factor

Visible	Count	Central	Year	Keywords
2	34	0.38	2004	disease
2	30	0.08	2007	children
2	25	0.16	2013	prevalence
2	22	0.18	2016	Impact
~	22	0.22	2013	college students
~	20	0.23	2013	health
~	20	0.05	2013	risk
~	18	0.12	2007	acute respiratory syndrome
~	18	0.22	2005	air pollution
~	18	0.33	2016	outbreak
~	14	0.23	2013	medical students
-	12	0.39	2008	infection
-	12	0.02	2000	chudapte
	14	0.02	2013	aveaute
-	44	0.02	2010	exposure
	44	0.02	2021	cowd 19
	11	0.24	2005	association
-	10	0.00	2021	coronavirus disease 2019
<b>N</b>	9	0.07	2020	sars
~	9	0.05	2015	copd
×	8	0.02	2003	care
2	8	0.19	2010	attitudes
2	8	0.02	2018	asthma
<b></b>	7	0.13	2020	transmission
2	7	0.02	2017	saudi arabia
2	7	0.16	2019	united states
2	7	0.00	2020	coronavirus
2	7	0.02	2019	lung function
2	6	0.16	2009	immune responses
~	6	0.00	2016	respiratory diseases
~	6	0.09	2008	childhood asthma
~	6	0.14	2007	adults
~	5	0.01	2015	risk factors
~	5	0.00	2021	pneumonia
~	5	0.02	2017	common diseases
~	5	0.00	2019	obstructive pulmonary dis
	5	0.11	2009	lelvstad virus
~	5	0.00	2022	mental health
~	5	0.01	2017	health care workers
-	5	0.05	2012	symptoms
-	6	0.00	2013	raeniratan evodrama cara
	4	0.10	2002	constants syndrome coro
	4	0.09	2003	apoptosis
	4	0.00	2004	epidemic
	4	0.00	2019	knowledge
	4	0.04	2022	university students
~	4	0.00	2022	dental students
×	4	0.00	2022	obesity

#### Figure 4. Timeline map





to respiratory diseases among college students, and scholars have been paying attention to this issue for the past two decades.In 2018, the Education Department issued a notice stating that the winter and spring seasons are the peak periods for respiratory infectious diseases, with seasonal influenza being prevalent in most parts of the country. Recent monitoring results from the Chinese Center for Disease Control and Prevention show that the overall level of influenza activity remains high and is expected to continue for some time. The winter and spring seasons are also known for the high incidence of respiratory infectious diseases such as chickenpox, measles, mumps, meningitis, and tuberculosis. Many schools and childcare institutions are approaching the end of the semester, and the intensity of school activities is increasing. To ensure effective prevention and control of infectious respiratory diseases, particularly influenza, in schools before and after the winter break and at the beginning of the spring semester, it is necessary to safeguard students' health and address the respiratory infectious disease issues among college students. Given the high population density and close proximity among students, the spread of infectious diseases or respiratory illnesses can lead to further transmission and outbreak. Therefore, it is crucial for universities to strictly adhere to policy guidance. The release of policies has prompted colleges and universities to emphasize respiratory diseases more. Between 2020 and 2023, the emergence of the novel coronavirus has further highlighted the importance of regional health issues among universities and students. During this period, more scholars have paid increased attention to students' health concerns.

The "acute respiratory syndrome" has been appearing since around 2008 and has persisted until now. This indicates that this type of syndrome is relatively common among college students. It is primarily caused by accidental injuries or incidents during vacation swimming that result in diffuse lung lesions and the loss of lung oxygen exchange function, leading to symptoms of hypoxia. Based on this observation, universities need to pay close attention to students' swimming safety during vacations and holidays. By addressing this issue and ensuring students' personal safety, it is possible to prevent the occurrence and spread of respiratory diseases associated with such accidents and avoid pulmonary edema and subsequent respiratory system illnesses.

The "infectious laryngotracheitis virus" is a virus that causes avian infectious laryngotracheitis (AILT) in chickens.9 It is caused by the Infectious Laryngotracheitis Virus (ILTV). The presence of the "infectious laryngotracheitis virus" in the context of college students' respiratory system diseases has been observed since 2007 and has persisted until 2020. This suggests there have been issues with hygiene and food safety in university cafeterias, leading to the spread of this virus. In 2019, the Ministry of Education emphasized the importance of food safety for college students and established a comprehensive system for managing food safety risks in schools. This initiative has significantly improved food safety and prevented the transmission of viruses in students' meals. As a result of this policy implementation, the occurrence of this virus in respiratory system diseases among college students has decreased since 2020, indicating the effectiveness and adherence to the policy.

The occurrence of "common diseases" in the context of college students' respiratory system diseases has been frequent since around 2013 and has persisted until the present. This indicates that the transmission of common diseases is one of the contributing factors to respiratory system diseases among college students. Due to the high density and concentration of university students, coupled with poor ventilation, the spread of common diseases can occur rapidly and extensively. As a result, common diseases have become a significant area of concern for scholars and remain a hot topic to day. In the future, they may continue to play an important role in transmitting respiratory system diseases among students and remain at the forefront of research.

By conducting visual analysis using CiteSpace, we obtained the "keyword co-occurrence network" among the authors of the above publications. In this network, keywords serve as the nodes, and undirected links represent the co-occurrence relationships between keywords. The thickness of the links indicates the strength of the association between the keywords. Considering the meaning, characteristics, and frequency of the keywords, we selected the highly frequent keywords as the main topics and high-frequency keywords for further analysis in the following text.

In Figure 5, each node represents a keyword. The node size corresponds to the occurrence frequency in the 954 data articles. Larger nodes indicate a higher frequency. The letter "n" denotes the node, representing a positional keyword. The larger the font size, the greater respiratory system disease occurrences among college students in the 954 data articles. The letter "e" represents the link, and the thickness of the node indicates the frequency of connections between nodes. The network consists of 55 nodes and 88 links. Notably, there

is a strong collaborative relationship between "schlenher we" and "Schuster ma," "silver rc" and "schlenher we," as well as "Kilpatrick DG" and "shalevay." Specifically, the collaboration between "silver rc" and "schlenger we" exhibits a recurring trend, suggesting that these authors have a significant interest in respiratory system diseases among college students.

By conducting visual analysis using CiteSpace, we obtained the "keyword co-occurrence network" among the publishing institutions mentioned above. In this network, keywords serve as the nodes, and undirected links represent the co-occurrence relationships between keywords. The thickness of the links indicates the strength of the association between the keywords. Considering the meaning, characteristics, and frequency of the keywords, we selected the highly frequent keywords as the main topics and highfrequency keywords for further analysis in the following text.

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According to the graph, it is evident that from 1998 to 2007, there was generally low research attention given to respiratory system diseases among college students. The number of publications during these years remained relatively stable, consistently below 10 articles, indicating a low level of research focus and investment in respiratory system diseases among college students. From 2008 to 2014, there was a gradual increase in research on respiratory system diseases in universities. The number of publications showed a strong correlation with the issuance of policies. As mentioned earlier, the Ministry of Education in China implemented a smoking ban policy in universities in 2014, indicating the prevalence of smoking behavior among college students and indirectly confirming the causal and correlational relationship between smoking behavior and respiratory system diseases.

In 2018, the Ministry of Education announced that the winter and spring seasons are the peak periods for respiratory infectious diseases, with most regions in China experiencing a seasonal influenza epidemic. Recent monitoring results from the Chinese Center for Disease Control and Prevention showed that influenza activity remains at a high level and may continue to be prevalent for some time. Consequently, a significant number of scholars have published articles and focused on respiratory system diseases among college students. This increase in publications marks a turning point in research activity.

#### **Figure 6.** Correlation between the publishing agencies



Figure 7. Trend chart of the number of posts published



In 2019, there was an exponential growth in the number of publications on respiratory system diseases in universities. This was due to the global outbreak of the novel coronavirus, which primarily attacks the respiratory tract and exhibits high infectivity. Therefore, a large number of scholars began studying respiratory system diseases among college students. Given the high population density and limited activity range of college students, they are highly susceptible to respiratory system diseases, and an outbreak among college students can lead to a significant number of infections. The years 2019 to 2022 were the period when China focused on the novel coronavirus, making it the highest period of attention to respiratory system diseases among college students in nearly two decades and a period of increased research interest among scholars.

In 2023, the number of publications by scholars decreased, which can be attributed to relevant policies in China. At the end of 2022, China relaxed its policies regarding the COVID-19 pandemic, leading to a decline in attention toward the novel coronavirus and, consequently a decrease in the number of publications. This highlights the influential role of policies in guiding the research focus of scholars.

### CONCLUSION

This study conducted a visual analysis of research literature on black tea both within and outside of China using

the CiteSpace bibliometric software, based on data from the CNKI and WOS databases. Various aspects such as years, journals, authors, institutions, and countries (regions) were compared. Additionally, this study generated visual representations including clustering maps and keyword evolution maps to highlight research hotspots and trends in the causative factors of respiratory system diseases among university students globally and domestically. The following conclusions were drawn:

Keywords such as 'Air pollution,' 'attitude,' 'lifestyle,' and 'infectious laryngotracheitis virus' exhibit prominent nodes, signifying their pivotal role in the emergence of respiratory system diseases among university students. Notably, 'attitude' and 'lifestyle' have sustained a longer and more enduring presence over time. In contrast, keywords like 'COVID-19' and 'health,' introduced in recent years, have continued to garner significant attention, underscoring their status as contemporary research hotspots and frontiers in the study of respiratory system diseases among university students."

Based on the aforementioned visual analysis, it is evident that understanding and addressing respiratory system diseases among university students are of paramount importance for public health and society as a whole. University students, as integral members of society, have a direct impact on the overall health of the community. University campuses are densely populated areas prone to disease outbreaks. Therefore, safeguarding the respiratory health of university students contributes to preventing the spread of epidemics and maintaining public health in society. Furthermore, as future leaders and workforce members, the health of university students directly influences the development and economic prosperity of society. By helping university students maintain a healthy respiratory system, we can reduce academic interruptions and decreased work capacity due to illness, thereby providing robust support for the long-term sustainable development of society.

Moreover, respiratory system diseases are linked to broader issues of social health, such as inequalities and disparities in healthcare access. Understanding and addressing these diseases among university students can offer insights into societal health inequalities, prompting policymakers to take measures to improve overall health and ensure equitable healthcare for all.

In conclusion, food safety and hygiene on campuses, along with students' lifestyles and attitudes, are critical factors influencing the occurrence and development of respiratory system diseases among university students. To prevent respiratory diseases at their source, a comprehensive approach that addresses food safety concerns and nurtures students' personal habits and attitudes is necessary. This can be achieved through strengthened monitoring and regulation of school cafeterias and off-campus food supply chains to ensure food quality and safety. Simultaneously, health education and awareness campaigns can guide students toward adopting proper dietary practices and healthy lifestyles. Additionally, active engagement and guidance from teachers in students' health education are indispensable. By providing relevant knowledge and resources, we can guide students to cultivate healthy habits and foster positive attitudes towards life.

#### CONFLICTS OF INTEREST

The authors report no conflict of interest

#### AVAILABILITY OF DATA AND MATERIALS

The data supporting this study's findings are available from the corresponding author upon reasonable request.

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