Study on Medication Rules of Modern Chinese Herbal Medicine in the Treatment of Non-small Cell Lung Cancer Based on Data Mining

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Abstract

Objective: Based on data mining technology, we attempted to explore the medication rules of modern traditional Chinese medicine (TCM) compounds in non-small cell lung cancer (NSCLC) treatment, to provide a reference for clinical drug use. Methods: From 2010 to 2017, TCM compounds used for NSCLC treatment were collected from the Beijing 301 Hospital. The modern TCM compounds utilized in the treatment of NSCLC were established in the prescription database. Excel, SPSS 22, and SPSS Modeler14.2 software were utilized for the frequency analysis, factor analysis, cluster analysis, and association analysis. Then, the quantitative and qualitative analyses of the regularity of TCM compound medicaments were performed, and the possible mechanism was discussed. Results: The treatment of NSCLC using Chinese herbal compounds involved 231 prescriptions, 389 types of Chinese herbs, and 135 types of high-frequency Chinese herbs. Of these, Fritillaria cirrhosa, stir-baked fried Scutellariae, raw Os Draconis, Poria cocos (Schw.) Wolf, and Scutellaria barbata were the top five frequently prescribed Chinese herbs. Among the 39 types of drugs, heat-clearing and detoxifying drugs and qi-tonifying drugs were the leading. Cold, warm, flat, slightly cold, sweet, bitter, and pungent of four properties and five tastes and the meridians of lung, spleen, and stomach were most commonly selected. Factor analysis extracted 12 common factors, and the cumulative contribution rate was 65.595%, which mainly contained tonifying qi and blood; tonifying yin, clearing away heat, and eliminating stagnation; tonifying the spleen, regulating qi, and eliminating phlegm. Forty drug groups were obtained by cluster analysis; a total of 63 association rules were obtained by association analysis. The pairs of Poria cocos → dried tangerine peel and fried Atractylodes macrocephala → dried tangerine peel were commonly used in NSCLC, while the three most frequent herb groups were raw Astragalus → fried A. macrocephala and Poria cocos; raw medicated leaven → fried A. macrocephala and Poria cocos; and dried tangerine peel → fried A. macrocephala and Poria cocos. Conclusion: Lung cancer is mainly caused by qi stagnation, phlegm obstruction, phlegm, and blood stasis. Based on the principle of strengthening the body and dispelling pathogens, clinical treatment of NSCLC involves clearing heat and detoxifying, tonifying the spleen, regulating qi, eliminating phlegm to dispel pathogens, and tonifying qi and blood to strengthen the body.

Keywords: Data mining, modern Chinese medicine compounds, non-small cell lung cancer

INTRODUCTION

Lung cancer is a malignant tumor that occurs in the bronchial mucosa, glands, and alveolar epithelium. Studies have demonstrated that lung cancer has the highest incidence and mortality rate in China. Furthermore, non-small cell lung cancer (NSCLC) accounts for 75%–80% of all lung cancers, which is a serious threat to human health. Early symptoms of lung cancer are mainly cough or dry cough, which are extremely common for patients to notice. Hence, lung cancer is usually discovered in the middle and later stages when the possibility of surgery, radiotherapy, or chemotherapy is no longer available. A large number of clinical studies have shown that Chinese medicine has the potential to improve the therapeutic effects of traditional therapy. Therefore, modern Chinese herbal medicine (MCHM) is an important area of research and development.

Data mining, modern Chinese medicine compounds, non-small cell lung cancer

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Received: 22-07-2019, Accepted: 09-10-2019, Published: 20-02-2020

How to cite this article: Liu LT, Zhao CY, Wu T, Yu ZY, Sun Y, Li J. Study on medication rules of modern Chinese herbal medicine in the treatment of non-small cell lung cancer based on data mining. World J Tradit Chin Med 2020;6:83-96.
medicine has unique advantages in inhibiting malignant tumor growth, regulating immunity, increasing the efficiency, and reducing side effects of radiotherapy or chemotherapy.

In ancient books of traditional Chinese medicine (TCM), there is no mention of “lung cancer,” but similar records of lung cancer symptoms have been documented. For example, “Suwen Qibinglun” (one ancient book of Chinese medicine) said, “the disease is called Xiji, which has the symptoms of fullness under the ribs and adverse rising of qi, etc.” “Shengji Zonglu” (another ancient book) recorded, “pulmonary retention, also called Xiben, expresses cough and hemoptysis.” The pathogenesis of lung cancer is extremely complicated, in which the deficiency of healthy qi is considered primary while the spread of pathogen toxins to the whole body is considered secondary.

In this article, we attempted to analyze the data of Chinese medicine compounds utilized for NSCLC treatment (in the chemotherapy stage) from the Beijing 301 Hospital, during 2010–2017. We performed frequency analysis, association rule analysis, and factor analysis, to calculate the frequency of TCM and its four natures, five flavors, meridian tropism, and efficacy variables. We assessed drug groups for treating lung cancer, analyzed the combination rules of various Chinese medicines in compounds quantitatively and qualitatively, analyzed the law of drug utilization, and discussed various consensus and rules for the use of TCM in NSCLC treatment.

All these outcomes could provide objective data for the clinical treatment of NSCLC, improving the efficacy of TCM in the treatment of lung cancer and providing reference for future clinical treatment and novel drug research and development.

**SEARCH METHODS**

**Prescription source**

From 2010 to 2017, TCM compounds used for NSCLC treatment (with chemotherapy treatment) were collected from the Beijing 301 Hospital, obtained from the National Scientific Data Sharing Platform for Population and Health.

**CHINESE MEDICINE COMPOUND SCREENING AND ENTRY**

**Inclusion criteria**

All TCM compounds for NSCLC treatment were included.

**Data specification**

We referred to the “Twelfth Five-Year Plan” textbook of “Chinese Pharmacy” and the 2015 edition of the “Chinese Pharmacopoeia” of the National Higher Hospital of TCM and regulated the names of TCMs, such as Epimedium and Xianlingpi, termed Epimedium in this research. Furthermore, efficacy was classified. For example, Codonopsis pilosula, processed licorice, and fried Atractylodes macrocephala were classified as qi-tonifying drugs. Cooked rehmannia, peony, and Angelica were classified as blood-tonifying drugs.

**Data processing and analysis**

The TCM compounds utilized for the treatment of NSCLC were established in the prescription database using the Excel software. Excel (Microsoft Corporation, Redmond, Washington, USA) was used for frequency analysis, SPSS 22.0 (SPSS 21 Inc., Chicago, IL, USA) was used for factor and cluster analysis, and the SPSS Modeler14.2 (Inc., Chicago, IL, USA) software for employed for association rule analysis.

**RESULTS AND ANALYSIS**

Based on the search and screening, 231 Chinese medicinal compounds were finally determined, and the Chinese herbal compounds were sorted to establish a database of Chinese herbal medicines for treating NSCLC as shown in Table 1.

**Analysis of absolute frequency and percentage frequency**

**Analysis of absolute frequency and percentage frequency of high-frequency traditional Chinese medicine**

The database listed a total of 389 types of Chinese herbal medicines. The Chinese herbal medicines whose frequency was below the average absolute frequency were excluded. A total of 135 types of Chinese herbal medicines remained, and the absolute frequency and percentage frequency analysis results are shown in Table 2, with the arrangement of the Chinese herbal medicines in order of absolute frequency from high to low.

**Efficacy analysis of high-frequency traditional Chinese medicine**

Table 3 and Figure 1 present the heat-clearing and toxin-resolving drugs, especially Hedyotis diffusa and Cremastra appendiculata (D.Don) Makino, which are most commonly used in modern Chinese medicine for NSCLC treatment, with a percentage frequency of 7.98%. The second was the qi-tonifying drugs (7.75%), demonstrating no significant difference compared to the first. The percentage frequency of each of the top five categories of TCM was over 5.5%. Furthermore, the heat-clearing, toxin-resolving, and qi-tonifying drugs were at the forefront of these data mining results, indicating the importance to strengthen the body and dispel pathogens during NSCLC treatment.

**Analysis of meridian tropism of high-frequency traditional Chinese medicine**

The meridian tropism of high-frequency Chinese medicine was 12. Arranged in the order of frequency from high to low, the frequency analysis results are shown in Table 4 and Figure 2. The top six meridian tropisms were as follows: lung meridian (39.36%), spleen meridian (39.48%), liver meridian (55.80%), stomach meridian (34.46%), heart meridian (34.15%), and kidney meridian (29.35%), while each absolute frequency was over 1200. Furthermore, in lung cancer treatment, replenishing the spleen and stomach and regulating the heart, liver, and kidney were crucial.

**Analysis of the four natures of high-frequency traditional Chinese medicine**

Based on the analysis results in Table 5 and Figure 3, the first
In Table 6 and Figure 4, in high-frequency Chinese medicines, the top three of the five flavors presented were sweet (66.26%), bitter (48.88%), and pungent (42.06%), with each absolute frequency exceeding 2400. Chinese medicines with the three flavors, i.e., sweet, bitter, and pungent were more commonly used for the treatment of NSCLC.

**Factor analysis**

In Table 7, factor analysis was performed on every single Chinese medicine with an absolute frequency of over 41, and the results are presented in Table 7 and Figure 5. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.850, which was over 0.5 ($P < 0.05$). Hence, factor analysis could be applied. In Table 8, twelve common factors were finally extracted based on a featured root greater than one, and the cumulative contribution rate was 65.59%. In Table 9, according to the principle that the load factor was greater than 0.5, ten groups of several drug-combination factors affecting NSCLC treatment were finally extracted. The extraction results and the specific treatment methods reflected by each group of drugs are shown in Table 10.

**Cluster analysis**

The cluster analysis was performed on Chinese medicines with a frequency of 20 times or greater. The results of the analysis and the results of the combined extraction are shown in Table 11 and Figure 6.

**Analysis results of association rules**

According to the association rules, the parameter support degree was over ten, and the confidence level was over 50 (the support degree reflected the frequency of the drug groups; the confidence level reflected the reliability degree and
| Serial  | Chinese medicine                             | Absolute frequency (%) | Serial  | Chinese medicine                             | Absolute frequency (%) | Serial  | Chinese medicine                             | Absolute frequency (%) |
|---------|---------------------------------------------|------------------------|---------|---------------------------------------------|------------------------|---------|---------------------------------------------|------------------------|
| 1       | Fritillaria cirrhosa                        | 126                    | 46      | Raw glycyrrhiza                             | 42                     | 91      | Dendrobium                                  | 25                     |
| 2       | Fried Scutelariae                           | 115                    | 47      | Processed spinosas Ziziphi semen            | 42                     | 92      | Pinelliae rhizoma                           | 25                     |
| 3       | Raw Os Draconis                             | 113                    | 48      | Codonopsis pilosula                         | 40                     | 93      | Root of balloon flower                      | 25                     |
| 4       | Poria cocos (Schw.) wolf                    | 109                    | 49      | Pinelliae rhizome                           | 40                     | 94      | Golden lotus flower                         | 25                     |
| 5       | Hedypotes diffoha                           | 107                    | 50      | Rhizoma imperatae                           | 39                     | 95      | Scorched area seed                          | 25                     |
| 6       | Raw Scutellariae                            | 96                     | 51      | Pearl powder                                | 38                     | 96      | Herba patriciae                             | 25                     |
| 7       | Processed Astragalus membranaceus           | 95                     | 52      | Schisandra                                  | 38                     | 97      | Bolbestema panulicatum                      | 24                     |
| 8       | Raw Cyperus rotundus L                      | 93                     | 53      | Raw farfarea flos                           | 38                     | 98      | Ligustrum lucidum                           | 24                     |
| 9       | Raw gypsy                                   | 93                     | 54      | Cistanche desertica                         | 37                     | 99      | Oroxylum indicum                            | 24                     |
| 10      | Cremastra appendiculata (D.Don) Makino      | 91                     | 55      | Nelumbinis plumula                          | 37                     | 100     | Dried ginger                                | 24                     |
| 11      | Raw lotus roots                             | 89                     | 56      | Arisaema cum Bile                           | 37                     | 101     | Wax gourd peel                              | 24                     |
| 12      | Processed Astraglyodes macrocephala         | 81                     | 57      | Rhizoma dioecrea septemloba                 | 37                     | 102     | Processed cocis semen                       | 24                     |
| 13      | Glehnia littoralis                          | 78                     | 58      | Rhizoma phragmitis                          | 36                     | 103     | Spinosae Ziziphi semen                      | 23                     |
| 14      | Raw malt                                    | 75                     | 59      | Concha margaritfera                         | 35                     | 104     | Polygoni orientalis fructus                 | 23                     |
| 15      | Juncus effusus                              | 73                     | 60      | Lophatherum gracile                         | 35                     | 105     | Raw crataegus pinnaÆﬁda bunge              | 23                     |
| 16      | Raw Gardenia jasminoides                    | 72                     | 61      | Mulberry leaves                             | 34                     | 106     | Ligusticum chuanxiong hort                  | 23                     |
| 17      | Raw Sanguisorba officinalis L               | 71                     | 62      | Spathum                                     | 34                     | 107     | Lithospermum                                | 22                     |
| 18      | Mustard seed                                | 71                     | 63      | Toosendan fructus                           | 34                     | 108     | Processed tronycis carapax                  | 22                     |
| 19      | Asari radix et rhizoma                      | 65                     | 64      | Endothelium comenum gigeriage galli         | 33                     | 109     | Raw Loquat leaves                           | 22                     |
| 20      | Inula japonica Thunb.                       | 62                     | 65      | Bupleuri radix                              | 33                     | 110     | Orange                                      | 22                     |
| 21      | Stephanies tetrandrae radix                 | 62                     | 66      | Aurantii fructus                            | 32                     | 111     | Angelica                                    | 22                     |
| 22      | Asparagus                                   | 60                     | 67      | Angelica                                    | 32                     | 112     | Cibotium barometz                           | 22                     |
| 23      | Processed radix polygoni multiflori         | 59                     | 68      | Armeniaceae semen                           | 31                     | 113     | Radix paconiac rubra                        | 22                     |
| 24      | Fritillaria thunbergii miq                  | 59                     | 69      | Gastrodiae rhizome                          | 31                     | 114     | Lily                                        | 22                     |
| 25      | Processed loquat leaves                     | 58                     | 70      | Coked crataegi fructus                      | 31                     | 115     | Polysyagma temenosia                         | 21                     |
| 26      | Raw Scutellariae                            | 58                     | 71      | Trichosanthes periacanthum                  | 31                     | 116     | Rehmanniae radix                           | 21                     |
| 27      | Borax                                      | 58                     | 71      | Raw oyster                                  | 30                     | 117     | Polygonum bistorta L                        | 21                     |
| 28      | Processed licorice                          | 56                     | 72      | Pinelliae Rhizoma                           | 30                     | 118     | Seman Platycladi                           | 21                     |
| 29      | Poria cocos                                | 56                     | 73      | Paris polyphlla smith                       | 30                     | 119     | Radix stemonae                              | 21                     |
| 30      | Epimedium                                  | 55                     | 74      | Raw Atractylyodes                           | 29                     | 120     | Hottingia cordata thunb                     | 20                     |
| 31      | Taxillus chinensis (DC.) danser             | 53                     | 75      | Poria cutis                                 | 29                     | 121     | Peach kernel                                | 20                     |
| 32      | Tangerine peel                             | 53                     | 76      | Raw medicated leaven                        | 28                     | 122     | Radix adenophorae                           | 20                     |
| 33      | Crocus sativus L                           | 52                     | 78      | Raw peony                                  | 28                     | 123     | Windproof                                   | 20                     |

Contd...
the prediction intensity of the association rule of the drug groups). Using a priori for correlation analysis, the degree of association among TCM compounds was evaluated in the sNSCLC treatment, and the results are presented in Table 12. There were 63 association rules for the drug groups. Among these, there were 36 association rules for the 36 drug pairs and 27 association rules for the 27 drug groups of the three Chinese medicines. As shown in Table 12, the two TCM association rules, two drug pairs, *Poria cocos* (Schw.) Wolf → tangerine peel and processed *Atractylodes* → tangerine peel, ranked first with 73.20% support. In addition, in the three TCM association rules, the three-drug groups, which were raw *Scutellariae* → processed *Atractylodes* and *Poria cocos*, raw-mediated leaven → processed *Atractylodes* and *Poria cocos*, tangerine peel → processed *Atractylodes* and *Poria cocos*, ranked first with 58.82% support.

**Discussion**

Lung cancer is a common malignant tumor that has a high disease incidence in clinics. In TCM, it is termed “Fei Ji” and “Xi Ben.”
Table 3: Efficacy analysis of high-frequency traditional Chinese medicine

| Efficacy                                         | Absolute frequency (%) | Chinese medicine                                                                 |
|--------------------------------------------------|------------------------|-----------------------------------------------------------------------------------|
| Heat-clearing and toxin-resolving drugs           | 440 (7.98)             | Hedysos diffusa, Cremastra appendiculata (D.Don) Makino, Solanum niguelm, Scutellaria barbata, Hypericum erectum, Golden lotus flower, Herba patriniae, Oxoxyl indicum, Polygonum bistorta L, Houttuynia cordata, thubn                       |
| Qi-tonifying drugs                                | 427 (7.75)             | Processed Astragalus memeranaceus, Fried Atractylodes, Raw Scutellariae, Processed licorice, Raw licorice, Codonopsis pilosula, Atractylodes, Pseudostellaria heterophylla |
| Yin-nourishing drugs                              | 336 (6.09)             | Glehnia littoralis, Asparagus, Ophiopogon japonica, Dendrobium, Ligustrum lucidum, processed Trionycis carapax, Lily, Radix adenophore, Polygonati rhizome             |
| Drugs of clearing away heat to resolve phlegm    | 310 (5.62)             | Fritillaria cirrhosa, Fritillaria thunbergii, miq, the root of balloon flower, Bolbostemma panicul, atum, Semen benincasae, Arceae concha                    |
| Heat-purging-fire drugs                           | 303 (5.5)              | Raw gypsum, Raw gardenia jasminoides, Prunella vulgaris L, Rhizoma phragmitis, Lophatherum gracile, Fried cassia tora                              |
| Rectifying-Qi drugs                               | 285 (5.17)             | Raw Cyperus rotundus L, Tangerine peel, Toosendan fructus, Aurantii fructus, Processed Cyperus rotundus, L, Fructus aurantii immatatus               |
| Heart-nourishing, spirit-quieting drugs           | 253 (4.59)             | Processed spinoaee Ziziphi semen, Spinoaee Ziziphi semen, Pogylba tenuifolia, Semon platycladi, Poria cocos (Schw.) wolf, Nelumbinis placumula         |
| Phlegm cough and asthma drugs                     | 244 (4.43)             | Processed loquat leaves, Processed radix stemonae, Raw farfarae flos, Armeniaceae semen, Perilla frutescens seed, Raw loquat leaves radix stemonae     |
| Heat-clearing, damp-drying drugs                  | 238 (4.32)             | Fried Scutellariae, Coptidis rhizome                                              |
| Digestant drugs                                   | 217 (3.94)             | Raw malt, endothelium cornuei gigeriagle galli, Coked crataegi fructus, Raw massa medic, Fermentata, Processed crataegus pinnatiida Bunge, Raw crataegus pinnatiida bunge |
| Drugs for inducing diuresis to alleviate edema    | 182 (3.3)              | Poria cocos, Raw coicis semen, Poria cocos, Waxgourd peel, Processed coicis semen |
| Drugs of warming and resolving cold-phlegm        | 157 (2.85)             | Inula japonica thumb, Pinelliae rhizome                                            |
| Drugs for inducing diuresis for treating stranguria| 155 (2.81)             | Juncus effuses, Talc, Rhizoma Dioscoreae sepholemoe                              |
| Dispersing wind-heat drugs                        | 142 (2.58)             | Chrysanthemum, Mulberry leaves, Bupleuri radix, Vinegar-processed bupleuri radix |
| Blood-activating menstruation-regulating drugs    | 142 (2.58)             | Salvia miltiorrhiza Bge, Polygoni orientalis fructus, Peach kernel, Salvia chinensis herba, Cactus sativus L                                   |
| Blood-enriching drugs                             | 141 (2.56)             | Processed radix polygini multiflora, Raw angelia, Raw peony, Angelica             |
| Drugs for cooling blood to arrest bleeding        | 136 (2.47)             | Raw sanguisorba officinalis L, Rhizoma imperatae, Platycladus orientalis leaf      |
| Yang-nourishing drugs                             | 122 (2.21)             | Epimedium, Cistanche deserticola, Paris polyphyllum smith                         |
| Heavy settling spirit-quieting drugs              | 113 (2.05)             | Raw Os Draconis                                                                    |
| Heat-clearing blood-cooling drugs                 | 112 (2.03)             | Scrophularia ningpoensis hemsl, Lithospermum, Radix paoniac rubra, Rehmnniae radix |
| Dispersing wind-cold drugs                        | 104 (1.89)             | Asari radix et rhizome, Windproof, Cinnamomi ramulus                               |
| Astringing blood-stanching drugs                  | 89 (1.61)              | Raw lotus roots                                                                    |
| Drugs of relieving rheumatism and qi strengthening muscles and bones | 75 (1.36) | Taxillus chinensis (DC.) danser, Cibotium barometz                        |
| Anthelmintic drugs                                | 74 (1.34)              | Raw areca catechu L, Scorched areca seed                                          |
| Qi-disinhibiting phlegm-sweeping drugs            | 71 (1.29)              | Mustard seed                                                                       |
| Drugs for blood circulation and painkiller        | 69 (1.25)              | Turmeric, Ligusticum, Chuanxiong Hort                                             |
| Wind-extinguishing tetany-checking drugs          | 69 (1.25)              | Pearl powder, Gastrodiae rhizome                                                  |
| Damp dispersing drugs                             | 65 (1.18)              | Magnolia officinalis, Amomum villosum Lour, Alpinia katsumadai Hayata              |
| Smoothing liver yang medicine drugs               | 65 (1.18)              | Conhea margaritifera, Raw oyster                                                  |
| Drugs of securing essence, reducing urination and checking discharge | 64 (1.16) | Fructus corni, Rosae laevigatae fructus                                            |
| Wind-damp-dispelling heat-clearing drugs          | 62 (1.12)              | Stephanie tetrandrae radix                                                         |
| Removing necrotic tissue and promoting tissue regeneration drugs | 58 (1.05) | Borax                                                                            |
| Lung-intestine astringent drugs                   | 38 (0.69)              | Schisandra                                                                        |
| Drugs of breaking blood stasis to resolve lunapm | 34 (0.62)              | Sputum                                                                            |
| Drugs of clearing away heat to resolve phlegm    | 31 (0.56)              | Trichosanthes pericarpium                                                          |
| Stasis-transforming blood-stanching drugs         | 28 (0.51)              | Radix notoginseng                                                                  |
| Interior-warming drugs                            | 24 (0.44)              | Dried ginger                                                                       |
| Drugs for detoxicating insecticide and anti-itch | 19 (0.34)              | Cnidium monnieri (L) cuss                                                          |
| Moist precipitating drugs                         | 19 (0.34)              | Cannabis fructus                                                                   |
Table 4: Analysis of meridian tropism of high-frequency traditional Chinese medicine

| Meridian tropism         | Absolute frequency (%) |
|--------------------------|------------------------|
| Lung meridian            | 3216 (58.33)           |
| Spleen meridian          | 2189 (39.71)           |
| Liver meridian           | 2170 (39.36)           |
| Stomach meridian         | 1982 (35.95)           |
| Heart meridian           | 1593 (28.9)            |
| Kidney meridian          | 1282 (23.25)           |
| Large intestine meridian | 808 (14.66)            |
| Gallbladder meridian     | 511 (9.27)             |
| Small intestine meridian | 471 (8.54)             |
| Bladder meridian         | 289 (5.24)             |
| Triple Energizer meridian| 191 (3.46)             |
| Pericardium meridian     | 94 (1.71)              |

Table 5: Frequency analysis of the four natures of high-frequency traditional Chinese medicine

| Four natures     | Absolute frequency (%) |
|------------------|------------------------|
| Cold             | 1232 (22.35)           |
| Warm             | 1186 (21.51)           |
| Gentle           | 1186 (21.51)           |
| Slight cold      | 1016 (18.43)           |
| Slight warm      | 395 (7.16)             |
| Cool             | 330 (5.99)             |
| Great cold       | 120 (2.18)             |
| Hot              | 46 (0.83)              |

Table 6: Analysis of five flavors of high frequency traditional Chinese medicine

| Five flavors     | Absolute frequency (%) |
|------------------|------------------------|
| Sweet            | 3085 (55.95864)        |
| Bitter           | 2314 (41.97352)        |
| Pungent          | 1552 (28.15164)        |
| Salty            | 464 (8.416470)         |
| Slight bitter    | 443 (8.035552)         |
| Astringency      | 443 (8.035552)         |
| Mild-natured     | 420 (7.618357)         |
| Sour             | 341 (6.18538)          |
| Slight pungent   | 128 (2.321785)         |
| Slight sweet     | 119 (2.158534)         |

Table 7: Kaiser-Meyer-Olkin and Bartlett’s test

| Statistical terms                        | Value    |
|------------------------------------------|----------|
| KMO measure of sampling adequacy        | 0.850    |
| Bartlett’s test of sphericity            |          |
| Approximately $\chi^2$                   | 5473.291 |
| df                                       | 1081     |
| Significant                             | 0.000    |

Significant is the $P$ value of Bartlett’s spherical test ($P<0.05$ has statistical significance). KMO: Kaiser-Meyer-Olkin
According to Za Bing Yuan Liu Xi Zhu (an ancient book of TCM), “pathogen was accumulated in the chest, and the airway was blocked, so the qi was not allowed to pass.” The pathogen could include phlegm, blood stasis, or indigestion induced by overeating, all of which could fight with the healthy qi. After the pathogen is successful, it accumulates and palpable blockages are formed. Strong evil qi will damage healthy qi, and finally cause organ dysfunction, poor qi-lood circulation and even tangible blockages. 

### Table 8: Total variance explained

| Component | Initial eigenvalues | Extraction sums of squared loadings | Rotation sums of squared loadings |
|-----------|--------------------|-------------------------------------|----------------------------------|
|           | Total              | Percentage of variance | Cumulative (%) | Total              | Percentage of variance | Cumulative (%) | Total              | Percentage of variance | Cumulative (%) |
| 1         | 10.407             | 22.142                 | 22.142          | 10.407             | 22.142                 | 22.142          | 6.324              | 13.455              | 13.455          |
| 2         | 5.207              | 11.078                 | 33.220          | 5.207              | 11.078                 | 33.220          | 3.663              | 7.794               | 21.249          |
| 3         | 2.485              | 5.287                  | 38.507          | 2.485              | 5.287                  | 38.507          | 3.582              | 7.622               | 28.872          |
| 4         | 1.929              | 4.105                  | 42.612          | 1.929              | 4.105                  | 42.612          | 2.738              | 5.825               | 34.696          |
| 5         | 1.697              | 3.611                  | 46.223          | 1.697              | 3.611                  | 46.223          | 2.632              | 5.600               | 40.296          |
| 6         | 1.572              | 3.345                  | 49.568          | 1.572              | 3.345                  | 49.568          | 2.139              | 4.551               | 44.847          |
| 7         | 1.466              | 3.119                  | 52.687          | 1.466              | 3.119                  | 52.687          | 1.765              | 3.756               | 52.961          |
| 8         | 1.381              | 2.937                  | 55.625          | 1.381              | 2.937                  | 55.625          | 1.563              | 3.325               | 56.285          |
| 9         | 1.338              | 2.846                  | 58.471          | 1.338              | 2.846                  | 58.471          | 1.563              | 3.325               | 56.285          |
| 10        | 1.266              | 2.694                  | 61.165          | 1.266              | 2.694                  | 61.165          | 1.520              | 3.234               | 59.519          |
| 11        | 1.080              | 2.297                  | 63.462          | 1.080              | 2.297                  | 63.462          | 1.487              | 3.164               | 62.683          |
| 12        | 1.003              | 2.133                  | 65.595          | 1.003              | 2.133                  | 65.595          | 1.369              | 2.912               | 65.595          |
Table 9: Component score coefficient matrix

| Component | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 11    | 12    |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Processed radix polygoni multiflori | 0.180 | 0.147 | 0.315 | 0.324 | 0.324 | 0.315 | 0.147 | 0.315 | 0.324 | 0.324 | 0.315 | 0.147 |
| Processed loquat leaves | 0.114 | 0.130 | 0.231 | 0.701 | 0.009 | 0.114 | 0.154 | 0.081 | 0.154 | 0.081 | 0.154 | 0.081 |
| Processed astragalus memeraneaceus | 0.032 | 0.105 | 0.278 | 0.278 | 0.278 | 0.105 | 0.105 | 0.278 | 0.278 | 0.278 | 0.105 | 0.105 |
| Processed licorice | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 |
| Processed radix stemonae | 0.020 | 0.063 | 0.209 | 0.193 | 0.046 | 0.203 | 0.140 | 0.062 | 0.203 | 0.140 | 0.062 | 0.203 |
| Fritillaria thunbergii miq | 0.603 | 0.023 | 0.070 | 0.110 | 0.014 | 0.140 | 0.211 | 0.101 | 0.140 | 0.211 | 0.101 | 0.140 |
| Crocus sativus L. | 0.039 | 0.053 | 0.152 | 0.079 | 0.091 | 0.217 | 0.074 | 0.000 | 0.217 | 0.074 | 0.000 | 0.217 |
| Scrophularia ningpoensis hemsl | 0.558 | 0.086 | 0.020 | 0.111 | 0.030 | 0.143 | 0.175 | 0.303 | 0.316 | 0.226 | 0.099 | 0.117 |
| Turmeric | 0.098 | 0.047 | 0.065 | 0.396 | 0.396 | 0.396 | 0.396 | 0.396 | 0.396 | 0.396 | 0.396 | 0.396 |
| Inula britanica L. | 0.128 | 0.230 | 0.139 | 0.163 | 0.147 | 0.147 | 0.147 | 0.163 | 0.147 | 0.147 | 0.163 | 0.147 |
| Epimedium | 0.095 | 0.001 | 0.142 | 0.056 | 0.295 | 0.021 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Prunella vulgaris L. | 0.149 | 0.054 | 0.011 | 0.664 | 0.035 | 0.208 | 0.107 | 0.102 | 0.077 | 0.314 | 0.247 | 0.056 |
| Asari radix et rhizoma | 0.103 | 0.086 | 0.051 | 0.080 | 0.017 | 0.076 | 0.010 | 0.118 | 0.022 | 0.213 | 0.077 | 0.130 |
| Asparagus | 0.041 | 0.170 | 0.287 | 0.278 | 0.278 | 0.154 | 0.363 | 0.231 | 0.136 | 0.127 | 0.018 | 0.049 |
| Raw gardenia jasminoides | 0.158 | 0.137 | 0.185 | 0.022 | 0.117 | 0.063 | 0.171 | 0.014 | 0.105 | 0.036 | 0.686 | 0.017 |
| Raw coicus semen | 0.635 | 0.106 | 0.077 | 0.158 | 0.079 | 0.108 | 0.020 | 0.012 | 0.049 | 0.236 | 0.160 | 0.050 |
| Raw Cyperus rotundus L. | 0.131 | 0.253 | 0.848 | 0.049 | 0.171 | 0.077 | 0.026 | 0.075 | 0.176 | 0.087 | 0.089 | 0.005 |
| Gypsum | 0.146 | 0.224 | 0.861 | 0.121 | 0.147 | 0.097 | 0.009 | 0.030 | 0.116 | 0.070 | 0.105 | 0.011 |
| Raw lotus roots | 0.224 | 0.232 | 0.860 | 0.052 | 0.187 | 0.091 | 0.018 | 0.039 | 0.114 | 0.098 | 0.074 | 0.011 |
| Raw malt | 0.145 | 0.194 | 0.020 | 0.194 | 0.214 | 0.100 | 0.062 | 0.192 | 0.089 | 0.036 | 0.016 | 0.618 |
| Raw Os Draconis | 0.106 | 0.230 | 0.143 | 0.278 | 0.388 | 0.038 | 0.007 | 0.149 | 0.016 | 0.155 | 0.080 | 0.005 |
| Fried Scutellariae | 0.241 | 0.190 | 0.010 | 0.660 | 0.123 | 0.026 | 0.117 | 0.014 | 0.105 | 0.036 | 0.686 | 0.017 |
| Raw Scutellariae | 0.106 | 0.190 | 0.010 | 0.660 | 0.123 | 0.026 | 0.117 | 0.014 | 0.105 | 0.036 | 0.686 | 0.017 |
| Radix glycyrrhizae | 0.462 | 0.218 | 0.008 | 0.238 | 0.127 | 0.129 | 0.132 | 0.050 | 0.291 | 0.371 | 0.000 | 0.005 |
| Raw sanguisorba officinalis L. | 0.293 | 0.230 | 0.413 | 0.278 | 0.388 | 0.038 | 0.007 | 0.149 | 0.016 | 0.155 | 0.080 | 0.005 |
| Raw arnea catechu L. | 0.134 | 0.396 | 0.156 | 0.391 | 0.291 | 0.105 | 0.131 | 0.015 | 0.105 | 0.031 | 0.049 | 0.005 |
| Fructus corni | 0.142 | 0.383 | 0.233 | 0.137 | 0.097 | 0.048 | 0.183 | 0.033 | 0.507 | 0.183 | 0.273 | 0.039 |
| borax | 0.263 | 0.201 | 0.262 | 0.401 | 0.460 | 0.156 | 0.045 | 0.097 | 0.088 | 0.021 | 0.166 | 0.004 |
| Cremasto appendiculata (D.Don) | 0.114 | 0.093 | 0.130 | 0.005 | 0.204 | 0.796 | 0.024 | 0.018 | 0.057 | 0.024 | 0.011 | 0.164 |

block. When the physical blocks appear in the lungs, lung cancer is present. The program formulated by the National Administration of TCM\cite{11} in 2011 classified lung cancer into five types, including qi-stagnation and blood-stasis syndrome, phlegm-heat obstruction of the lung syndrome, lung-spleen qi deficiency syndrome, lung yin deficiency syndrome, and qi-yin deficiency syndrome. Currently, the treatment principle is generally based on replenishing the deficiency of the healthy qi and clearing of the residual pathogen.

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and poison. In other words, this implies strengthening the healthy qi, dispelling the pathogen, consolidating the body resistance, and cleaning the source of disease.

We retrieved 231 formulas of Chinese medicine in the database and combined the results of the above data analysis to present the following outcomes:
| Serial number | Drug pair                        | Support (%) | Confidence (%) | Serial number | Drug pair                                                                 | Support (%) | Confidence (%) |
|---------------|---------------------------------|-------------|----------------|---------------|---------------------------------------------------------------------------|-------------|----------------|
| 1             | Poria cocos→Tangerine peel      | 73.20       | 78.57          | 33            | Processed Atractylodes→pinelliae rhizoma                                  | 53.59       | 84.15          |
| 2             | Processed Atractylodes→Tangerine peel | 73.20       | 75.00          | 34            | Tangerine peel→opiophygon japonicus                                       | 51.63       | 72.15          |
| 3             | Tangerine peel→Raw Scutellariae | 69.28       | 72.64          | 35            | Poria cocos→opiophygon japonicus                                          | 51.63       | 70.89          |
| 4             | Processed Atractylodes→Raw Scutellariae | 69.28       | 71.70          | 36            | Raw Scutellariae→opiophygon japonicus                                      | 51.63       | 82.28          |
| 5             | Poria cocos→Raw Scutellariae     | 69.28       | 70.75          | 37            | Raw Scutellariae→processed Atractylodes, poria cocus                      | 58.82       | 71.11          |
| 6             | Raw Scutellariae→Poria cocus     | 69.28       | 70.75          | 38            | Raw medicated leaven→processed Atractylodes, poria cocus                  | 58.82       | 70.00          |
| 7             | Processed Atractylodes→Poria cocus | 69.28       | 84.91          | 39            | Tangerine peel→processed Atractylodes, poria cocus                        | 58.82       | 84.44          |
| 8             | Tangerine peel→Poria cocus       | 69.28       | 83.02          | 40            | Raw crataegus pinnatifida bunge→raw malt, raw massa medicata fermentata   | 57.52       | 98.88          |
| 9             | Poria cocos→Processed Atractylodes | 68.63       | 85.71          | 41            | Processed Atractylodes→pora cocus, tangerine peel                         | 57.52       | 86.36          |
| 10            | Tangerine peel→Processed Atractylodes | 68.63       | 80.00          | 42            | Poria cocus→raw malt, raw medicated leaven                                | 57.52       | 79.55          |
| 11            | Raw Scutellariae→Processed Atractylodes | 68.63       | 72.38          | 43            | Processed Atractylodes→raw malt, raw medicated leaven                     | 57.52       | 77.27          |
| 12            | Raw massa medicata Fermentata→Raw malt | 58.17       | 98.88          | 44            | Tangerine peel→raw malt, raw medicated leaven                            | 57.52       | 77.27          |
| 13            | RawMalt→Raw medicated leaven     | 58.17       | 98.88          | 45            | Pinelliae rhizoma→pora cocus, tangerine peel                              | 57.52       | 76.14          |
| 14            | Raw crataegus pinnatifida bunge→Raw malt | 58.17       | 97.75          | 46            | Raw Scutellariae→raw malt, raw massa medicata fermentata                 | 57.52       | 72.73          |
| 15            | Raw crataegus pinnatifida bunge→Raw medicated leaven | 58.17       | 97.75          | 47            | Raw crataegus pinnatifida bunge→pora cocus tangerine peel               | 57.52       | 71.59          |
| 16            | Poria cocus→Raw medicated leaven | 58.17       | 79.78          | 48            | Raw medicated leaven→pora cocus, tangerine peel                           | 57.52       | 71.59          |
| 17            | Poria cocus→raw malt            | 58.17       | 78.65          | 49            | Raw malt→pora cocus, tangerine peel                                       | 57.52       | 70.45          |
| 18            | Tangerine peel→raw malt         | 58.17       | 77.53          | 50            | Poria cocus→raw crataegus pinnatifida bunge, raw malt                    | 56.86       | 80.46          |
| 19            | Processed Atractylodes→raw medicated leaven | 58.17       | 77.53          | 51            | Poria cocus→raw crataegus pinnatifida bunge, raw medicated leaven         | 56.86       | 80.46          |
| 20            | Tangerine peel→raw medicated leaven | 58.17       | 77.53          | 52            | Processed Atractylodes→raw crataegus pinnatifida bunge, raw malt          | 56.86       | 78.16          |
| 21            | Processed Atractylodes→raw malt | 58.17       | 76.40          | 53            | Tangerine peel→raw crataegus pinnatifida bunge, raw malt                 | 56.86       | 78.16          |
| 22            | Raw Scutellariae→raw malt       | 58.17       | 73.03          | 54            | Processed Atractylodes→Raw crataegus pinnatifida bunge, Raw medicated leaven | 56.86       | 78.16          |
| 23            | Raw Scutellariae→raw medicated leaven | 58.17       | 73.03          | 55            | Tangerine peel→raw crataegus pinnatifida bunge, raw medicated leaven      | 56.86       | 78.16          |
| 24            | Raw malt→raw crataegus pinnatifida bunge | 57.52       | 98.88          | 56            | Raw Scutellariae→raw crataegus pinnatifida bunge, raw malt                | 56.86       | 72.41          |
| 25            | Raw massa medicata Fermentata→raw crataegus pinnatifida bunge | 57.52       | 98.88          | 57            | Raw Scutellariae→raw crataegus pinnatifida bunge, raw medicated leaven    | 56.86       | 72.41          |
| 26            | Tangerine peel→raw crataegus pinnatifida bunge | 57.52       | 78.41          | 58            | Raw massa medicata fermentata→raw crataegus pinnatifida bunge, raw malt    | 56.86       | 100.00         |
| 27            | Processed Atractylodes→raw crataegus pinnatifida bunge | 57.52       | 77.27          | 59            | Raw malt→raw crataegus pinnatifida bunge, raw medicated leaven            | 56.86       | 100.00         |
| 28            | Raw Scutellariae→raw crataegus pinnatifida bunge | 57.52       | 71.59          | 60            | Pinelliae rhizoma→processed Atractylodes, tangerine peel                 | 54.90       | 75.00          |
| 29            | Poria cocus→raw crataegus pinnatifida bunge | 57.51       | 80.68          | 61            | Poria cocus→processed Atractylodes, tangerine peel                       | 54.90       | 90.48          |
| 30            | Raw Scutellariae→pinelliae rhizoma | 53.59       | 71.95          | 62            | Poria cocus→Raw Scutellariae, tangerine peel                             | 50.33       | 77.92          |
| 31            | Tangerine peel→pinelliae rhizoma | 53.59       | 91.46          | 63            | Processed Atractylodes→Raw Scutellariae, Tangerine peel                  | 50.33       | 74.03          |
| 32            | Poria cocus→pinelliae rhizoma   | 53.59       | 86.59          |               |                                                                          |             |                |
Treatment

Yizhong Biduo (another ancient book of Chinese medicine), written by Zhongzi Li, has presented that “at the beginning of the disease, the healthy qi is still strong, while the evil qi is still shallow. As the disease progresses, the evil qi is stronger, while the healthy qi is weaker. When the disease is long lasting, the evil qi invades, while the healthy qi disappears.” Influenced by these thoughts, modern doctors[12-15] believe “the theory of pathogenic toxin invading the lung,” “the theory of phlegm-damp gathering inside,” and “the theory of healthy qi deficiency.” Hence, we believe that in the early stage of NSCLC treatment, the treatment mainly focuses on attacking the pathogenic factors, strengthening and attacking equally in the mid-term, and mainly strengthening the healthy qi in the later-term. Lung cancer[16,17] is a kind of disease, which is deficiency in nature and excess in superficiality. Deficiency of healthy qi and serious cancer toxin will further damage the healthy qi. Hence, it is difficult to inhibit the progress of lung cancer by strengthening the healthy qi only.

Simultaneously, along with modern means of treatment (such as radiotherapy and chemotherapy), pathogen-attacking TCM can be used to enhance the efficacy and eliminate residual cancer cells. Zhongying Zhou,[18] a TCM master, put forward the “cancer toxin” theory, which indicated that “eliminating the pathogen precedes the strengthening the healthy qi.” Furthermore, he proposed that in the late stage of lung cancer, the deep spreading of the toxin, such as lung cancer–brain metastasis and lung cancer–liver metastasis, occurred due to the exuberant phlegm-heat and toxin. Cancer toxins such as heat-toxin and phlegm-toxin[19] are the direct causes of lung cancer, so eliminating the pathogen mainly relied on heat-cleaning and toxin-resolving.

In NSCLC treatment, the Beijing 301 Hospital has used a higher proportion of pathogen-attacking drugs, including heat-cleaning and toxin-resolving drugs, and drugs clearing away heat and resolving phlegm, with heat-cleaning and toxin-resolving drugs (7.98%) ranking first. In addition, the frequency of use of health-supporting drugs, such as qi-tonifying drugs and yin-nourishing drugs, was also high, with qi-tonifying drugs (7.75%) ranking second. The treatment method for NSCLC was based on clearing heat and relieving toxicity, tonifying qi, nourishing yin, clearing heat and removing phlegm, and clearing heat and purging fire. Based on research and analysis, it was observed that the NSCLC patients undergoing chemotherapy were prescribed the TCM treatment of clearing heat and relieving toxicity to eliminate the pathogen, tonifying qi and yin to strengthen healthy qi, and reflecting the principle of pathogen-eliminating and healthy qi-strengthening in a balanced manner. Ancient and modern doctors have had similar opinions: In lung cancer, due to qi stagnation, phlegm gathering and blood stasis are bound to each other to form the tumor block. The cancer toxin is the key to the disease progression; when blocked, the disease is developing abnormally, and pathological products, such as phlegm and heat toxin, consume qi and yin. Therefore, treatment is based on resisting cancer and relieving toxicity. Concurrently, supporting health is crucial to treat the primary disease, thus supporting and strengthening health throughout treatment. An NSCLC patient in the chemotherapy stage is still considered the early stage when the healthy qi is not deficient, and the evil qi is just beginning to take over. In addition, the cancer toxin is an important factor in the occurrence and development of lung cancer. Therefore, the main treatment is heat clearing and toxin resolving to attack the pathogen, due to healthy qi deficiency. Furthermore, it is also vital to tonify qi and yin to strengthen health. However, as the data were derived from NSCLC patients undergoing chemotherapy, bias of data results cannot be ruled out.

High-frequency Chinese medicines

The results demonstrated that five kinds of Chinese medicine, including Fritillaria cirrhosa (54.55%), processed-fried Scutellariae (49.78%), raw Os Draconis (48.92%), Poria cocos (46.32%), were the commonly used compounds in the treatment of NSCLC. Combined with the cluster analysis results on drug combination extraction, F. cirrhosa, processed fried Scutellariae, and H. diffusa often appeared in combination. As mentioned above, the main pathogenic factors of lung cancer were heat and phlegm toxin. Chinese medicine of heat-clearing and toxin-resolving drugs, such as H. diffusa (46.32%), C. appendiculata (D.Don) Makino (39.39%); qi-tonifying drugs, such as processed Astragalus membranaceus (41.13%) and processed Atractylodes (35.06%); and yin-tonifying drugs, such as Glehnia littoralis (33.77%) and Asparagus (25.97%), were most commonly used.

Modern clinical studies have indicated that the antitumor mechanisms of H. diffusa[20] included immune regulation, inhibition of tumor cell proliferation, inhibition of telomerase activity. C. appendiculata (D.Don) Makino has been commonly used as an anticancer agent in TCM.[21] containing a variety of alkaloids, that could inhibit the mitosis and proliferation of cancer cells and exhibit nonselective medium-intensity cytotoxic activity against cells, such as lung cancer cells and liver cancer cells. Astragalus radix[22,23] promotes tumor cell apoptosis, inhibits tumor proliferation, migration, and enhances immune functions. Atractylenolide[24] down-regulates the levels of factors associated with cancer-related cell differentiation. G. littoralis[25,26] inhibits tumor cell migration and invasion and enhances T-cells, B-cells, white blood cells, lymphocytes, etc., thereby promoting immune function. Drugs clearing away heat to resolve phlegm, such as F. cirrhosa D.Don[27,28] can inhibit the efflux activity of P-gp, thereby reversing the multidrug resistance observed in tumor cells.

Combined with modern research on high-frequency Chinese medicine, the antitumor effect of TCM is mainly mediated through the following mechanisms:[20] (1) Activation of an immune response. For example, regulating receptor signals such as lymphocytes to improve immunity, such as H. diffusa, A. radix, and G. littoralis; (2) Regulation of inflammatory...
factors and other mechanisms to improve the tumor microenvironment, such as *H. diffusa*, *A. radix*, *F. cirrhosa*, and *Scutellariae*; (3) Regulation of tumor cell proliferation, migration, differentiation, and apoptosis by regulating metabolic pathways such as tumor-suppressor factors, including *H. diffusa*, dogtooth violet, and *A. radix*.

**Drug pairs and drug groups**

Forty common drug groups were extracted using cluster analysis. Association analysis demonstrated that the drug pairs, *Poria cocos* → tangerine peel and processed *Atractylodes* → tangerine peel, were most commonly used. In addition, the drug groups, raw *Scutellariae* → processed *Atractylodes* and *Poria cocos*, raw Massa Medicata Fermentata → processed *Atractylodes* and *Poria cocos*, tangerine peel → processed *Atractylodes* and *Poria cocos*, were most commonly used. Data analysis suggested that the four herbs, *Poria cocos*, *Atractylodes*, *A. radix*, and tangerine peel, often appeared in pairs or in groups of three, and each of the four herbs could strengthen the spleen.

The spleen is the foundation of acquired constitution, the source of qi and blood production. Furthermore, the spleen earth promotes the lung gold; hence, whether the lung qi is complete or not depends on whether the spleen function of transportation and transformation of water, grain, and refined essence are normal. As stated by Shiduo Chen in “Shishi Milu Zhengyifa” (another book of Chinese medicine), “it was very difficult to treat the lung by the routine treatment. It should be transferred to treat the spleen, replenishing the spleen qi, then the earth promotes the gold.” Therefore, in the case of lung disease, it is especially necessary to invigorate the spleen and stomach.

*Poria cocos* promotes urination and invigorates the spleen, also calming the mind; *A. radix* replenishes the lung qi and spleen qi and promotes urination; *Atractylodes* invigorates the spleen and tonifies qi, dries dampness, and promotes urination; tangerine peel replenishes qi, invigorates the spleen, dries dampness, and resolves phlegm. The combination is selected based on the clinical type of the patient syndrome, invigorating the spleen and tonifying qi, to ensure that the spleen qi is smooth and the water, grain, and refined essence can be normally transported to the whole body.

**Meridian tropism**

The meridian tropism of TCM was mainly based on the lung, spleen, stomach, heart, liver, and kidney meridians. Danxi Zhu believed that “the qi and blood were uncoordinated, and diseases did not occur. Once stagnation occurred, various diseases generated; hence, the illness was mostly induced by stagnation.” Clearly, qi and blood stagnation are keys to all diseases.

Based on the occurrence and development of lung cancer, the disease pathogenesis is mostly based on the disorder of Zang-Fu qi and stagnation. Then, qi which cannot disperse the body fluid causes phlegm condensation, and qi stagnation and blood stasis lead to cancer. Lungs govern qi and control the dispersing and sending downward of qi. When healthy qi is deficient, the lungs are dysfunctional. Spleens and stomachs digest the food. Furthermore, they can also transport and transform water, grain, and refined essence. However, transportation relies on the lungs dispersing and sending downward to spread to the whole body. When the lung function is lost, the transportation of body fluid is abnormal, and the retention of water damp produces phlegm. The spleen is a source of phlegm, while the lung is a phlegm vessel. With phlegm in the lungs and disordered function, lung qi is obstructed and stagnated. Spleen insufficiency is primary, nature is deficient and the superficiality is excessive.

Therefore, in the clinic, *H. diffusa* and *C. appendiculata* (D.Don) Makino are used to clear heat, relieve toxicity, and attack pathogens, combined with *Astragali radix*, *Atractylodes*, and other qi-supplementing and spleen-strengthening drugs. If the spleen qi can be transported and can transform normally, there is no phlegm produced. Furthermore, when it takes a prolonged long time, it damages the collaterals, leading to collateral stasis, when the phlegm and blood stasis bind together called “Feiji.” Livers smoothen the qi. Emotional disorders can cause liver qi stagnation and loss of function, inducing abnormal body fluid transportation. Furthermore, the body fluid can condense into phlegm. Stagnation of liver qi can change into fire, and stagnated fire consuming the body fluid can refine fluid into phlegm. Liver wood can restrain spleen earth, causing spleen dysfunction in transportation and transformation, which permits the development of turbid phlegm, which may condense into the tumor mass.

**Four natures and five flavors**

The statistics demonstrated that cold, warm, flat, and slight cold were the main four natures, while sweet, bitter, and pungent were the main five flavors. TCM treatment is regulating the function of the entrails and qi movement (upward, downward, inward, and outward movement). The lungs govern qi and breathing. Furthermore, it has functions of dispersing and sending downward qi, which are interdependent and mutually constrained to maintain the physiological functions of the lungs. Pungency medicines can be used to disperse dysfunctions of lung qi, and bitterness can be used to lower adverse rising. The spleen and stomach remain in the middle energizer, demonstrating the energy of upward and downward qi movement. In addition, the spleen sends the clear upward and the stomach sends digested foods downward. Treatment of spleen deficiency is mainly based on sweet and warm drugs, and treatment of stomach fire uses bitterness to adapt to stomach descent. The liver and kidney are in the lower energizer, and the liver blood, kidney essence, and the ministerial fire are contained within. Liver and kidney diseases are mainly caused by the deficiency of yin blood and kidney essence, which can be combined with liver yang or ministerial rising fire. Sweet medicines tonify the liver blood or kidney essence, salty medicines tonify the kidney, acid medicines tonify the liver, and bitter medicines purge fire. Wu observed that Chinese medicines of the lung meridian are mainly cold and have clinical effects such
as relieving asthma, dispelling phlegm, and relieving cough. Moreover, the pharmacological effects also include dispelling phlegm, relieving asthma, and antitumor effects.

This study demonstrated that in the treatment of lung cancer, doctors commonly prescribed bitter and cold medicines. Furthermore, doctors used their efficacy of clearing heat and dampness and resolving phlegm for anticancer, antipyretic, and antiviral applications in the clinic. While bitter and cold medicines are mainly heat clearing and toxin resolving, clearing away heat could resolve phlegm. Chinese medicines of sweet flavor and cold nature can tonify yin and clear heat, which were mainly tonifying-yin medicines. Chinese medicines of sweet in flavor and warm in nature, can tonify yang qi, and relieve spasms. This kind of medicines is mainly tonifying qi medicines. Pungency medicine herbs can disperse and move, which move qi and activate blood. This kind of medicines is mainly qi-regulating medicines.

**Conclusion**

This study refined the academic opinions of the 301 hospitals in Beijing for the treatment of NSCLC through data analysis, and it was in line with the ancient and modern doctor’s cognition and clinical application of the etiology, pathogenesis, treatment, and medication of the disease, so it can provide clinical reference for clinical treatment of NSCLC. However, because of the restrained data sources from only one hospital, the study lacked the generalization. Furthermore, as the data were derived from NSCLC patients during chemotherapy, data bias cannot be ruled out. Further research needs to sum up the regular pattern of the TCM treatment by utilizing multicenter and large samples.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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