

## Pathology-Related Term-Frequency in Chinese Medical Classics

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### Abstract

**Background:** Pathology-related term-frequency was studied in Chinese medical classics to trace the base of the development and growth of Pathology in China. **Methods:** Internet and Microsoft vocabulary extraction function and MyZiCiFreq word frequency statistics tool were used as the research methods. The data is to be used for the further study of the history of pathology in China as a whole. **Results:** With reference to several vernacular Chinese versions, 11 pathology-related entries and 23 word frequencies were selected. **Conclusion:** The research on the mechanism of disease's occurrence, development and changes in Chinese traditional medicine failed to be integrated into pathology like modern western medicine. The lack of accurate expression and clear analysis for medical terms has seriously influenced the structure and systematization of Chinese traditional medicine.

**Key words:** Chinese medicine; Pathology; Term-frequency

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### INTRODUCTION

As an important part of modern medical research and one of the necessary means of modern medicine, pathology plays an essential role in life sciences. The research on the history of western medicine is deepened and improved, and thus pathology is developing clearly with complete research on the history within pathology associated with the inherent logic of its own development. The same as historiography, the history of science and technology, and other histories of medical disciplines starting early, the research on history of western pathology began to shift into the combination of internal history and external history, which was the stage of the combination with its own historical facts and social environment, historical period, economic development. However, before the introduction of western medicine, China has already had a complete system of Chinese medicine. As a result, the introduction of western medicine went through ups and downs, which was a process of competition, exclusion and integration between two medical systems. Thus, compared with the history of western medicine, the research on the history of Chinese medicine is much more complicated. Other than anatomy and physiology, pathology had not become a system in the west when it first came to China. The establishment of pathology as an independent discipline in China and the process of acceptance and abortion by Chinese medicine even overcame all obstacles. In the aspect of research on domestic specialized medical history, the research on the history of pathology is far behind the history of anatomy, physiology, and even some specialized clinical histories due to its complexity, and systematic research on the history of pathology has not yet been seen.

Frequency analysis of keywords is conducting order statistics of keywords in literature of target disciplines by frequency analysis software to determine the degree

of importance in the text based on the frequency of use of words, and further to determine the importance of the analyzed words related topics in literature. This paper attempts to analyze and determine pathology related theory and its analysis through the frequency of pathology related terms in Chinese medical common knowledge classics represented by *Huangdi's Canon of Medicine (Huangdi Neijing)*, *Classic of Difficulties (Huangdi Bashiyan Nanjing)* and Chinese medical classics on etiology, pathology and pathogenesis represented by *Treatise on Causes and Symptoms of Diseases (Zhubing Yuanhou Lun)*, *Treatise on Cold-Induced Diseases (Shanghan Zabing Lun)*. The main method was to sort and conduct statistics of keywords in original version and vernacular Chinese version of 49 Chinese medical classics by Internet and Microsoft vocabulary extraction function and MyZiCiFreq word frequency statistics tool based on Zip's Law, and pathology related words with high frequency were extracted and analyzed.

## 1. METHODS

The original version and several vernacular Chinese versions of *Huangdi's Canon of Medicine*, *Classic of Difficulties* were downloaded from Super Star Digital Library and Scholar Digital Library, pathology related content in the books were conducted frequency statistics and analysis by Internet and Microsoft vocabulary extraction function and MyZiCiFreq word frequency statistics tool, and help to correctly understand the meaning of "disease" and its phrases in classics through extraction and comparison in several vernacular Chinese versions. In addition, the publication year (AD1518) of Wang Yangming's *Instructions for Practical Living (Chuan Xi Lu)* was used as cut-off date (In this study, "pathology" was first appeared in *Instructions for Practical Living* published in 1581 that recording Wang Yangming's quotations). Classic works whose contents were universally recognized and related with etiology, pathology and pathogenesis in Chinese traditional medicine before 1518 were downloaded, and the heritage and breakthrough in pathology of doctors after *Huangdi's Canon of Medicine*, *Classic of Difficulties* were explored through choice and application of vocabulary, so as to find the possibility of "pathology" appearing earlier as an independent medical vocabulary. The classic works for vocabulary mining includes the original version and 8 vernacular Chinese versions of *Huangdi's Canon of Medicine*, the original version and 8 vernacular Chinese versions of *Classic of Difficulties*, the original version and 5 vernacular Chinese versions of *Treatise on Causes and Symptoms of Diseases*, the original version and 3 vernacular Chinese versions of *Treatise on Cold-Induced Diseases*, and other 25 Chinese medical classics (*The selection of medical classics were according to the classification criterion of A+Medical encyclopedia*

*Website*), and frequency analysis was conducted to pathology related vocabulary in the first four classics.

## 2. RESULTS: PATHOLOGY RELATED VOCABULARY MINING IN CHINESE MEDICAL CLASSICS AND FREQUENCY ANALYSIS

The purpose of this vocabulary study is to explore the changes of medical philosophy through the evolution of "pathology" instead of specialized language and literary studies. As a result, during the process of frequency analysis, full text vocabulary extraction, mining and control were also conducted to the vernacular Chinese versions of *Huangdi's Canon of Medicine* and *Classic of Difficulties*, and to ensure the accurate understanding of related vocabulary in the original version.

"Pathology" was not seen in the vocabulary extraction in Chinese medical classics before Ming Dynasty of *Classic of Difficulties*, *Treatise on Cold-Induced Diseases*, *Plain Question about Six Qi Secrets*, *Plain Questions of Huangdi's Canon of Medicine*, *Great Simplicity of Huangdi's Canon of Medicine*, *Plain Question about Exploration to Pathogenesis*, *Plain Question about Pathogenesis*, *Healthy-qi and Keeping Life*, *Plain Question about Gists*, *Plain Question about Elucidation on Prescriptions Huangdi's Canon of Medicine*, *Treatise on Cold-Induced Diseases with Notes*, *Direct Explanation of Treatise on Cold-Induced Diseases*, *Collection of Root and Manifestations of Cold-Induced Diseases*, *Hejian Essential Experience of Cold-Induced Diseases*, *Reading Copies of Plain Questions*, *Ao's Records of Golden Mirror of Cold-Induced Diseases*, *Liu Hejian's Medical Guide of Cold-Induced Diseases*, *Classified Canon of Medicine*, *Illustrated Supplement to the Classified Canon of Medicine*, *Commentary of Classic of Difficulties*, *Six Books of Cold-Induced Diseases*, *Detailed Analysis of Treatise on Cold-Induced Diseases*, *Standards for Diagnosis and Treatment of Cold-Induced Diseases*, *Generalization of Key Points in Treatise on Cold-Induced Diseases*, *Standards for Diagnosis and Treatment- Cold-Induced Diseases*. Full text data mining and key words frequency software processing were conducted to *Huangdi's Canon of Medicine*, *Classic of Difficulties*, *Treatise on Causes and Symptoms of Diseases*, and *Treatise on Cold-Induced Diseases* to establish key words database with a total of 13,989 entries. With reference to several vernacular Chinese versions, 11 pathology-related entries and 23 word frequencies were selected. 13 pathology-related terms were disease (2,239), disease name (32), disease manifestation (18), disease root (12), disease attack (9), disease changes (8), symptom (6), disease symptom (5), disease location (5), pathogenesis (4) and disease transmission (3).

**Table 1**  
**Pathology-Related Word Frequencies in *Huangdi's Canon of Medicine***

No.*	Terms	Number of appearance	Frequency
12	Disease	1373	0.9356
722	Disease name	30	0.0191
969	Disease manifestation	16	0.0113
1390	Disease root	10	0.0068
1800	Disease changes	6	0.0041
1807	Disease attack	6	0.041
1951	Disease symptom	5	0.0034
2122	Disease location	4	0.0027
2128	Pathogenesis	4	0.0027
2610	Disease transmission	3	0.0020
3694	Symptom	1	0.0007

**Table 2**  
**Pathology-Related Word Frequencies in *Treatise on Causes and Symptoms of Diseases***

No.*	Terms	Number of appearance	Frequency
7	Disease	957	1.252
1185	Symptom	5	0.006
1607	Disease attack	3	0.0039
2010	Disease changes	2	0.0026
2011	Disease name	2	0.0026
2012	Disease root	2	0.0026
3068	Disease location	1	0.013

## 2.1 Frequency Analysis of “Disease”

“Disease” appears 2,239 times in four classics, and is high-frequency keywords in all four classics, among which 938 times in *Huangdi's Canon of Medicine*, 957 times in *Treatise on Causes and Symptoms of Diseases*, 123 times in *Classic of Difficulties*, 221 times in *Treatise on Cold-Induced Diseases*. The lexical meaning relating with pathology includes “pathology”, “disease condition” and so on.

### 2.1.1 The Lexical Meaning of “Disease” Is “Pathology”

Bogao said,

The changes of diseases, either floating or sinking, deep or superficial, are numerous. The therapeutic methods are decided according to the locations of diseases. If the disease is mild, the needle is inserted shallowly; if the disease is severe, the needle is inserted deeply; if the disease is mild, fewer needles are needed. Anyway, Qi should be regulated according to the

pathological changes. So those who can treat patients in such a way are regarded as the best doctors. (Tian, 2005, p.116)

### 2.1.2 The Lexical Meaning of “Disease” Is “Disease Condition”

In the human body, there are Keqi and Tongqi. The treatment of the case marked by difficulty in urination and defecation should be concentrated on its Biao; the treatment of the case marked by normal urination and defecation should be concentrated on its Ben. If the disease is caused by superabundance of Xie (Evil), Xie is the Ben and therefore the treatment should be concentrated on its Ben first and then on its Biao. If the disease is caused by insufficiency of Zhengqi (Healthy-Qi), insufficiency of Zhengqi is its Biao and therefore the treatment should be concentrated on its Biao first and then on its Ben. Great care must be taken to observe the pathological condition and deal with it carefully. If the disease is mild, the treatment can be concentrated simultaneously on its Ben and its Biao. If the disease is serious, the treatment of the case marked by difficulty in urination and defecation followed by onset of the disease should be concentrated on its Ben (Tian, 2005, p.126).

### 2.2 Frequency Analysis of “Disease Name”

“Disease name”, referring to the name of the disease, appears 32 times in four classics, among which 30 times in *Huangdi's Canon of Medicine*, 2 times in *Treatise on Causes and Symptoms of Diseases*, none in *Classic of Difficulties* or *Treatise on Cold-Induced Diseases*. In *Plain Questions-Discussion on Genuine-Zang Pulses*,

So wind is the leading factor responsible for all diseases. The invasion of Wind-Cold into the body makes the body hairs stand on the end and the sweat pores obstructed, leading to fever which can be relieved by sweating or Bi-Syndrome, numbness, swelling and pain which can be treated by washing with warm medicinal decoction or hot medicated compress or acupuncture and moxibustion. If it is not treated in time, the disease will be transmitted to the lung and cause Feibi (Lung-Bi Syndrome) with the symptoms of cough and adverse flow of Qi. If it is not treated in time, the disease will be transmitted to the liver and cause Ganbi (Liver-Bi Syndrome), also known as Jue, with the symptoms of hypochondriac pain and vomiting of food which can be treated by massage or acupuncture. If it is not treated in time, the disease will be transmitted to the spleen and cause Pifeng (Spleen-Wind Syndrome) with the symptoms of Dan, abdominal fever, dysphoria and yellowish urine which can be treated by massage, drugs and medicated bathing. If it is not treated in time, the disease will be transmitted into kidney and cause Shanbiao also known as Gu, which can be treated by massage and drugs. If it is not treated in time, the disease will be transmitted to the heart and cause spasm of sinews known as Chi which can be treated by moxibustion and drugs. If it is not treated in time, it will lead to death after ten days. When the disease is transmitted from the kidney to the heart, the heart will transmit the disease to the lung and cause Cold-Heat, leading to death after three years. This is the order of disease transmission. (Tian, 2005, p.38)

### 2.3 Frequency Analysis of “Disease Manifestation”

“Disease manifestation” refers to the manifestations of the disease, and appears 18 times, among which 16 times in *Huangdi’s Canon of Medicine*, 2 times in *Treatise on Cold-Induced Diseases*, , none in *Classic of Difficulties* or *Treatise on Causes and Symptoms of Diseases*. In *Spiritual Pivot-Abnormal Changes of Weiqi (Defensive-Qi)*, Huangdi asked Bogao, “how do the doctors know whether the disease is in the skin or muscles, Qi or blood and tendons or bones?” Bogao said,

If the morbid color appears on the region between the eyebrows and looks thin and lustrous, the disease is in the skin; if the lips appear blue, yellow, red, white and black, the disease is in the muscles. If the skin is moist due to sweating, the disease is in the blood and Qi. If the eyes appear blue, yellow, red, white and black, the disease is in the tendons. If the ears appear withered and dirty, the disease is in the bones.

Huangdi said, “what are the manifestations of these diseases and how to treat them?” Baogao said, “the changes of diseases are numerous. However the skin has corresponding regions, the muscles have eminences, the blood and Qi have tunnels to flow in and the bones have affiliated joints.” Huangdi said, “I’d like to know the details.” Bogao said,

The regions of the skin are distributed over the four limbs. The eminences of the muscles are located in the arms, legs, the fleshes over the Yang Channels and the Kidney Channel of Foot-Shaoyin. The tunnels of the blood and Qi are in the Collaterals. If Qi and blood are stagnated, the Collaterals will be full and bulgy. To examine the disease in the tendons, there is no need to differentiate Yin from Yang and the left from the right. The treatment just focuses on the location of diseases. The joints that are connected with the bones have articular cavities which receive body fluid to nourish the brains. (Tian, 2005, pp.117-119)

### 2.4 Frequency Analysis of “Disease Root”

“Disease root” means the root causes to the disease, and appears 12 times, among which 10 times in *Huangdi’s Canon of Medicine*, 2 times in *Treatise on Causes and Symptoms of Diseases*, none in *Classic of Difficulties* or *Treatise on Cold-Induced Diseases*. In *Plain Questions-Discussion on Bi-Syndrome*, Huangdi asked, “why Bi-Syndrome sometimes leads to death, sometimes causes prolonged pain and sometimes is easy to heal?” Qibo answered, “when Bi-Syndrome enters the Zang-Organs, it leads to death; when Bi-Syndrome liners in the sinews, it causes chronic pain; when Bi-Syndrome stays in the skin and muscles, it is easy to heal.” Huangdi asked, “What makes Bi-Syndrome invade the Six Fu-Organs?” Qibo answered, ‘It is due to intemperance in eating and irregular daily life. The Six Fu-Organs have their Back-Shu Acupoints respectively. Wind, cold and dampness invade the body through these Acupoints and intemperance in eating impairs the body inside. When pathogenic factors invade the body through these

Acupoints, they eventually deepen into the Fu-Organs.” (Tian, 2005, p.88)

### 2.5 Frequency Analysis of “Disease Attack”

“Disease attack” means the occurrence of the disease, and has 9 times’ appearances, among which 6 times in *Huangdi’s Canon of Medicine*, 3 times in *Treatise on Causes and Symptoms of Diseases*, none in *Classic of Difficulties* or *Treatise on Cold-Induced Diseases*. In *Treatise on Causes and Symptoms of Diseases-Several Syndromes of Cold-Induced Diseases*,

It is not easy for to People who got cold-induced diseases become infectious. Patients, who got disease after in contact with cold and toxin Qi, are not infectious. But patients, who had the attack of the disease because of disharmony of seasons and time, irregular warm and cool, and infected with pathogenic Qi, are infectious. (Chao, 2010, p.322)

### 2.6 Frequency Analysis of “Disease Changes”

“Disease changes”, referring to the changes of disease, appears 8 times, among which 6 times in *Huangdi’s Canon of Medicine*, 2 times in *Treatise on Causes and Symptoms of Diseases*, none in *Classic of Difficulties* or *Treatise on Cold-Induced Diseases*. In *Spiritual Pivot-Division of the Four Seasons in One Day*, “Huangdi said, ‘What do you mean by saying that the Zang-Organs are related to winter, the seasons to summer, the notes of traditional Chinese music to the late summer, the tastes to autumn and the colors to spring? I’d like to know the rules.” Qibo said,

If the disease is in the Zang-Organs, it can be treated by needling the Jing-Well Acupoint; if the disease is in the colors (complexion), it can be treated by needling the Ying-Spring Acupoint; if the disease is now alleviated and then aggravated it can be treated by needling the Shu-Stream Acupoint; if the disease affects voice, it can be treated by needling the Jing-River Acupoint; if there are symptoms of fullness of Channels and stagnation of blood due to stomach disorder and improper diet, it can be treated by needling He-Sea Acupoint. That is why it is said that the tastes correspond to the He-Sea Acupoint. These are the so-called five changes in needling. (Tian, 2005, p.107)

### 2.7 Frequency Analysis of “Symptom”

“Symptom” means the manifestations of the disease, and have 6 times’ appearances, among which once in *Huangdi’s Canon of Medicine*, 5 times in *Treatise on Causes and Symptoms of Diseases*, none in *Classic of Difficulties* or *Treatise on Cold-Induced Diseases*. In *Treatise on Causes and Symptoms of Diseases-Several Symptoms of Stranguria*, “the symptoms of patients with cold stranguria are coldness firstly and urination secondly.” (Chao, 2010, p.212)

### 2.8 Frequency Analysis of “Disease Symptom”

“Disease symptom” means the symptoms of the disease, and only appears 5 times in *Huangdi’s Canon of Medicine*, and none in *Treatise on Causes and Symptoms of Diseases*, *Classic of Difficulties* or *Treatise on Cold-*

*Induced Diseases*. In *Plain Conversation-Discussion on Jue-Syndrome*, Huangdi said, “Good! I’d like to know the symptoms of the Jue Syndromes of the Six Channels.”

Qibo answered,

Jue Syndrome of Juyang (Taiyang) is characterized by swoolen and heaby head, difficulty to walk and falling down due to faint; Jue Syndrome of Yangming is characterized by mania with the symptoms of running about and shouting, difficulty to lie down due to abdominal fullness, reddish and feverish face, visual hallucination and delirium; Jue Syndrome of Shaoyang is characterized by sudden deafness, buccal swelling, feverishness, hypochondriac pain and inflexibility of legs; Jue Syndrome of Taiyin is characterized by abdominal distension, unsmooth defecation, no appetite, vomiting after eating and difficulty to lie down; Jue Syndrome of Shaoyin is characterized by dry mouth, brownish urine, abdominal fullness and heart pain; Jue Syndrome of Jueyin is characterized by lower abdominal swelling and pain, abdominal distension, unsmooth urination and defecation, preference to lie down with the knees bent, swelling and shrinkage of the genitals and feverishness over the inner side of the legs. The therapeutic principles for treating Jue-Syndromes are to use Xie (reducing or purging therapy) to deal with Sheng (excess or predominance), to use Bu (nourishing or tonifying therapy) to deal with Xu (deficiency or weakness). For treating Jue-Syndrome that is neither Sheng (excess or predominance) nor Xu (deficiency or weakness), the Acupoints located on the Channels proper can be selected to needle. (Tian, 2005, p.88)

## 2.9 Frequency Analysis of “Disease Location”

“Disease location” means the places where diseases occur, and appears 5 times, among which 4 times in *Huangdi’s Canon of Medicine*, once in *Treatise on Causes and Symptoms of Diseases*, none in *Classic of Difficulties* or *Treatise on Cold-Induced Diseases*. In *Plain Conversation-Separate Discussion on Yin and Yang*,

The so called Yin pulse refers to Zhenzang (Genuine-Zang) pulse marked by loss of Weiqi (Stomach-Qi). The appearance of such pulse is the sign of the deterioration of the Five Zang-Organs and the deterioration of the Five Zang-Organs inevitably leads to death. The so-called Yang pulse means that the pulse shows Yang of the stomach (Stomach-Qi). Differentiation of Yang (Stomach-Qi) helps decide the location of diseases. Differentiation of Yin helps predict the time of death. (Tian, 2005, p.14)

## 2.10 Frequency Analysis of “Pathogenesis”

“Pathogenesis”, referring to the mechanism of the occurrence and transfer of disease, only appears 4 times in in *Huangdi’s Canon of Medicine*, and none in *Treatise on Causes and Symptoms of Diseases*, *Classic of Difficulties* or *Treatise on Cold-Induced Diseases*. In *Plain Conversation-Discussion on the Most Important and Abstruse Theory*, Huangdi said,

Good! All diseases are caused by the transformation and changes of Wind, Cold, Heat, Dampness, Dryness and Fire. The medical canons suggest that Excess syndrome should be treated by purgation and Deficiency syndrome should be treated by supplementation. I have given these rules to Fangshi (doctor or psychic). But they have not got perfect results after using them. I hope that this abstruse and profound theory can be practiced as efficiently as Fu (drumstick) and Gu (Drum), just like pulling

out thorns and cleaning contamination. Could you tell me how to use these methods correctly?

Qibo said, “Pathogenesis has to be carefully examined and suitability of Qi should not be missed. This is the important point.”

Qibo answered,

The reason that Wind blows over the earth is that it is transformed on the basis of Earth-Qi and so are the other kinds of Qi. If it pertains to the heavens, it is the Qi of the heavens; if it pertains to the earth, it is the Qi of the earth. The combination of Qi of the heavens and the earth results in the division of the Six Steps in a year and the transformation and growth of all things in the natural world. That is why it is said that the changes of Qi must be carefully observed lest pathological changes be missed. The reason is just what mentioned above. (Tian, 2005, p.128)

## 2.11 Frequency Analysis of “Disease Transmission”

“Disease transmission” means the transformation of disease locations, and only appears 3 times in in *Huangdi’s Canon of Medicine*, and none in *Treatise on Causes and Symptoms of Diseases*, *Classic of Difficulties* or *Treatise on Cold-Induced Diseases*. In *Plain Conversation-Discussion on Transmission of Biao and Ben*,

In terms of disease, heart disease first leads to heart pain. It causes cough in the first day when the disease is transmitted to the lung, hypochondriac pain after three more days when the disease is transmitted to the liver as well as obstruction of the abdomen, pain and heaviness of the body after five more days when the disease is transmitted to the spleen. If the disease is not cured after three more days, the patient will die in the midnight in winter and noon in summer. (Tian, 2005, p.176)

## CONCLUSION

Frequency analysis and vocabulary explanation of pathology-related terms in Chinese medical classics show that the research on the mechanism of disease’s occurrence, development and changes in Chinese traditional medicine were not divided into pathology like western modern medicine. In the term application, the single word “disease” has multiple meanings including disease name, particular disease, general disease, root cause of the disease, and disease transformation. Although some pathology related terms were seen in some classics like *Huangdi’s Canon of Medicine*, the medical books in later ages did not have strict use during the process of paraphrase and explanation, which caused that doctors often explored the exact meaning of “disease” in the context by experience, speculation and conjecture during the process of learning and understanding medical books.

The lack of accurate expression and clear analysis for medical terms has seriously influenced the structuration and systematization of Chinese traditional medicine. One of the consequences is that it is adverse to the knowledge transmission, and the other one is that it is difficult for serious scientific questions to get rid of metaphysical

thinking habits of inferring, speculation and self-justification.

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