

# Bibliometric Study on Prevention and Control of Thalassemia in China Based on Citespace

Qixian Huang<sup>1,a</sup>, Xin Peng<sup>1,b,\*</sup>

<sup>1</sup>Research Center of Humanities and Medicine, Zunyi Medical University, Zunyi, China

<sup>a</sup>1465307046@qq.com, <sup>b</sup>3549240298@qq.com

\*Corresponding author

**Abstract:** To analyze the development trend of the prevention and control of thalassemia in China from the perspective of bibliometrics, and to provide reference for future research and prevention and control of thalassemia. The literatures on the prevention and control of thalassemia in China from January 1, 1986 to October 25, 2025 were collected from China National Knowledge Infrastructure (CNKI) database. The bibliometrics and visualization methods were used to organize and analyze the number of papers, authors, institutions, keywords, etc. A total of 4409 articles were included in this study. The number of published articles increased slowly in the early stage, surged in the middle stage, reached a peak in 2019, and then gradually decreased. The author with the largest number of publications was He Sheng from Guangxi Maternal and Child Health Hospital (44 articles). The main research sites are concentrated in Guangdong and Guangxi, forming a research pattern characterized by concentration in South China and dispersion across the country. The top three key words were "thalassemia", "iron deficiency anemia" and "prenatal diagnosis". The research focus has shifted from the basic diagnosis of the disease to the popularization of diagnostic techniques in primary care. The research on prevention and control of thalassemia in China is at the early stage of maturity. The core research strength is concentrated in South China, and the regional distribution is uneven. The cooperation ability of researchers needs to be improved.

**Keywords:** Thalassemia; China; Prevention and Control; Bibliometrics; CiteSpace

## 1. Introduction

Thalassemia is a class of recessive hereditary monogenic disorders characterized by ineffective or absent hemoglobin synthesis, which can cause anemia<sup>[1]</sup> of varying severity. China has the largest number of new cases and patients with thalassemia worldwide. Approximately 30 million people carry thalassemia-related mutations, and 300,000 individuals have severe or intermediate thalassemia requiring medical intervention. The high-risk areas are concentrated in 10 provinces south of the Yangtze River, and some ethnic minorities (such as the Li ethnic group) have a higher<sup>[2]</sup> incidence of thalassemia. Thalassemia imposes a huge burden on China. The cost of treating the existing 15,000 severe thalassemia patients (including fees for red blood cell infusion and iron chelating agents) is expected to reach 72 billion yuan, with an average survival period of 50 years<sup>[3]</sup>, in addition, regional differences in medical accessibility, shortage of blood supply, and high expenses for iron chelating agent treatment further exacerbate the health, economic, and psychological burdens on patients and their families. For this type of hereditary disease, prevention is more cost-effective than treatment<sup>[4]</sup>. Given the large number of domestic thalassemia gene carriers and existing patients, extensive practices and research on thalassemia prevention and control have been promoted in China. Bibliometric analysis can help professionals engaged in thalassemia prevention and control identify research trends and hot spots in the field and clarify the future research direction.

## 2. Methods

Based on previous long-term systematic research in the field of thalassemia prevention and control and existing literature, China National Knowledge Infrastructure (CNKI) is one of the databases in China that covers the most comprehensive Chinese medical academic literature and concentrates the most types of journal papers, enabling us to systematically obtain public academic achievements in the field of Chinese thalassemia prevention and control. To avoid omissions, this study selects CNKI as the

main retrieval database for the supplementary collection of literature. The search date was October 25, 2025, with the search strategy: SU=(thalassemia + thalassaemia) \* (prevention + control + intervention + screening + diagnosis + management), and no restriction on the search period. We excluded literature without keyword labels published before the 1980s, and dissertations were also excluded. The reasons were as follows: there are few domestic monographs focusing on the theme of "thalassemia prevention and control", and most dissertations focus on basic pathogenesis or clinical diagnosis and treatment technologies, which have a low degree of matching with this study centered on 'prevention and control'. In addition to excluding conference papers, newspaper articles, and periodical literature, we finally included 4,409 academic papers related to thalassemia prevention and control. The final included literatures were exported to RefWorks plain text format for analysis.

CiteSpace 6.1 is a citation analysis and visualization tool. It helps visualize the structure, distribution, and trends of academic information, and this function is also referred to as "scientific knowledge mapping". The theoretical basis and application methods of CiteSpace6.1 have important influence in the field of bibliometrics. This study uses CiteSpace 6.1 to construct "author co-occurrence maps", "institution co-occurrence maps", "keyword co-occurrence maps", and "keyword highlight maps". These maps are used to show the cooperative relationships and research activities among authors in the field of Chinese thalassemia prevention and control, present the distribution and cooperation networks of institutions conducting related research, and reflect the research focus and development trends of domestic thalassemia prevention and control<sup>[5, 6]</sup>.

### 3. Results

#### 3.1. Annual publication trends



Figure 1: The Annual Number of Publications and the Moving Average Trend Chart on the Prevention and Control of Thalassemia in CNKI Database from 1986 to 2025

Figure 1 shows the number and publication trends of academic research papers related to thalassemia prevention and control in China from 1986 to 2025, where the histogram displays the specific annual number of publications and the line chart reflects the trend. The trend can be roughly divided into three stages: the first stage (1986-2005), during which the number of publications increased slowly and remained low. The second stage (2006-2019), during which the number of publications increased rapidly and reached a peak of 349 in 2019. The third stage (2020-2025): after 2020, the number of publications on thalassemia prevention and control in China gradually decreased but remained at a high level.

#### 3.2. The top Ten Authors of the Published Articles

Table 1 lists the top 10 authors in the field of thalassemia prevention and control, ranked by the number of papers published from 1986 to 2025. Among them, He Sheng from Guangxi Maternal and

Child Health Hospital has the largest number of papers published (44 papers), followed by Xu Xiangmin from Guangxi Maternal and Child Health Hospital (36 papers). Du Li from Guangdong Women and Children's Health Hospital and Zhang Xinhua from the 923rd Hospital of the Joint Logistic Support Force of the People's Liberation Army (both with 34 papers) ranked third in the number of publications.

Table 1: Top Ten Authors of Publications in the Field of Thalassemia Prevention and Control.

No.	Number of Publications	Author	Institution Affiliation
1	44	He Sheng	Guangxi Maternal and Child Health Hospital
2	36	Xu Xiangmin	Guangxi Maternal and Child Health Hospital
3	34	Du Li	Guangdong Women and Children Health Hospital
4	34	Zhang Xinhua	The 923 Hospital of the PLA Joint Logistics Support Force
5	33	Li Dongming	Guangxi Maternal and Child Health Hospital
6	32	Qin Danqing	Guangdong Women and Children Health Hospital
7	31	Zhou Yuqiu	Zhuhai Maternal and Child Health Hospital of Guangdong Province
8	30	Wang Jicheng	Guangdong Women and Children Health Hospital
9	29	Tang Yanqing	Guangxi Maternal and Child Health Hospital
10	29	Yin Aihua	Guangdong Women and Children Health Hospital

### 3.3. Author Collaboration Network

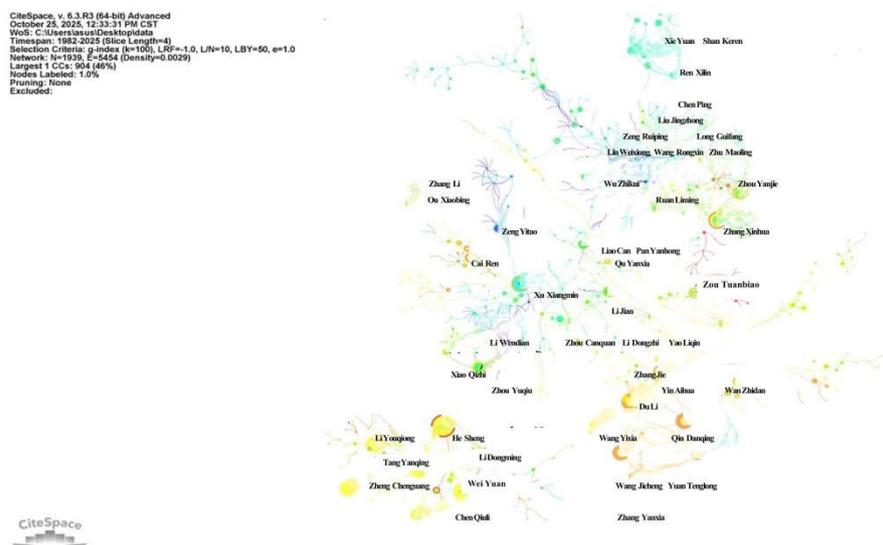


Figure 2: Visualization of Author Co-occurrence in Journals on Prevention and Control of Thalassemia Based on CNKI Data.

Figure 2 shows the cooperative relationships among authors in the field of Chinese thalassemia prevention and control. In this figure, nodes represent authors, with the size of nodes indicating the number of papers published, which reflects the authors' influence and activity; lines represent cooperative relationships between authors. The denser the lines, the stronger the cooperative relationships between authors. The core authors were Zhang Xinhua, Du Li, He Sheng, and Qin Danqing. Several cooperative subgroups were obviously formed in this atlas, such as the "Zhang

Xinhua - Zhou Yanjie - Liao Can" subgroup, the "He Sheng - Li Dongming - Tang Yanqing" subgroup, and the "Du Li - Wang Jicheng" subgroup.

3.4. Top ten institutions in terms of publication volume

Table 2 ranks the top 10 institutions in the field of Chinese thalassemia prevention and control by the number of publications. The institution with the highest number of publications is the Maternal and Child Health Hospital of Guangxi Zhuang Autonomous Region (28 papers), while the one with the lowest is the Key Laboratory of Maternal and Child Metabolism and Genetic Diseases, Medical Genetic Center of Guangdong Women and Children's Health Hospital (12 papers). It can be clearly seen from the table that the main research institutions for thalassemia prevention and control in China are concentrated in Guangdong and Guangxi.

Table 2: Top 10 Institutions in the Field of Thalassemia Prevention and Control in China.

No.	Number of Publications	Institutions
1	28	Guangxi Zhuang Autonomous Region Maternal and Child Health Hospital
2	24	Medical Genetics Center, Guangdong Women and Children's Hospital
3	19	Yunnan Maternal and Child Health Hospital
4	18	Laboratory of Genetic Metabolism Center, Maternal and Child Health Hospital of Guangxi Zhuang Autonomous Region
5	16	Guangdong Maternal and Child Health Hospital
6	16	Department of Medical Genetics, School of Basic Medicine, Southern Medical University
7	14	Zhuhai Maternal and Child Health Hospital of Guangdong Province
8	13	Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences
9	13	Department of Clinical Laboratory, People's Hospital of Guangxi Zhuang Autonomous Region
10	12	Guangdong Provincial Key Laboratory of Maternal and Child Metabolism and Genetic Diseases, Medical Genetic Center, Guangdong Women and Children's Hospital

3.5. Institutional Cooperation Network

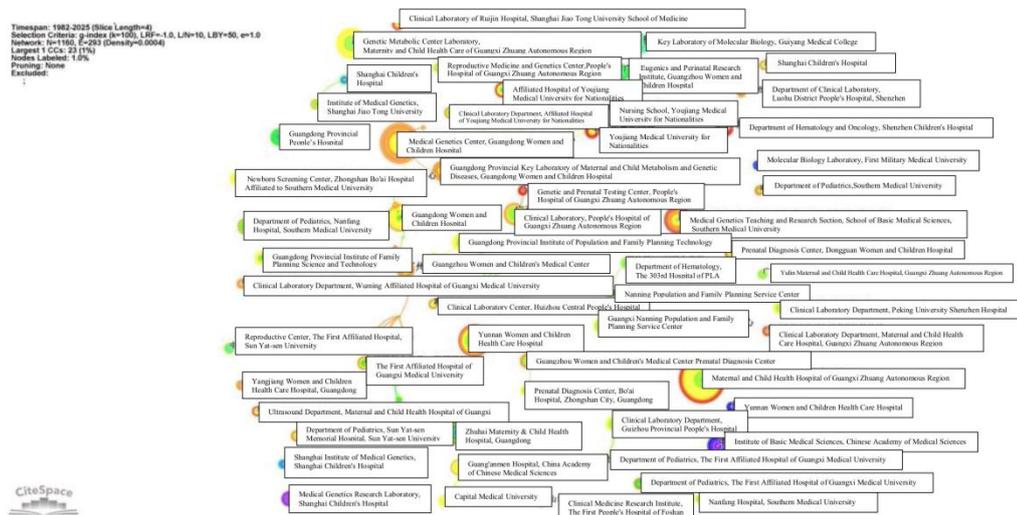


Figure 3: Visual Map of Institutional Co-occurrence in Journals of Thalassemia Prevention and Control Based on CNKI Data.

Figure 3 shows the cooperative relationships among institutions in the field of Chinese thalassemia prevention and control. In this figure, the size of nodes represents the number of publications of each institution; the larger the node, the higher the influence and activity of the institution in this field. The

color and tree rings of the nodes represent the research continuity over time, and node labels indicate the names of the institutions. The core institutions identified are the Maternal and Child Health Hospital of Guangxi Zhuang Autonomous Region and the Medical Genetic Center of Guangdong Women and Children's Health Hospital. Youjiang Medical University for Nationalities and its affiliated hospitals, as well as affiliated institutions of Southern Medical University (such as the Department of Pediatrics of Nanfang Hospital and the Department of Medical Genetics of the School of Basic Medicine), are also active forces in this field.

### 3.6. Top Ten Keywords in Frequency

Table 3: Top 10 Keywords in the Field of Prevention and Control of Thalassemia.

No.	Frequency	Keyword
1	1895	Thalassemia
2	453	Iron-deficiency anemia
3	408	Prenatal diagnosis
4	334	Blood tests
5	322	Anemia
6	303	Genetic diagnosis
7	266	Screening
8	264	Differential diagnosis
9	201	Diagnosis
10	199	$\beta$ -thalassemia

Table 3 lists the top 10 most frequent keywords, among which "thalassemia" (1895 times), "iron deficiency anemia" (453 times), "prenatal diagnosis" (408 times), and "blood tests" (334 times) are the most prominent.

### 3.7. Keyword Co-occurrence Analysis

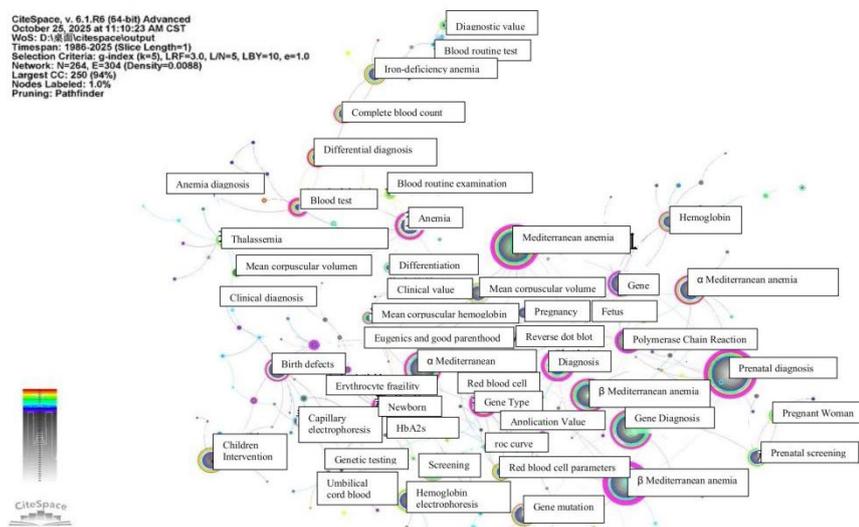


Figure 4: Visualization of Keyword Co-occurrence in the Study on Prevention and Control of Thalassemia.

A total of 264 nodes and 304 links were identified in the keyword co-occurrence analysis (Figure 4), with high-frequency keywords including "thalassemia", "iron deficiency anemia", and "prenatal diagnosis".

## 4. Discussion and Conclusion

### 4.1. Discussion

The prevention and control of thalassemia in China began with a national epidemiological survey<sup>[7, 8]</sup> in the 1980s. Since then, a three-level prevention and control system<sup>[9]</sup> has been gradually established, including premarital/preconception screening, prenatal diagnosis, and newborn screening. The core of this system is to identify high-risk groups through hematological screening, confirm the diagnosis via genetic testing, and provide prenatal diagnosis for high-risk couples to selectively terminate pregnancies involving fetuses with major thalassemia.

Based on changes in the annual number of publications, the publication trend in the field of Chinese thalassemia prevention and control can be divided into three stages. The period from 1986 to 2005 was a phase of slow growth with a low number of publications. From 2006 to 2019, the field entered a period of rapid growth, with the number of publications increasing significantly and peaking at 349 in 2019. From 2020 to 2025, the number of publications has gradually decreased. The reason behind this phenomenon may be that thalassemia is a high-incidence single-gene disorder in China, and its prevention and control is of great significance for improving the quality of newborns. With the growing domestic emphasis on the prevention and control of genetic diseases, related research received considerable attention and investment in the early stage, which contributed to the emergence of the rapid growth phase. In the later stage, the number of published papers may have decreased due to factors such as the accumulation of existing research findings and the adjustment of research directions.

Publication frequency and the number of cooperative connections are two core bibliometric indicators for identifying domestic core institutions. From the perspective of regional distribution, domestic research on thalassemia prevention and control presents the characteristics of concentration in South China and dispersion nationwide. The Guangdong and Guangxi regions account for 34.2% of the total institutions and 47.5% of the total number of publications, forming a Guangdong-Guangxi-Yunnan triangular cooperation network. The cooperative connections of this triangular network account for 42.3% of the total cooperative connections in the national thalassemia prevention and control field.

Guangdong and Guangxi are the provinces<sup>[2, 8]</sup> with the largest number of thalassemia gene carriers and patients in China. Over the past 50 years, a considerable number of cases have generated substantial demands for thalassemia prevention and control in this region, which has also led to the concentration of domestic research efforts on thalassemia prevention and control in these two provinces. The Maternal and Child Health Hospital of Guangxi Zhuang Autonomous Region exerts the highest influence and shows the greatest activity in this field, and has the highest number of publications related to thalassemia prevention and control since 1986 (28 papers).

Based on the number of cooperative connections among institutions, the core institutions in this field can be divided into high-yield and high-cooperation institutions, and high-yield but low-cooperation institutions. High-yield and high-cooperation institutions with more than 5 cooperative connections are mainly regional maternal and child health hospitals, such as Yunnan Maternal and Child Health Hospital (19 publications, 6 cooperative connections) and the Department of Medical Genetics of Southern Medical University (16 publications, 6 cooperative connections). They possess both research strength and resource integration capabilities, and serve as hubs of regional cooperation networks. High-yield but low-cooperation institutions with fewer than 1 cooperative connection are mainly laboratories and specialized hospitals. Representative examples include the Guangxi Central Laboratory of Genetic Metabolism in Maternal and Child Health (18 publications, 0 cooperative connections) and the Molecular Biology Laboratory of Guiyang Medical University (11 publications, 0 cooperative connections). These laboratories and hospitals focus on basic research or technological R&D, and their work tends to be independent. The most active cooperative institution is Guangzhou Women and Children's Medical Center (11 publications, 9 cooperative connections), which serves as a key node in the South China cooperation network. Among the core institutions, 50% belong to the maternal and child health care system, which reflects that thalassemia prevention and control research in this field is oriented toward clinical application—namely, basic research ultimately serves clinical prevention and treatment.

Based on the literature data of 1,890 authors in the field of Chinese thalassemia prevention and control from 1986 to 2025, we screened authors with a publication frequency of  $\geq 10$  and a number of cooperative connections of  $\geq 10$ , and identified 99 core authors. Although they account for only 5.2% of

the total number of authors, they have contributed 38.7% of the high-value research outputs in this field. These 5.2% of authors dominate the research in the field of thalassemia prevention and control.

Among them, He Sheng from Guangxi Maternal and Child Health Hospital (44 publications, 30 cooperative connections) is the author with the highest output and strong cooperative capacity; Xu Xiangmin from Guangxi Maternal and Child Health Hospital (36 publications, 60 cooperative connections) has the highest number of cooperative connections; and Zhang Xinhua from the 923rd Hospital of the Joint Logistic Support Force of the People's Liberation Army (34 publications, 40 cooperative connections) is an author with both high output and strong cooperative capacity. Du Li from Guangdong Women and Children's Health Hospital is a high-output author with distinctive research focuses. Her most cited paper in CNKI is a retrospective analysis of prenatal genetic diagnosis in 2,171 cases of thalassemia. Most of the core authors are from Guangdong and Guangxi, which echoes the institutional network analysis, and the regional academic advantages are obvious.

A comprehensive analysis of the cooperation between institutions and authors shows that the field of thalassemia prevention and control in China is in the early mature stage, and the research scale is growing steadily. However, the cooperation mechanism between institutions and authors still needs to be further strengthened. We should give full play to the leading role of core institutions and authors to promote the overall development of the field of thalassemia prevention and control.

Keywords represent the core content of thalassemia prevention and control research, and their frequency indicates their influence in this field. These keywords are important reflections of research hotspots. In terms of high-frequency keywords, the most frequently used ones are mainly related to disease types, diagnostic technologies, and detection methods. In terms of disease types, thalassemia is the absolute core, covering anemia and its subtypes. Prenatal diagnosis and genetic diagnosis are the core technologies in this field. The focus of research on detection methods is clinical blood tests. Another part of the research focuses on basic research areas such as thalassemia genotypes, which serves to bridge disease research and technological research. Based on the keyword co-occurrence analysis, the research hotspots of thalassemia prevention and control in China can be summarized into two research chains: one is the core research chain of "thalassemia-prenatal diagnosis-genetic diagnosis", and the other is the clinical detection research chain of "anemia-blood tests-blood routine", which focuses on the basic indicators for the clinical detection of thalassemia based on disease categories.<sup>[10]</sup>

## 4.2. Conclusion

Using bibliometric methods and the CiteSpace 6.1 bibliometric visualization tool, this study systematically analyzed the literature in the field of thalassemia prevention and control in the CNKI database from 1986 to 2025, and clarified the research trends, core research forces, and research hotspots in this field. The results show that the number of publications in the field of thalassemia prevention and control has shown an overall growth trend since 1986, and has remained at a high level after peaking in 2019, indicating that this field will remain active in the future. Guangdong and Guangxi are the core research provinces. The Maternal and Child Health Hospital of Guangxi Zhuang Autonomous Region and the Medical Genetic Center of Guangdong Women and Children's Health Hospital are the core research institutions. The research hotspots focus on disease types, diagnostic technologies, and detection methods, and the development direction is to promote technological breakthroughs, improve the prevention and control system, and simplify the detection process. This study can provide a reference for researchers in this field to grasp research trends and identify potential cooperation partners, and also offer certain data support for the development of thalassemia prevention and control strategies.

## References

- [1] KATTAMIS A, KWIATKOWSKI J L, AYDINOK Y. *Thalassaemia [J]. Lancet*, 2022, 399(10343): 2310-24.
- [2] WANG W D, HU F, ZHOU D H, et al. *Thalassaemia in China [J]. Blood Rev*, 2023, 60: 101074.
- [3] ZHEN X, MING J, ZHANG R, et al. *Economic burden of adult patients with beta-thalassaemia major in mainland China [J]. Orphanet J Rare Dis*, 2023, 18(1): 252.
- [4] CAO A, KAN Y W. *The prevention of thalassemia [J]. Cold Spring Harb Perspect Med*, 2013, 3(2): a011775.
- [5] LI Q, LI X, HE S, et al. *Hotspots and status of Fetal Alpha-Thalassemia from 2009 to 2023: a*

*bibliometric analysis [J]. Front Pediatr, 2024, 12: 1467760.*

[6] LV A, LI J, CHEN M, et al. *Global Trends on beta-Thalassemia Research Over 10 Years: A Bibliometric Analysis [J]. Int J Gen Med, 2024, 17: 3989-4001.*

[7] LAI K, HUANG G, SU L, et al. *The prevalence of thalassemia in mainland China: evidence from epidemiological surveys [J]. Sci Rep, 2017, 7(1): 920.*

[8] WEI B, ZHOU W, PENG M, et al. *The population incidence of thalassemia gene variants in Baise, Guangxi, P. R. China, based on random samples [J]. Hematology, 2022, 27(1): 1026-31.*

[9] Jiang HS, Peng Y. *Expert Consensus on Screening and Prevention and Control of Thalassemia Carriers in China [J]. Journal of International Neurology and Neurosurgery, 2024, 51 (5):43-50. DOI: 10.16636/j.cnki.jinn.1673-2642.2024.05.006.*

[10] Wu J, Zeng HY. *Application of hematological analysis combined with gene diagnosis in prenatal diagnosis of thalassemia [J]. International Journal of Laboratory Medicine, 2015, 36 (5):604-605, 607.*