

Lived experiences of patients with idiopathic pulmonary fibrosis: navigating through the complex healthcare system

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Abstract

Background : Over the last decade, idiopathic pulmonary fibrosis (IPF) has been attracting health care professionals' attention worldwide due to its impact on poor survival rate and quality of life, such as ongoing physical and emotional distress experienced by patients and their families. The diagnosis and management of IPF patients often remain as a significant challenge for clinicians. Therefore, it is imperative to gain an in-depth understanding on experiences of IPF patients during their disease journey in order to improve the care delivered to this vulnerable group. The aim of this study was to explore the lived experiences of the disease journey and care needs of patients with IPF.

Methods : A semi-structured face-to-face one on one interview was conducted with a purposive sampling of 16 IPF patients admitted to a respiratory medicine department of a tertiary hospital in Beijing, China. The consolidated criteria for reporting qualitative research checklist was used.

Results : Four themes emerged from the qualitative data included the long and confusing journal to reach diagnosis, living with the disease, understanding the disease and treatment, and desire for continuity of care.

Conclusions : The findings provide an in-depth understanding of the lived experience of the disease journey and the care needs in patients with IPF. There is an urgent need to improve the care delivery to this vulnerable population. To meet the health demands of this group of patients, it is of paramount importance to develop effective education programs for health professionals and IPF patients and also to improve the care models of healthcare systems, especially in the remote area in order to enhance the principle of continuing care for IPF patients in the communities.

Background

Idiopathic pulmonary fibrosis (IPF) is defined as a progressive, incurable, fibrotic interstitial lung disease of unknown cause [1], characterized by impaired gas exchange, progressive decline in lung function and increased symptoms that limit physical activities [2]. Worldwide, the prevalence of patients diagnosed with IPF has been increasing over the last decade [3]. In the UK, there are approximately 5,000 new cases being diagnosed with 15,000 prevalence cases annually [4]. In the USA, the prevalence has been steadily increasing from 13.4 cases in 2005 to 18.2 cases in 2010 per 100,000 person-years [5]. In European countries, the case of IPF rose from 1.25 to 23.4 per 100,000 populations in Belgium, the Czech Republic, Finland, Greece, and Italy [6].

In China, there has been an increased in the incidence of Interstitial Lung Disease (ILD) (including IPF). Interstitial Lung Disease Group of the Chinese Thoracic

Society (2004) revealed that 56 ILD cases were admitted to 10 hospitals in Beijing in 1990, accounting for 1.98% of yearly hospitalized cases, while the case load reached 485 in 2003, accounting for 4.66% of yearly hospitalized cases [7]. A survey conducted in ten hospitals in Tianjin province in China showed that hospitalized ILD cases accounted for 4.5% of all hospitalized cases in 2003. This rate rose to 39.5 % in 2009 [8]. This indicates the increased prevalence of patients with ILD (including IPF) in Chinese population.

It is suggested that there is an increased financial cost of IPF treatment and poor prognosis with a median survival rate between 3-5 years from the time of diagnosis to the death [4,9,10]. The diagnosis and management of IPF patients often remain as a significant challenge for clinicians. The evidence in the literature has suggested that patients with IPF often experience ongoing symptoms of dyspnea, dry coughs, sleep disturbance and emotional distress [2, 11]. Such symptoms often result in loss of independence and restriction of daily activities [11-13]. As such, this group of patients often has poorer quality of life compared to patients with other types of respiratory diseases [14]. Despite the increasing incidence rate and poor quality of life, IPF is often misdiagnosed and managed inappropriately [15]. It has been reported that, in European country, there is usually 2-5 years delay in reaching a correct diagnosis for IPF patients [12, 16]. Undoubtedly, this delay causes distress and adds frustration to patients and their families. Insufficient information and support for patients with IPF were also reported in some studies [12, 17]. Current literature recommends that management of IPF patients should focus on slowing down the progression of lung fibrosis, which in turn helps to extend patients' life expectancy and improve their quality of life [18].

There have been some studies describing the perceptions from patients' experiences of living with IPF in European countries [12, 17, 19]. Still, there has been a paucity of research exploring the lived experience of patients with IPF, especially in Chinese population. Given the complex nature of IPF disease journey, there is a need to gain an in-depth understanding of the lived experiences with regards to their disease journey and care needs on Chinese patients with IPF.

Methods

Aim

This study aimed to explore the lived experiences of the disease journey and the care needs of Chinese patients with IPF.

Study design

A phenomenological approach was chosen to guide this study [20]. Phenomenology is a qualitative research method that seeks the narratives of the lived experiences of a certain phenomenon. It is considered the most appropriate methodology to explore the way people experience and interpret the world in which they live [21]. Individual interview was used as data collection method.

Setting and participants

Hospitals are classified as a 3-tier system in China, including primary-level, secondary-level and tertiary-level facilities. The 3-tier system recognizes a hospital's bed capacity and ability to medical treatments, education and research. Patient acuity is higher at the tertiary-level facility as it offers care to patients with complex healthcare needs.

This study was conducted in a 44-bed department of respiratory medicine in a 1400-bed tertiary hospital in Beijing, China. Inclusion criteria were: 1) patients with confirmed IPF diagnosis; 2) no psychiatric history; and 3) able to speak and understand Mandarin. Purposive sampling approach was used. Potential participants were identified via respiratory physicians in the respiratory department. The researcher then recruited eligible participants.

Data collection

Between August 2018 and February 2019, an in-depth one on one face-to-face semi-structured interview was conducted with 16 participants in a private and quiet room in the hospital. The interviews were audio-recorded and ranged from 50-60 minutes. The interviews were conducted by the first author (YL) who is a female registered nurse and an experienced qualitative researcher with a master's degree in nursing. YL was a research

nurse in this respiratory department who did not provide direct care to the patients being interviewed at the time of study. Prior to study commencement, YL established a rapport with the team leader and patients by attending and observing daily routine nursing care on the ward. Participants were fully informed of the nature of this qualitative study (i.e. background, aim and the audio recording) prior to signing the consent forms. Participants were asked to fill out a demographic data form, which included gender, age, education level, occupation, long-term residence (city/countryside), time period from initial symptom to confirmed diagnoses.

Interview questions were based on previous published literature and the researchers' experiences. The interview started with a broad question: "Could you tell me your experiences regarding how you were diagnosed with IPF?" Participants were encouraged to use their own words and tell their own story in an open and free manner. The topic covered but was not limited to their experiences of diagnosis, their perception of the disease, treatment options, their experiences in living with the disease, and their care needs. Prompt questions were used, such as "then, what happened?" "Could you please tell me how that affected you?" "What were your thoughts and feelings at the time?" The interviewer also recorded patients' meaningful facial expressions and body language. The patients were told that the interview could be stopped at any time if needed. If the patients felt breathless, anxious or tired during the interview, they could ask to stop the interview and or choose to continue the conversation at another time. No participants stopped the interviews or withdrew from the study. The data collection was ongoing until there was no evidence of recurring themes that emerged from the data.

Data analysis

Thematic analysis was conducted for the qualitative data [22]. The interview audio recordings were transcribed verbatim into Chinese and translated to English by the researcher (YL) who is bilingual. [Braun and Clarke's \(2006\)](#) six-step thematic data analysis guided the process: 1) familiarizing with the data; 2) generating initial codes; 3) searching for themes; 4) reviewing themes; 5) defining and naming themes; and 6) producing the report [22]. Two researchers (YL and YRJ) independently read and reread all the

transcripts for immersion in the data. Key quotes were highlighted, and initial codes were developed based on participants' verbatim statements. Codes were grouped according to similarity into subthemes and then themes based on common threads throughout the data. Any disagreement or contested theme/subtheme was discussed within the team with all researchers (YL, YRJ, FLG, YLH, FL) until consensus was reached. Interview transcripts were returned back to participants for comments and further clarifications.

The reporting of this research follows the Consolidated Criteria for Reporting Qualitative Research (COREQ) [23] (please see Supplementary Material S1).

Supplementary Material S1

Ethics

The Human Research and Ethics Committee of the hospital approved the study (ethics number: 2018-8-23-1). All participants were fully informed of the nature of this study, including the background, aims and benefit and harms prior to the commencement of this study. Written consents were obtained before the interviews.

Trustworthiness

Methodological trustworthiness of a qualitative study could be guaranteed by evaluating credibility, dependability, confirmability and transferability [24]. To strengthen credibility, regular discussions within the research team (YL, YRJ, FLG, YLH, FL) were held with regards to the emerging codes, subthemes and themes. All researchers (YL, YRJ, FLG, YLH, FL) have knowledge of conducting qualitative research (i.e. study design, data collection and analysis, skills of conducting and organizing in-depth interview). Three authors (YL, YRJ and YLH) have had extensive clinical experiences, especially in respiratory area. In terms of dependability, regular open discussions were held with all researchers (YL, YRJ, FLG, YLH, FL) to discuss the similarities or differences of the interview contents, which may change during the collection of interview data. Transferability was ensured by providing a detailed description of the healthcare context in China and characteristics of participants in this study. As for confirmability, a paper trail was kept recording significant

ideas or incidents emerging from the conversations with the participants. Participants were also asked by the interviewer (YL) to provide their feedback on the interview transcripts for further clarifications.

Results

16 patients participated in this research, with 13 males (81.3%) and 3 females (18.7%). Participants' age ranged from 35 to 72 years old (mean age was 59 years). Diagnosis journey (from initial symptoms to confirmed IPF diagnosis) was between 1.5-5 years with an average of 2.9 years. Around one third of participants had high school education, followed by primary and secondary schools. Only 3 participants had university education. [Table 1](#) shows the characteristics of participants with IPF.

Table 1 Characteristics of participants with IPF

Characteristics	Number of participants
Gender	
Male	13
Female	3
Age group	
30-39	1
50-59	8
60-69	5
70-79	2
Education level	
Primary school	4
Secondary school	4
High school	5
University level	3
Occupation	
Farmer	4
Teacher	2
Worker	5
White collar	2
Officer	3
Area of Residence	
Urban area	8
Rural area	8
Time from onset of symptom to diagnosis	
1.5-2 years	4
2.5-3 years	8
3.5-4 years	2
4.5-5 years	2

Primary school: 1-6 years of education; Secondary school: 7-9 years of education; High school: 10-12 years of education; University level: >12 years of education

Thematic analysis of the participant narratives uncovered four themes representing the lived experiences of patients with IPF. These included: the long and confusing journey to reach diagnosis, living with the disease, understanding the disease and treatment, and desire for continuity of care. **Table 2** shows the themes and associated sub-themes.

Table 2 Themes and associated sub-themes

Themes	Sub-themes
The long and confusing journal to reach diagnosis	<ul style="list-style-type: none"> • Uncertainty of diagnosis • Delaying process
Living with the disease	<ul style="list-style-type: none"> • Living with physical symptoms • Living with emotional distress • Loss of independence • Uncertainty with the prognosis
Understanding the disease and treatment	<ul style="list-style-type: none"> • Questioning the cause of the disease • Concerning the side effects of treatments
Desire for continuity of care	<ul style="list-style-type: none"> • Lacking continuity of care • Wanting better quality of healthcare in community hospitals

The long and confusing journey to reach diagnosis

Participants described their long journey to get a correct diagnosis, including uncertainty of diagnosis and delaying process. Common initial symptoms experienced by participants were shortness of breath and cough. While some participants did not take it seriously, others looked for medical advice from their local community hospitals.

Majority of the participants ($n=14$, 87.5%) were initially misdiagnosed as having other types of respiratory diseases, such as asthma, Chronic Obstructive Pulmonary Disease (COPD) or pneumonia and were consequently given symptom relieving medications, such as cough suppressants, inhalations and oral antibiotics. For those with cardiac disease, they seek for treatment with a cardiologist in a specialized hospital with cardiovascular service, as they attributed exertional dyspnea to cardiac dysfunction. Most did not look for

further medical advice until the condition deteriorated and significantly affected their daily living activities. As participants stated:

"I was just short of breath and I coughed a lot. I went to the hospital, had a chest X-ray. The doctors said that I had chronic obstructive pulmonary disease. Then I went to another hospital and I was told that it was pneumonia. Anyway ... different diagnosis. Finally, I came to this hospital [specialized hospital in respiratory medicine] and was diagnosed with interstitial pneumonia ... from the initial symptom of the coughs until diagnosis, it had been almost four years." (P8)

"I have had coronary heart disease for 10 years. Firstly, I felt difficult to breath. I thought [it] maybe a heart problem. I went to see a cardiologist. He prescribed some medicines for heart disease. I felt much better, but it got worse later ..." (P2)

There was a 3 to 4 years delay of being confirmed with the IPF diagnosis for many participants. Two participants from the countryside had more than 5 years delay. They looked for further medical advice at several hospitals. Some participants underwent multiple and repeated diagnostic tests and procedures, such as blood, X-ray and spirometry tests before being appropriately diagnosed with IPF.

"It was nearly 5 years to get diagnosis. [I] did all the examinations, chest function, blood sample, X rays. I went [to] nearly four to five hospitals to get the final diagnosis. Every time the prescribed medicines appeared to be working for a while, so it was delayed over and over again." (P2)

Living with the disease

Participants described their lived experiences with the disease as 1) living with physical symptoms 2) living with emotional distress, 3) loss of independence and 4) uncertainty with the prognosis.

Most participants stated that the severity of the physical symptoms was associated with the progression of the disease. Breathlessness and persistent cough were the common

symptoms, which significantly affected the daily activities. They also experienced the symptoms of fatigue, sleep disturbance and chest pain.

"... shortness of breath. [It was] like something was strangling my throat. Sometimes, I felt like choking, especially during physical activities. I cough all night, and my chest hurts. I can't even sleep. I always feel very tired with energy." (P6)

Participants also experienced emotional distress i.e. feeling anxious, frustrated and depressed due to the long disease journey, physical symptoms and limitations to daily activities. The severity of the distress can be affected by the progression of the disease. Most participants often described having the feeling of guilt because they needed help with regards to basic activities from their families on the daily basis.

"Now even go to the toilet, I have to depend on them [family members]. I cannot move freely. My daughter had to quit her job to take care of me. My wife was not in good health either. She has diabetes. But she takes care of me every day [and also] does housework. I feel that I am a burden to my family. I feel very frustrated." (P8)

Participants also expressed how the disease shaped their ordinary life and social function.

"I used to climb the mountain and ride a bicycle. It was fine. I can't do it now (sigh)." (P4)

"I have to depend on the oxygen, even now [when] I talk to you. I cannot talk for a long time. You know, I cannot do the activities as usual." (P7)

Uncertainty with the prognosis also emerged from the interview data. Many participants expressed a strong feeling of uncertainty with regards to the prognosis of the disease and its impact on their life. They often wondered if they could go back to their normal lives,

especially young participants who were concerned about their careers. As stated by a 35 years old male participant,

"Can this disease be cured? What will life be for me in the future? Will I have to depend on the oxygen for the rest of my life? I am still young. I am a backbone at work. My career just started. I don't know if I can return to work in the future." (P5)

Understanding the disease and treatment

Most participants stated that they had "never heard of ILD or IPF" and that they had insufficient knowledge with regards to the cause, prognosis, and treatments of the disease. They often questioned the cause of the disease. As these quotes illustrated,

"I always have the doubt why I get this deadly disease, the pulmonary disease. I never smoked, and I have a very healthy life style. I exercise regularly. I want doctors and nurses [to] tell me [more about] this disease, [helping] me [to] figure [it] out ... " (P5)

"I don't know if it is associated with the haze/smog [in our environment] and the exact reason why I got this disease. I usually do not wear a mask when I go out. I regretted it. If I wore a mask, it may reduce the smoke inhaling. Maybe, I would not get the disease. Who knows? [It is] so unfortunate!" (P8)

In addition, immunosuppressant and ant-fibrotic drugs are commonly used for treating patients with IPF. Participants often expressed their concerns regarding the side effects, as they did not know much about the medications used for the IPF treatment. They also questioned the need to take immunosuppressive agents continuously.

"I have taken immunosuppressant for a long time. I am worried about side effects, be addicted and cannot stop." (P4)

"Cyclophosphamide, one of my friends takes this medication. Is this for cancer patients? I know there have horrible side effects, like [going] bold. Do I really need it? (Frowning)." (P8)

Desire for continuity of care

Participants in this study described their experience in care needs from health professionals as: 1) lacking continuity of care, and 2) wanting better quality of healthcare in community hospitals.

In the interviews, participants expressed their desire for the continuity of care post discharge from the specialized hospitals. They hoped that health professionals in the specialized hospital could provide more knowledge, especially on how to self-manage the disease at home. They wanted specific instructions or education about diet, oxygen use, medication, and daily activities. But there was no support once they were discharged from the hospitals. As participants stated,

"When I need professionals to help in my hometown, I don't know who I can ask. Obviously, I don't think community hospital staff know how to treat such uncommon disease." (P11)

"I hope the staff [working in the community hospital] can teach me how to use oxygen, care for myself at home, tips about daily activities, like what kinds of activities I could do, you know." (P5)

Participants often had to attend the follow up appointments at the local primary care setting or community hospitals that are closer to home and are more accessible than the specialized hospitals, which often require them to travel long distance. They reported having low confidence on the healthcare quality in the community hospitals.

"Doctors in community hospitals just prescribe some medicines and drips. You really can't trust them. Pulmonary rehabilitation program (during my stay in the specialized hospital) made me feel better to breath, but I don't think the doctors and nurses in the community hospitals are adequately trained on this [pulmonary rehabilitation]." (P5)

Discussion

While health professionals of respiratory medicine have been making every effort to diagnose and manage IPF effectively, patients' real-world experiences and care needs from their own perspectives have not been paid much attention by the clinicians in China. To our knowledge, this study was the first study exploring the lived experience of the diagnosis journey and the care needs of the Chinese patients with IPF. The interview data depicted a vivid picture of "being disconnected with the healthcare system" where IPF patients struggled throughout the disease journey. Four main themes emerged from the data featured in IPF patients' narratives of lived experiences. These included the long and confusing journal to reach diagnosis, living with the disease, understanding the disease and treatment, and desire for continuity of care.

Firstly, the most overwhelming issue expressed by the participants in this study is their long journey from having the initial symptoms to confirming the diagnosis. The journey took an average of 2-3 years. Participants were often initially "misdiagnosed" as asthma, COPD, recurrent pneumonia or "undiagnosed". This is consistent with the findings of US study [16]. In Collard's study (2007), the protract time issue of patients with IPF was highlighted. In his study, 55% of patients reported delay at least one year from initial symptoms to a final diagnosis [16]. In a 2018 nationwide survey in the US, more than half of participants had to consult with more than three physicians to confirm the diagnosis of IPF [25]. This could be explained by the fact that diagnosing IPF is a challenging issue as patients often present with the initial symptoms of breathlessness and cough, which are common symptoms of other respiratory diseases. Besides, it is common among older population. While some often regard breathlessness is related to the natural process of aging, others with heart issues often attribute the symptoms to the cardiac disease [25]. Furthermore, the lack of primary care in China is another contributing factor, that is patients have to decide which specialists they see by themselves at the onset of the disease, which could lead to the misdiagnosis, and also prolongs their journey to reach a correct diagnosis [26]. Therefore, the structure of primary care is needed to shorten the disease diagnosis journey.

In addition, Qian (2012) stated that the public literacy of respiratory diseases is lower than other chronic diseases such as diabetes and hypertension among the public in

China [27]. It is suggested that it is important to enhance people's knowledge on IPF [27]. Another reasonable suggestion is to provide systematic education and training to the primary health professionals in community hospitals in order to raise the awareness of IPF. It was also highly advocated by guidelines that early detection, timely and accurate diagnosis help to avoid unnecessary tests and potential harmful treatment and to improve the outcomes [28].

The second theme emerged from the data reflects the lived experiences of patients living with the IPF disease. Participants expressed the struggles of living with the physical symptoms and emotional distress and coping with loss of independence. They also expressed their feelings of uncertainty with the prognosis and the future. Symptoms expressed by participants in this study are similar to what had been reported in literature [29].

Current literature suggests that symptom management and palliative care are regarded as the cornerstones to improve quality of life for IPF patients [30]. The National Institute for Health and Care Excellence (NICE) (2015) published a quality statement in recommending that people with IPF should have an ILD specialist nurse available from the diagnosis to the end of life [31]. ILD specialist nurse can conduct comprehensive assessment and make individual care plan throughout all stages of the disease, such as activity of daily living, oxygen use, education on medication management, and emotional support [32, 17]. In the UK, 90% of patients reported that ILD specialist nurse was their main clinical contact [32]. Since the systematic training program of specialist nurses implemented in the year 2000 in China, there has been an increased numbers of trained specialist nurses in the areas of intensive care unit, operation theatre, emergency nursing, diabetes, pressure injury, and intravenous therapy [33, 34]. However, there is still no specialist nurse training available in the area of ILD and IPF in China. This gap needs to be addressed to provide effective and quality care for patients with IPF in China.

The third theme emerged from the data was the understanding of the disease and treatment. This finding was supported by Bajwah et al. (2013) who described that patients with interstitial pneumonia (including IPF) were not given accurate information about the progression and the prognosis of the disease [35]. Most participants in the present study

asked why they had the disease, especially for the patients who had a healthy lifestyle. The present study suggests that inexperienced physicians may not know how to initiate the open discussion about IPF with patients and their caregivers. Lack of open discussion and information disclosure could lead to uncertainty, fear, doubt and anxiety [36]. There is a strong recommendation to establish a patient-centered care model, which focuses on collaboration and a shared decision-making with patients [37]. Such model can help to facilitate the decision-making process with regards to the treatments and education on disease and symptom managements, which, in turn, improve the treatment outcomes and the quality of life of patients [18].

Desire for continuity of care also emerged from the interview data. Participants experienced the lack of continuity of care post discharge from the specialized hospital. They also expressed their uncertainty of the quality of the care provided by the community hospital doctors and nurses with regards to IPF. Due to the reform of healthcare policy in China, public hospitals especially in bigger cities have been under pressure to shorten patients' hospital length of stay [38]. Consequently, patients are often discharged from the hospital after the acute phase of the disease and that they are not ready to self-manage their symptoms at homes. Indeed, most patients participated in this study were from northern regions of China, a remote area that is hundreds of kilometers away from specialized hospitals which are often located in bigger cities. Thus, access to good quality of care can be a challenge for these patients after being discharged from the tertiary hospitals. The findings of this study indicate that there is a lack of care coordination between specialized hospitals and community hospitals in China. In European countries, the local network for ILD or IPF specialist centers have been established working in collaboration and partnership with healthcare professionals, policy makers to improve quality of care for patients in the community [9]. Despite recommendation from the NICE, which states that the pulmonary rehabilitation can improve exercise capacity and quality of life [39], there is still unequal access to pulmonary rehabilitation in the primary care settings and community hospitals in China.

This study suggests that it is of paramount importance to increase public awareness of IPF, improve treatment outcomes and symptom managements via collaboration with

multidisciplinary team, and provide timely and accurate diagnosis. A care model with specialized ILD or IPF nurses is essential to provide a continuous care and improve care quality for patients with IPF.

Limitations Of The Study

There are some limitations of this study. Firstly, all the participants came from northern regions of China. The findings should be interpreted with caution because patients' experiences in other parts of China may be different due to the unbalanced/inconsistent quality and level of healthcare across China. Besides, the participants self-reported their journey retrospectively, there may be inaccuracies in their responses. However, the patients' experiences illustrated in this study may shed some light on how future improvements can be made to improve the quality and continuity of care for this vulnerable population. This study also acknowledges that there was an evidence of no recurring themes from the interview data but does not claim that the data saturation has occurred

Conclusions

The findings of this study provide an in-depth knowledge on the lived experiences of Chinese patients with IPF. Themes emerged from the interview data feature the lived experiences of IPF patients' narratives, including the long and confusing journal to reach diagnosis, living with the disease, understanding the disease and treatment, and desire for continuity of care. Establishment of a comprehensive symptom management program and IPF healthcare network is needed to provide continuous care post discharge and to improve the quality of life of this vulnerable population in China.

Abbreviations

COREQ: Consolidated criteria for reporting qualitative research; IPF: Idiopathic Pulmonary Fibrosis; ILD: Interstitial Lung Disease; COPD: Chronic Obstructive Pulmonary Disease; NICE: National Institute for Health and Care Excellence

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Declarations

Ethics approval and consent to participate

All participants were fully informed of the nature of this study, including the background, aims and benefit and harms prior to the commencement of this study. Written consents were obtained before the interviews. The Human Research and Ethics Committee of the hospital approved the study (ethics number: 2018-8-23-1).

Consent for publication

Not applicable.

Availability of data and materials

The data are available from the corresponding author on reasonable request with the approval of study group and study participants.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

YL led all aspects of the project including conception and design of the study, acquisition of data, data analysis, interpretation of data, drafting, revising and finalizing the article. YJ and FLG contributed to the conception and design of the study, made substantial contribution in data acquisition, interpretation of data and reviewing the manuscript. YLH and FL made substantial contribution in conception and design of the study, data analysis, interpretation of data and reviewing and revising the manuscript. All authors read and approved the final manuscript.

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