Medication Adherence and Barriers Among Persons with Chronic Rhinosinusitis, the First Affiliated Hospital of Kunming Medical University*

ความร่วมมือและอุปสรรคในการใช้ยาในผู้ที่เป็นไซนัสอักเสบเรื้อรัง โรงพยาบาลเครือแห่งแรกของมหาวิทยาลัยการแพทย์คุนหมิง*

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Abstract

Medication adherence is vital for controlling symptoms and preventing complications of chronic rhinosinusitis (CRS). The purpose of this descriptive study was to investigate medication adherence and barriers to medication adherence among persons with CRS. Purposive sampling was used to select 259 participants who were treated at the First Affiliated Hospital of Kunming Medical University, the People's Republic of China. The research instruments included the demographic data form developed by the researchers, the 12-item Medication Adherence Scale (MAS) developed by Ueno et al., and the Adherence Barriers Questionnaire (ABQ) developed by Müller et al. The MAS and the ABQ were translated into Chinese by the researcher, and were tested for their reliability, yielding Cronbach's alphas of 0.78 and 0.82, respectively. Descriptive statistics were used to analyze data.

The results revealed:

1. Participants had high medication adherence (M = 48.97, SD = 5.25); and
2. Intentional adherence barriers among the participants in this study included the belief that all medications were poisons (M = 3.33, SD = 0.75), being unsure of the need for medication (M = 3.26, SD = 0.68), and access to healthcare barriers (M = 3.15, SD = 0.66). Unintentional adherence barriers were feeling discouraged or depressed (M = 3.23, SD = 0.70), forgetfulness (M = 3.12, SD = 0.73), and not receiving required help (M = 2.59, SD = 0.94). Additionally, medication-related barriers included stopping or decreasing medications due to side effects (M = 3.23, SD = 0.59), being afraid of side effects (M = 3.22, SD = 0.66), and problems with taking medications (M = 3.19, SD = 0.68). A healthcare system barrier was participants' co-payments (M = 3.25, SD = 0.69).

The results of this study provide valuable insights into medication adherence and its barriers among Chinese individuals with CRS. Healthcare providers can employ these findings to develop targeted strategies, such as education programs to address negative beliefs about medication, simplified medication schedules to combat forgetfulness, and financial assistance programs to reduce financial burden.

Keywords: Chronic rhinosinusitis; Medication adherence; Barriers to medication adherence

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บทคัดย่อ

ความร่วมมือในการใช้ยามีความสำคัญต่อการควบคุมอาการ และป้องกันภาวะแทรกซ้อนของโรคไซนัสอักเสบเรื้อรัง การวิจัยเชิงพรรณนานี้ มีวัตถุประสงค์เพื่อศึกษาความร่วมมือและอุปสรรคในการใช้ยาของผู้ที่เป็นไซนัสอักเสบเรื้อรัง คัดเลือกกลุ่มตัวอย่างแบบเจาะจงจำนวน 259 คน ซึ่งได้รับการรักษาที่โรงพยาบาลในเครือแห่งแรกของมหาวิทยาลัยแพทย์คุนหมิง ประเทศสาธารณรัฐประชาชนจีน เครื่องมือที่ใช้ในการวิจัย ได้แก่ แบบบันทึกข้อมูลส่วนบุคคลสร้างโดยผู้วิจัย แบบประเมินความร่วมมือในการใช้ยา 12 ข้อ สร้างโดยยูอีโนและคณะ และแบบสอบถามอุปสรรคต่อความร่วมมือในการใช้ยาสร้างโดยมูลเลอร์และคณะ แบบประเมินความร่วมมือในการใช้ยา และแบบสอบถามอุปสรรคต่อความร่วมมือในการใช้ยาได้รับการแปลเป็นภาษาจีนโดยผู้วิจัย และนำไปทดสอบความเชื่อมั่น ได้ค่า Cronbach's alpha เท่ากับ 0.78 และ 0.82 ตามลำดับ วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา

ผลการศึกษา มีดังนี้

1. กลุ่มตัวอย่างมีความร่วมมือในการใช้ยาในระดับสูง (M = 48.97, SD = 5.25)

2. อุปสรรคต่อความร่วมมือแบบตั้งใจของกลุ่มตัวอย่างในการศึกษานี้ ได้แก่ ความเชื่อว่ายาทุกชนิดเป็นพิษ (M = 3.33, SD = 0.75), ไม่มั่นใจว่าจำเป็นต้องใช้ยา (M = 3.26, SD = 0.68) และมีอุปสรรคในการเข้าถึงระบบบริการสุขภาพ (M = 3.15, SD = 0.66) อุปสรรคต่อความร่วมมือแบบไม่ตั้งใจของกลุ่มนี้ ได้แก่ ความรู้สึกหมดกำลังใจหรือซึมเศร้า (M = 3.23, SD = 0.70) การลืม (M = 3.12, SD = 0.73) และการไม่ได้รับความช่วยเหลือที่ต้องการ (M = 2.59, SD = 0.94) สำหรับอุปสรรคเกี่ยวกับการใช้ยาของกลุ่มนี้ ได้แก่ การหยุดหรือลดการรับประทานยาอันเนื่องจากผลข้างเคียง (M = 3.23, SD = 0.59) ความกลัวในผลข้างเคียงของยา (M = 3.22, SD = 0.66) และปัญหาที่เกิดขึ้นเมื่อรับประทานยา (M = 3.19, SD = 0.68) ส่วนอุปสรรคเกี่ยวกับระบบบริการสุขภาพของกลุ่มตัวอย่าง ได้แก่ ภาระในการจ่ายค่ารักษาร่วม (M = 3.25, SD = 0.69)

ผลการศึกษาครั้งนี้ ให้ข้อมูลในเรื่องความร่วมมือและอุปสรรคในการใช้ยาของผู้ที่เป็นไซนัสอักเสบเรื้อรังชาวจีน บุคลากรสุขภาพสามารถใช้ผลวิจัยนี้ในการพัฒนากลยุทธมุ่งเป้า เช่นการจัดโครงการให้ความรู้เพื่อแก้ความเชื่อผิด ๆ เกี่ยวกับการใช้ยา ปรับแผนการใช้ยาให้ง่ายขึ้นเพื่อลดการหลงลืม และจัดโครงการช่วยเหลือค่าใช้จ่ายเพื่อลดภาระในการจ่ายค่ารักษาร่วม

คำสำคัญ: โรคไซนัสอักเสบเรื้อรัง ความร่วมมือในการใช้ยา อุปสรรคในการใช้ยา

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Background and significance

Chronic rhinosinusitis (CRS) is defined by most guidelines as an inflammation of the nose and the paranasal sinuses characterized by 8-12 weeks of at least two of the following symptoms: nasal blockage/ obstruction/ congestion; nasal discharge (anterior/ posterior nasal drip); facial pain/pressure; and/or reduction or loss of smell. Signs of disease or relevant changes discovered by either endoscopic or CT scan are used to confirm CRS diagnosis (Keating et al., 2023). Moreover, this chronic disease causes significant physical symptoms, including loss of smell, rhinorrhea, nasal congestion, facial pressure or pain, and headache which affect the quality of life and work, and damage the general health, vitality, and social function of CRS persons.

CRS impacts approximately 5 to 15 percent of the population in the United States and Europe (Benjamin et al., 2019). Chinese research findings revealed that CRS affects nearly 8% of its population, or a staggering 107 million people (Liu et al., 2020). According to the 2020 to 2023 statistics from the Medical Record Office of the First Affiliated Hospital of Kunming Medical University, there were 2,879; 2,996; 3,321; and 3,575 patients diagnosed with CRS; whereas, 574; 559; 626; and 608 patients required admittance to the hospital for treatment, respectively, revealing a yearly increase in patient numbers over those four years. In the Chinese context, CRS has emerged as a pivotal public health concern, exerting substantial health and economic pressures across all societal strata, encompassing individuals to the broader communities (Leland et al., 2022). Studies have shown that patients with CRS will miss an average of 18.7 days of work per patient per year (Wahid et al., 2020, resulting in billions of dollars in indirect costs due to lost productivity. Therefore, CRS not only imposes a significant burden on afflicted individuals but also on society as a whole (Liu et al., 2020).

CRS often induces various symptoms with many patients requiring combined therapies. Traditionally, corticosteroids, nasal saline irrigation, and surgery are recommended for CRS treatment in China (Jiang et al., 2015). However, in the Otolaryngology Department of the First Affiliated Hospital of Kunming Medical University, only corticosteroids and nasal saline irrigation are commonly used. If special devices are not used properly, its efficacy will be decreased and/or delayed. As difficulties and feelings of discomfort are commonly experienced, this discomfort and overwhelming feelings may hinder long-term adherence.

Medication adherence encompasses not just rigorous compliance with medication regimens, but also active engagement with medical professionals, an active pursuit of medication-related information, and an integration of medication into one's daily routine. One study has shown that nearly 50% of prescribed medications go unused across diverse patient groups (Settineri et al., 2019). Another study suggests that non-adherence is related to health education and barriers to care, and future research should focus on educating patients about long-term medication use despite initial improvements in symptoms (Gutierrez et al., 2024).

The consequences of suboptimal compliance are manifold. It can not only aggravate the health status of CRS patients, and increase the risk of mortality and incidence rates, but also

burden the medical infrastructure, increase the number of inpatients, and result in patients' adoption of more expensive treatment methods (Shen et al., 2020). Lower adherence can lead to losses in drug effectiveness, toxicity, and drug resistance (Jose et al., 2021). The repercussions of inadequate medication compliance extend beyond health ramifications to economic implications. One factor that may influence an individual's adherence to prescribed medications is socioeconomic status and accompanying financial resources (Strickland et al., 2019).

In China, few studies have been done on adherence to medical regimens, and medication adherence is still unsatisfactory. There are very few studies on medication adherence among CRS patients; thus, no specific measures have been proposed regarding interventions for its improvement. To improve medication adherence, the multiple barriers to it must be understood, so that they may then be managed and possibly controlled in order to improve patients' adherence to medicine regimens. Barriers to medication adherence are defined as the factors causing persons with CRS to fail in their medication-related adherence, and they include four dimensions: 1) intentional adherence barriers, 2) medication-related adherence barriers, 3) unintentional adherence barriers, and 4) health care system-related adherence barriers (Muller et al., 2015). At the First Affiliated Hospital of Kunming Medical University where data was collected for this study, nurses have found, through follow-up phone calls, that many patients have not continued using medication as instructed, with the contributing factors to this problem ranging from incomprehensible drug labels, to complex treatment plans and strained healthcare provider relations.

Research objectives

1. To investigate levels of medication adherence among persons with CRS currently being treated at the First Affiliated Hospital of Kunming Medical University, the People's Republic of China.
2. To investigate barriers to medication adherence among persons with CRS currently being treated at the First Affiliated Hospital of Kunming Medical University, the People's Republic of China.

Conceptual framework

The conceptual framework of this study has been derived from the literature review. CRS is defined as symptomatic inflammation of the paranasal sinuses and nasal cavity lasting more than 12 weeks with or without acute exacerbations. Topical intranasal corticosteroids, antibiotics, and saline nasal irrigation are the common treatments that need to be individually adjusted according to the disease manifestations, which is usually time-consuming. The complexity of medication application, delayed perceived efficacy, and the earlier adverse effects of a prescribed regimen may affect medication adherence among persons with CRS. To achieve treatment effectiveness and optimal health outcomes, medical adherence (acceptance to take medication and the way in which taking medication fits patients' lifestyles, medication complications, collaboration with healthcare providers, and willingness to access and use information about medication) and barriers to medication

adherence (intentional adherence barriers, medication-related adherence barriers, unintentional adherence barriers, and health care system-related to adherence barriers) must be investigated in the setting. Exploring medication adherence and its barriers in specific contexts is vital as it will constitute the first step in overcoming these barriers and enhancing medication adherence specifically for individual settings.

Methodology

Population and sample

The target population of this study included persons diagnosed with CRS who were identified from hospital records and had been receiving treatment at the First Affiliated Hospital of Kunming Medical University.

The sample size was calculated by using Yamane's formula, yielding a sample size of 236. Considering the possibility of incomplete questionnaires, 10% was added, resulting in a total of 259 patients selected. Inclusion criteria consisted of: 1) receiving medication treatments for at least 3 months, 2) aged ≥ 18 years old, 3) agreeing to participate in the study, and 4) having the ability to communicate in Chinese. All patients who followed up during the data collection time were approached and those who agreed to participate in the study were included.

Research instrument

The instrument was a questionnaire including three parts, as follows:

1. The Demographic Data Form, including demographic data and clinical data, was developed by the researchers. Demographic data consisted of participant information, including age, gender, race, residence, marital status, religion, education level, health insurance, and monthly household income, while clinical data included the duration of CRS; a list of current medication including dosage, route, and usage time; and duration of medication use.

2. The Chinese version of the 12-item Medication Adherence Scale was used to measure medication adherence. The original English version was developed by Ueno et al. (2018). It consists of four dimensions (acceptance to take medication and how taking medication fits patients' lifestyles [3 items], medication complications [3 items], collaboration with healthcare providers [3 items], and willingness to access and use information about medication [3 items]) with a total of 12 items, and each item is rated on a five-point Likert-type scale, with answers ranging from 1 (never) to 5 (always). Total scores range from 12 to 60. A score lower than 7 for a single dimension indicates a low level of adherence, while a score higher than 11 for a single dimension indicates a high level of medication adherence (Ueno et al., 2018).

3. The Chinese version of the Adherence Barriers Questionnaire (ABQ) was used in this study. The original tool (English version) was developed by Muller et al. (2015) based on a systematic review of the relevant literature of the most frequent observable factors associated with medication-related non-adherence. It consists of four dimensions (intentional adherence barriers [5 items], medication-related adherence barriers [4 items], unintentional adherence barriers [4 items], and health care system-related adherence barriers [3 items]) with a total of 16 items, and

each item is rated on a 4-level Likert scale ("strongly agree", "generally agree", "generally disagree", and " strongly disagree") with values from 1 to 4 or 4 to 1 based on the individual item. Scores range from 16 to 64, and a higher score indicates a higher influence of a certain barrier on a patient's perceptions. Previous validations of the ABQ have indicated that a score > 2 for a single item indicates an existing barrier while a total score of 25 for all items indicates a significantly higher probability of non-adherence (Muller et al., 2015).

Measurement tools were translated into Chinese using the back-translation method and the translated tool (Chinese version) was checked by a certified standard company for its content validity. The tools' internal consistency was tested among 10 CRS persons who had similar characteristics as the sample. The Cronbach's alpha coefficients of the 12-item MAS and the ABQ were 0.78 and 0.82, respectively. The test-retest reliability of the MAS was 0.95.

Ethical considerations

This study was approved by the Research Ethics Committee of the Faculty of Nursing, Chiang Mai University, Thailand with certificate of approval number 071/2021. Permission for data collection was obtained from the first Affiliated Hospital of Kunming Medical University. The researcher reviewed and selected prospective participants from a list of those who followed up during the duration of data collection. Those who met the inclusion criteria were invited to participate, and upon accepting, were directed to a quiet and private room. All participants who agreed to participate were required to sign a written consent form, independently, after details of the study were explained and any clarifications were made. They had the right to participate in or quit from the study at any time without any negative consequences for their benefits or care provision. In addition, only a code number assigned for individual participants was used for data analysis. Voluntariness, privacy, and confidentiality were ensured.

Data collection

The participants were approached at the outpatient department while awaiting their doctor's appointment. Two packages of research documents were distributed to each participant. One package included study information and informed consent forms while the other included the questionnaires. Information the study and its purposes were clearly explained to eligible participants who were asked independently to complete the informed consent within an hour if they agreed to participate. After seeing their doctors, participants were then invited to a private room and asked to complete research documents by themselves and put them in a box labeled " the box for questionnaires" while their completed consent forms were put in a box labeled " the box for consent forms". These two boxes were located in front of the unit. The data collection process took approximately 15-25 minutes (an average of 20 minutes). The response rate for the 259 participants was 100%.

Data analysis

The data was analyzed using SPSS 13.0 (English version). Demographic and clinical information, data of medication adherence, and barriers to medication adherence' scores were analyzed using

descriptive statistics in terms of frequency, percentage, mean, range, and standard deviation.

Results

The participants' demographic characteristics were described by frequency, percentage, mean, and standard deviation. A total of 259 CRS participants from Kunming, Yunnan Province, mainland China, were included in this study. More than half of them were older-aged (139, 53.67%) with a mean age of 61.34 years (SD = 11.52). The majority were males (132, 50.97%), Han Chinese (227, 87.64%), and urban residents (157, 60.62%). Almost all (238, 91.89%) were married or cohabiting participants and had no religion (244, 94.21%). Most participants had a secondary or tertiary education (183, 70.66%) while only one-third (84, 32.43%) had insurance. In terms of disease history, almost half of them (116, 44.79%) had been diagnosed for more than 10 years, but the majority of them (184, 71.04%) had been on continuous medication for 10 years or less (Table 1).

Table 1 Demographic information characteristics of persons with CRS (n = 259)

Characteristics	Frequency (n)	Percentage (%)
Age (years) (Mean = 61.34, SD = 11.52, Range = 21-85)		
Age		
Youth (21-24 years)	2	0.77
Young age (25-44 years)	31	11.97
Middle age (45-60 years)	67	25.87
Older age (61-74 years)	139	53.67
Senile age (75-90 years)	20	7.72
Gender		
Male	132	50.97
Female	127	49.03
Ethnicity		
Han	227	87.64
Ethnic minority	32	12.36
Residency		
Urban	157	60.62
Rural	102	39.38
Marriage		
Married/Cohabiting	238	91.89
Single/Divorced/Widowed/Separated	2	8.11
Religion		
No religion	244	94.21
Have religion	15	5.79

Table 1 Demographic information characteristics of persons with CRS (n = 259) (continue)

Characteristics	Frequency (n)	Percentage (%)
Education		
Illiteracy/Primary education	76	29.34
Secondary education/Tertiary education	183	70.66
Insurance		
No insurance	175	67.57
Have insurance	84	32.43
Duration of being diagnosed with chronic rhinosinusitis		
≤5 years	35	13.51
6-10 years	108	41.70
>10 years	116	44.79
Years of continuous medication use		
≤5 years	81	31.27
6-10 years	103	39.77
>10 years	75	28.96
Daily medication taking		
Once a day	134	51.74
Twice or more per day	125	48.26

The participants had a high overall mean score for medical adherence at 48.97 (SD = 5.25). In addition, all of the medication adherence subscale scores were at a high level. The mean score for "Acceptance to take medication and how taking medication fits patients' lifestyle" was the highest (M = 12.29, SD = 1.58) followed by "Medication complication" (M = 12.23, SD = 1.55), "Collaboration with healthcare providers" (M = 12.23, SD = 1.47), and "Willingness to access and use information about medication" (M = 12.22, SD = 1.51), respectively (Table 2).

Table 2 Level of medication adherence among persons with CRS

Medication adherence category	Mean	SD	Level
Medication complication	**12.230**	**1.548**	High
Over the past three weeks, I have taken the prescribed daily dosage of my medication.	4.016	0.739	
Over the past three weeks, I have followed the instructions about when or how often to take my medication.	3.953	0.744	

Table 2 Level of medication adherence among persons with CRS (continue)

Medication adherence category	Mean	SD	Level
I have stopped taking medication based on my own judgment (not including times when I forgot to take my medication).	4.261	0.809	
Collaboration with healthcare providers	**12.226**	**1.469**	High
I am comfortable asking my healthcare provider about my medications.	3.984	0.760	
My healthcare provider understands when I tell him/her about my preferences in medication taking.	4.101	0.769	
My healthcare provider understands when I explain to him/her about my past medication including previous allergic reactions.	4.140	0.758	
Willingness to access and use information about medication	**12.222**	**1.508**	High
I understand both the effects and the side effects of my medication.	4.085	0.786	
I report side effects, allergic reactions, or unusual symptoms caused by the medication.	4.054	0.758	
I personally search for and collect information that I want about my medicine.	4.109	0.742	
Acceptance to take medication and how taking medication fits patients' life style	**12.292**	**1.575**	High
I accept the necessity of taking medication in the prescribed manner to treat my illness.	4.109	0.768	
Taking medication is part of my everyday life, just like eating or brushing my teeth.	4.109	0.783	
I sometimes get annoyed that I have to keep taking medicine every day.	4.047	0.749	
Overall medication adherence	**48.969**	**5.253**	High

Regarding medication adherence barriers, intentional adherence barriers among participants included the belief that medications are all poison (M = 3.33, SD = 0.75), being unsure of the need for taking medication (M = 3.26, SD = 0.68), and barriers to access healthcare (M = 3.15, SD = 0.66). Participants' unintentional adherence barriers were feeling discouraged or depressed (M = 3.23, SD = 0.70), forgetfulness (M = 3.12, SD = 0.73), and not receiving required help (M = 2.59,

SD = 0.94) while their medication barriers were stopping or decreasing taking medication due to side effects (M = 3.23, SD = 0.59), being afraid of the medication side effects (M = 3.22, SD = 0.66), and problems when taking medication (M = 3.19, SD = 0.68). Their healthcare system barrier was the burden of co-payment (M = 3.25, SD = 0.69) (Table 3).

Table 3 Barriers to medication adherence among persons with CRS

Medication Barriers Category	Mean	SD	Possible Score	Range
Intentional adherence barriers	13.17	1.34	5-20	5-18
Medications are all poison. If possible, one should avoid taking medication at all.	3.33	0.75	1-4	1-4
I feel basically healthy. Therefore, I am sometimes unsure whether I really need to take my medication daily.	3.26	0.68	1-4	1-4
I have to overcome barriers to access my healthcare (e.g., my doctor/pharmacy is far away, I am dependent on the help of others when I need to see my doctor).	3.15	0.66	1-4	1-4
Unintentional adherence barriers	10.58	1.54	4-16	5-15
In general, I often feel bad, and sometimes I feel discouraged and depressed.	3.23	0.70	1-4	1-4
I frequently forget things on an everyday basis.	3.12	0.73	1-4	1-4
I require help on an everyday basis (specifically with regards to my drug therapy). However, I do not receive any.	2.59	0.94	1-4	1-4
Medication barriers	11.38	1.32	4-16	4-15
In case I already noticed or in case I would notice side effects related to my medication: I have stopped/would stop taking my medications or took/ would take less of them.	3.23	0.59	1-4	1-4
I am very afraid of the side effects of my medications.	3.22	0.66	1-4	1-4

Table 3 Barriers to medication adherence among persons with CRS (continue)

Medication Barriers Category	Mean	SD	Possible Score	Range
I frequently have problems when taking my medication (e.g., swallowing, dividing the pills, opening the packaging) or it is difficult for me to adhere to the medication instructions (e.g., only take on an empty stomach, avoiding certain foods/alcohol).	3.19	0.68	1-4	1-4
Healthcare system barriers	6.71	1.05	3-12	3-11
I fully understand what my doctor, nurse, or pharmacist have explained to me so far.	1.76	0.66	1-4	1-4
I trust my doctor and agree on my treatment plan with him/her.	1.70	0.64	1-4	1-4
I feel that co-payments for medication are a great burden.	3.25	0.69	1-4	1-4

Discussion

Medication Adherence of Participants

The study's findings revealed a high overall mean medication adherence score among the participants along with high scores across all its subscales. Most participants (70.66%) had a secondary education/tertiary education, while only 29.34% were illiterate or had primary education. Level of education was possibly a major reason for the high medical adherence in this study. Differences in educational levels might also contribute to varying adherence levels. Better adherence was observed in those with higher education levels, and many previous studies have reached similar conclusions. A scoping review revealed that fewer years of education was associated with poorer understanding of prescription instructions and medication terms related to a chronic condition and its treatment (Konstantinou et al., 2020). Those with higher education were more easily able to access medication information and prepare themselves with an understanding about the disease, its treatment, and the ways to overcome treatment complications.

In addition, they were able to collaborate with healthcare providers more easily which made them more likely to accept and adjust medication regimens as part of their daily life and exhibit good adherence to medication at rates seven times higher than those with lower education levels (Hodges et al., 2020). Similarly, higher education levels have been identified as a factor facilitating significantly higher medication adherence in several studies (Bala et al., 2024; Braun et al., 2020). Furthermore, one systematic review conducted among adult patients with

chronic physical conditions identified specific factors, such as higher education and employment, as attributing factors to good medical adherence (Chauke et al., 2022). The authors believed that lower education levels could lead to unemployment and economic difficulties, which, in turn, could affect the ability to afford medicine. If a patient does not have enough money to buy necessities such as food and clothing, medicines are unlikely to be a priority. Therefore, there is a significant association between higher education levels and medication adherence. Consequently, healthcare providers are advised to provide enough time to get necessary information to patients. Moreover, clear and simple language while avoiding medical jargon terms should be emphasized when educating patients, especially those with lower education levels.

Barriers to Medication Adherence

The participants' intentional adherence barriers included the belief that medications are all poison (M = 3.33, SD = 0.75), unsure of the need for taking medication (M = 3.26, SD = 0.68), and barriers to access healthcare (M = 3.15, SD = 0.66). Intentional adherence barriers refer to the obstacles to following a prescribed treatment recommended by a healthcare professional due to a conscious individual decision influenced by one's attitudes or negative beliefs, resulting in their conscious decision to deviate from the treatment plan (Muller et al., 2015). On the other hand, unintentional adherence barriers arise from situations in which individuals fail to follow a therapeutic recommendation, but do this without making a conscious decision, for example, through forgetfulness, depression, or lack of knowledge.

Medication barriers are defined as the impeding elements coming from the medication itself, consisting of the complexity of medication regimes and the fear of experiencing medication side-effects, which may hinder individuals' adherence. Finally, healthcare system barriers refer to obstructive factors deriving from the health care system including direct or indirect medication-related costs, such as co-payments; waiting times; long journeys to reach a doctor; inconveniences in getting prescription refills; and poor patient-physician relationships, all of which may impede patient adherence to medications.

Some of the possible explanations for these adherence barriers include education level, continuous long-term medical treatment, age group, and ability to pay medical costs. The majority of participants in this study had secondary education or higher (139, 53.67%). Most of them had adequate knowledge and were more likely to understand necessary information about medication provided by the healthcare system. Knowledge could be important in terms of a patient deciding to continuously take medication. If people lack understanding, then fears and concerns may be difficult to resolve, and once side effects occur, people may stop medication or reduce dosages by themselves. Findings from another study revealed that a patient's educational level contributes to medication adherence (Awwad et al., 2015). It was also demonstrated that a higher level of education was significantly associated with medication adherence (Agidew et al., 2021). Such information supports the idea that these participants still had barriers but not at a high level.

Moreover, in this study, medical barriers arose from the beliefs that " Medications are all poison, one should avoid taking if possible" about which 45.56% of participants agreed (item 5). This may come from traditional Chinese culture, especially among the elderly (in this study, a majority of participants were 60 years old or more [159, 61.39%]). Some of them believe that 'medicine has its poison', even they do not have any experiences of its side effect. Even if the medication they take does not make them feel that there are side effects, people can still be afraid to take it. These cultural and social norms shape patients' decisions not to persist in taking medication (Xie et al., 2020). This is consistent with a qualitative study which indicated that more attention should be paid to patients' fear of medication side effects (Kvarnstrom et al., 2021).

Another possible explanation for this result might be that most participants had been diagnosed and treated for a long time, with only 81 (31.27%) having been diagnosed and treated for five years or less. Whether by themselves, or through their family, during long-term treatment, they gained some basic understanding about their illness, including how to effectively use medication and manage the adverse effects of discontinuing medication on their body. For people with long-term diagnosis and treatment, it is likely that they also have developed an understanding of communication and how to contact doctors to obtain support and medical resources.

Unintentional adherence barriers included feeling discouraged or depressed (M = 3.23, SD = 0.70), forgetfulness (M = 3.12, SD = 0.73), and not receiving required help (M = 2.59, SD = 0.94). Possible causes of these might include that, in this study, the majority of participants were older adults (age > 60 years) (159, 61.39%). A previous study showed that older people are more prone to psychological problems. Regarding barriers that result from psychological problems, 50% of participants in this study explained that they often felt bad, and sometimes felt discouraged and depressed (Eraso & Hills, 2021). CRS is associated with a significantly increased prevalence of depression, where 9-26% of patients with CRS will have physician-diagnosed depression (Smith & Alt, 2020). Similarly, another clinical study found that medication adherence significantly improved among CRS patients engaged in mental health treatment (Douglas et al., 2020). Due to the correlation between psychological symptoms and drug compliance, emotional support and treatment for those with psychological problems should be a part of general healthcare service.

Medication barriers included stopping or decreasing taking medication due to side effects (M = 3.23, SD = 0.59), being afraid of the medication side effects (M = 3.22, SD = 0.66), and problems when taking medication (M = 3.19, SD = 0.68). Regarding another possible explanation related to the age of participants as older adults (age >60 years) which was over half (61.39%), older people tend to experience side effects from medication due to impaired function of the liver and kidneys. Due to the coexistence of organ dysfunction and various chronic diseases in the elderly, the use of multiple drugs interferes with each other, and the incidence of adverse drug reactions significantly increases. In addition, most drugs are detoxified by the liver and excreted through the kidneys. In elderly people, liver and kidney function is reduced, drug metabolism

speed and decomposition ability are reduced, drug excretion is slow, drug concentration in the blood is increased, and this is easily accumulated in the body, leading to toxic effects.

In terms of healthcare system barriers, the main barrier was the burden of co-payment (M = 3.25, SD = 0.69). This is possible due to the fact that the majority of participants did not have insurance (175, 67.59%), whereas 84 (32.43%) had insurance but some of these were still required to make co-payments. Most of the participants (53.29%) generally agreed with the statement: "I feel that co-payments for medication are a great burden" while a third of participants (30.07%) strongly agreed with this point. Only 9.65% participants stated that they did not have a financial burden related to medications (Item 8). Generally, public health insurance in China covers only part of medical costs for chronic illnesses. This problem also exists among China's stoke population, and many participants described challenges in committing to the high costs of their medication regimens (Xu et al., 2021). In 2016, out of pocket expenses accounted for 28.8% of China's total health expenditure. However, 44.1% of impoverished households in China still cited illness as the driver of their spending in 2015 (Fuhr et al., 2018). Low coverage rates for rural insurance were considered to pose a medication-related adherence barrier. Controlling for medical adherence barriers should be done to enhance effective medical adherence among CRS patients in China.

Applications of research findings

The findings of this study provide basic information on medication adherence and explain the barriers towards medication adherence for Chinese persons with CRS. Better communication and clear information provision appear to be the most crucial factors for patients to overcome their misunderstanding regarding the prescribed medication. Understanding the choices related to medication treatment and its proper usage may facilitate appropriate adjustment to their medication regimen. In addition, this study' s results encourage researchers to commence research on the relationship between medication adherence and barriers.

Limitation of the study

1. Participants who had other chronic diseases may have to take other medications that may influence medication adherence as a whole;
2. Reports of medication adherence or adherence barriers from participants in this study can be overestimated or underestimated as self-report was used for data collection; and
3. Results of this study were applied at the time of data collection only.

Suggestions for further research

Interventions to enhance communication, provide clearer information, and facilitate open discussion between patients and healthcare providers should be done for earlier detection and to overcome any misunderstandings among patients which may possibly be a barrier to medication adherence. Understanding the choices related to medication treatment and how to apply it may facilitate appropriate adjustment to their medication.

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