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ORIGINAL RESEARCH

A Qualitative Study of Factors Affecting Medication Adherence in Patients with Open-Angle Glaucoma

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Objective: From a cultural perspective, this study explored the facilitators and barriers to medication adherence in patients with open-angle glaucoma (OAG) in Nanjing, aiming to provide evidence for targeted intervention strategies.

Participants and Methods: A qualitative study with in-depth semi-structured interviews was adopted. Between January and April 2025, 14 eligible OAG patients were recruited from the Ophthalmology Department of a Grade A tertiary hospital in Nanjing using purposive sampling. The interview outline was revised based on preliminary interviews and expert opinions. Data was collected through face-to-face interviews and analyzed via Colaizzi's 7-step method, with rigor ensured by reflective notes, data saturation verification, and independent analysis by two researchers.

Results: We found that among the 14 patients, 7 had high adherence, 4 had moderate adherence, and 3 had low adherence. The facilitators included good disease awareness, positive medication beliefs, and social support from healthcare providers, family members, and peers; the barriers were insufficient health literacy, poor perceived therapeutic benefits, and lack of patience among medical staff during diagnosis and treatment.

Conclusion: Medication adherence in Nanjing OAG patients is influenced by multiple factors. Strengthening individualized education, optimizing treatment regimens, and establishing a multidimensional social support system can improve patients' long-term adherence and clinical outcomes. These findings provide references for similar urban populations, and multicenter studies with larger samples are needed to enhance generalizability.

Keywords: open-angle glaucoma, medication adherence, influencing factors, qualitative study

Introduction

Glaucoma is an irreversible blinding eye disease worldwide, which seriously threatens human visual health.[1,2] From 2020 to 2050, the number of glaucoma patients in China is expected to increase from 15.28 million to 25.16 million, and open-angle glaucoma (OAG) accounts for 74% of these cases.[3,4] With the wider spread of medical knowledge and the continuous progress of diagnostic and therapeutic technologies, the detected prevalence of OAG has been increasing steadily.[5,6] This not only reduces patients' quality of life but also brings heavy economic pressure to patients, their families and the whole society. The main goal of OAG treatment is to keep intraocular pressure (IOP) within the target range by taking topical hypotensive drugs every day for a long time, to prevent further deterioration of visual field defects and optic nerve damage.[7] However, 30% to 80% of these patients do not take their medicines as prescribed, and this non-adherence is closely related to disease progression and even blindness.[8] This high rate of non-adherence is a global challenge, with studies from various countries reporting similar figures and identifying a range of patient, provider, and health system-related factors.[9,10] Therefore, it is clinically important to emphasize and improve regular medication adherence in OAG patients. At present, most existing studies on medication adherence in glaucoma patients focus on medication schemes, such as administration time, frequency and precautions, and most of them are quantitative

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studies.[11–13] Although numerous global qualitative studies have explored medication adherence in glaucoma patients,[14,15] few have focused on the unique sociocultural characteristics of Nanjing's population within the Chinese healthcare system. Building on prior research, this study comprehensively analyzes facilitators and barriers to medication adherence in this specific setting from a cultural perspective, to provide context-specific evidence and references for developing targeted interventions for similar populations.

Subjects and Methods

Participants

Patients diagnosed with and treated for OAG in the Department of Ophthalmology of a Grade A tertiary hospital in Nanjing from January to April 2025 were enrolled. Purposive sampling was used to recruit participants based on the principle of maximum variation, considering gender, age, time since OAG diagnosis, types of intraocular pressure-lowering medications, medication duration, and comorbid chronic diseases. Inclusion criteria: ① Confirmed OAG diagnosis without other severe ocular comorbidities; ② Aged ≥18 years, with continuous use of at least one IOP-lowering medication for over 3 months; ③ Normal language communication ability for effective interviews; ④ Active and voluntary participation in the study with signed informed consent. Exclusion criteria: ①Patients with severe physical disabilities (eg., significant limb dysfunction), cognitive impairments, or severe mental illnesses that hindered normal communication or cooperation during interviews. ② Mid-term withdrawal:Withdrawal of consent or inability to complete the interview process. This study complied with the Declaration of Helsinki. This study was approved by the Ethics Committee of Affiliated Hospital of Nanjing University of Chinese Medicine (Approval No.: 2024NL-067-01). All participants provided written informed consent, which included permission for the publication of their anonymized responses and direct quotes.

Defining the Interview Outline

Pharmacological management of OAG is prolonged and demanding. To ensure accurate medication guidance and better patient experience, the research team developed an interview protocol after systematic literature reviews and in-depth discussions. Two OAG patients underwent preliminary interviews, and their data were excluded from final analysis. The protocol was revised after analyzing preliminary interview materials and incorporating suggestions from glaucoma specialists, head ophthalmic nurses, and specialized eye care nurses. The final interview framework included: ① What do you think of your medication regimen? ② What challenges did you face during treatment? ③ How did you solve them? ④ What factors or strategies helped you maintain medication adherence? ⑤ If you did not maintain adherence, what caused you to stop taking medications? ⑥ What support do you need for medication management?

Data Collection Methods and Quality Control

The interviewer, a senior ophthalmic nurse, completed the Qualitative Study Theory and Practice Training Program at Fudan University, with proficiency in qualitative study and experience in in-depth interviews. Interviews were conducted in well-lit, quiet single patient rooms or consultation rooms after participants finished their medical procedures. Before each interview, the MMAS-8 scale was used with permission to assess medication adherence,[16] and participants were selected based on different adherence levels. Then the interviewer introduced herself, clarified the study's objectives, emphasized confidentiality, and obtained informed consent. Recording and documentation started only after consent. During interviews, the interviewer explored questions based on participants' responses, and closely observed nonverbal cues (eg., body language, facial expressions) with detailed notes. To strengthen methodological rigor and reduce potential bias, the interviewer kept reflexive notes throughout the entire data collection process, recording personal reflections, emotions, and pre-existing assumptions that could affect the interview or data interpretation. These notes were fully discussed among the research team during data analysis to support a more objective and in-depth interpretation of participants' experiences. The sample size was determined according to data saturation, and recruitment was ceased when no new themes or codes emerged from the data.

Data Collation and Analysis

Within 24 hours of completing interviews, the interviewer transcribed audio recordings into verbatim transcripts and conducted thorough cross-checks. The interviewer repeatedly reviewed and immersed herself in understanding participants authentic emotional expressions, followed by final verification with interviewees. The research team (comprising the interviewer and a masters student in nursing) systematically analyzed materials using Colaizzis 7-step analytical framework: ① Read all textual materials word-for-word; ② Identify arguments related to medication adherence; ③ Code frequently occurring themes; ④ Summarize codes and conduct inductive analysis to identify common concepts or characteristics, then refine themes; ⑤ Elaborate on themes; ⑥ Consolidate overlapping themes through further refinement, ⑦ conducting follow-up interviews to verify material authenticity. Both researchers independently analyzed data through repeated readings and comparisons with original materials. Disagreements were resolved through group discussion.

Results

Ultimately, 14 eligible patients were enrolled, aged 49–75 years (mean 62.7 ± 8.09 years), and numbered A1 to A14. Interviews ranged in length from 35 to 46 minutes, with an overall mean of 40 minutes. Seven patients showed high adherence with no missed doses since treatment initiation. Four had moderate adherence and reported difficulty with regular dosing. Three had low adherence, with missed doses or self-discontinuation. Their demographic and clinical characteristics are presented in Table 1.

Facilitators to Medication Adherence in Patients with OAG

Good Disease Awareness

Good disease awareness helps patients understand their condition comprehensively and objectively, encouraging them to cooperate with treatment and adhere to medication. As patient A1 stated:

> The doctor told me that failing to take medication on time would lead to elevated intraocular pressure (IOP), which could cause eye pain, blurred vision, and even optic nerve damage. Therefore, I take my medication on time.

Disease awareness and medication adherence reinforced each other. Patient A4 noted: “Glaucoma is a chronic condition. I need to adhere to medication, maintain emotional stability, and adopt a healthy lifestyle.”

Positive Medication Beliefs

Patients with strong medication beliefs often cooperate actively with treatment to achieve better outcomes. During interviews, some participants expressed confidence in pharmacotherapy and recognized the importance of consistent adherence, avoiding missed doses, unauthorized dose reductions, or discontinuation. Patient A5 commented: “Continued use of eye drops effectively alleviates symptoms, but discontinuation may lead to recurrence.” Their medication beliefs were gradually established through long-term use. Patient A3 shared: “I lost vision in two previous episodes of glaucoma due to non-adherence to medication. I am quite afraid and reluctant to discontinue treatment.”

Robust Social Support

Social support refers to the respect, assistance, and encouragement individuals receive from family, friends, and other sources. Some participants reported multiple support channels, with healthcare institutions as their primary source. Patient A10 stated:

> I feel that the doctor’s guidance is more effective than anything else, as I feel respected. The nurse advised me to prepare boxes of various colors to store eye drops, with the usage frequency labeled on each box to avoid confusion.

Many elderly participants reported age-related memory decline made it hard to adhere to medication schedules; family support and understanding were crucial in these cases. Patient A8 said: “My daughter-in-law (a nurse) is very attentive to my medication. She reminds me to take my medicine on time and sometimes even helps me with eye drops.” A14: “My son takes my medication very seriously, so I never slack off.” Support from patient support clubs was also highlighted. Patient A13

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Table 1 Demographic and Clinical Characteristics of Qualitative Interview Participants (n = 14)

Case Number	Sex	Age (Years)	Marital Status	Occupation	Degree of Education	Domicile	Date of Diagnosis	Types of Eye Drop Medications	Duration of Medication Use *(years)	Comorbidities** (Yes/No)	Family History
A1	Woman	75	Married	Retired	Senior middle school	Nanjing	2024.05	4 types	0.8	Yes	No
A2	Woman	69	Married	Retired	Junior college	Nanjing	2024.04	1 type	1	Yes	Yes
A3	Woman	61	Married	Retired	Master	Nanjing	2024.05	3 types	0.5	No	No
A4	Man	54	Married	Unemployed	An illiterate person	Nanjing	2014.07	2 types	10	No	No
A5	Man	49	Divorced	Ensure public Security	Senior middle school	Nanjing	2019.04	3 types	4	Yes	No
A6	Woman	68	Married	Housewife	An illiterate person	Nanjing	2021.04	3 types	5	No	No
A7	Woman	73	Married	Retired	Junior middle school	Nanjing	2022.07	1 type	2	Yes	No
A8	Man	63	Married	Peasant	Junior middle school	Nantong	2024.01	2 types	1	No	No
A9	Woman	63	Married	Unemployed	Senior middle school	Nanjing	2024.03	1 type	0.5	Yes	No
A10	Man	51	Married	Teacher	Undergraduate course	Nanjing	2019.05	2 types	3	Yes	No
A11	Man	63	Married	Retired	Senior middle school	Nanjing	2024.04	1 type	0.9	Yes	No
A12	Woman	61	Married	Retired	Junior middle school	Chuzhou	2024.02	2 types	1	Yes	Yes
A13	Woman	57	Married	Factory workers	Primary school	Tianchang	2024.03	4 types	1	No	No
A14	Man	72	Married	Retired	Senior middle school	Nanjing	2022.10	3 types	2	No	No

Notes: *up to interview date **Chronic diseases (i.e., hypertension, diabetes mellitus et al) Data was collected through semi-structured interviews conducted between January and April 2025. Duration of medication use reflects the total period from initiation to the interview date. This table presents descriptive characteristics of the sample; no statistical tests were performed."There were two whose household registration was in Chuzhou, Tianchang, but they had been living in Nanjing for a long time.

noted: "My fellow patients often call to remind me to take my medication on time, so I don't dare to slack off." All these supports provided participants with adequate knowledge and emotional assistance for medication adherence.

Barriers to Medication Adherence in Patients with OAG

Lack of Health Literacy

Health literacy involves mastering and applying health knowledge, as well as practical social and behavioral skills. It reflects an individual's motivation and ability to acquire, understand, and use health information to maintain health. Patient A6 stated:

> Sometimes certain disease-related knowledge is ambiguous. I just learned that Carteolol hydrochloride eye drops should be instilled at the medial canthus, and no doctor had previously instructed me to do so.

Patients with low health literacy often have incorrect perceptions and behaviors. Patient A14 commented:

> Sometimes I forget to take medication during the day and skip using Carteolol hydrochloride eye drops, as I believe they may conflict with latanoprost eye drops. Therefore, I only use latanoprost eye drops at night, thinking an 8-hour interval is optimal, so I use only one type.

Patient A12 added: "Isn't it better to use eye drops directly? Every time, I puncture the bottle opening into my eye, which is not wasteful at all." Beyond verbal reports, the interviewer's observations during the study revealed that over half of the participants demonstrated incorrect eye-dropping techniques, such as touching the bottle tip to the eye or missing the eye entirely, highlighting a critical gap between knowledge and practical skill often overlooked by medical staff.

Poor Sense of Therapeutic Benefit

Some participants reported that ineffective IOP control with medication led to unperceived therapeutic effects and negative emotions such as disappointment and helplessness. Patient A9 shared:

> I used Carteolol Hydrochloride Eye Drops for over a month, but the IOP remained high during follow-up. I stopped taking it before finishing the course, leaving more than half the bottle unused.

Prolonged treatment and complex regimens made many patients skeptical of their treatment plans. Patient A6 noted:

> I am using three medications with different daily dosages. Some caused severe adverse reactions: ocular stinging, conjunctival hyperemia, and occasional palpitations. I had hypotension before, yet my IOP still did not decrease.

Lack of Patience in Medical Staff During Diagnosis and Treatment

Patients with lower literacy were more likely to feel overwhelmed and struggle to understand medical jargon or navigate the healthcare system. Patient A8 expressed: "The doctor spoke too much and too quickly, using language I couldn't understand, leaving me helpless." whereas those with higher education tended to feel frustrated by insufficient detailed explanations, patient A10 stated: "I want to share my disease and medication concerns with the doctor but never get the chance. The doctor should be more patient." Some also reported short outpatient consultation times left inquiries unaddressed. Patient A3 commented: "Each follow-up is rushed; the doctor has too many patients, and the next is called in before I finish speaking."

Discussion

Promotion of Disease Education and Medication Guidance

Consistent with our Results, adequate disease awareness improves medication adherence, while low health literacy impairs it-findings aligned with those by Sawada M et al and Okuhara T et al[17,18] This is attributed to two factors: first, higher disease awareness strengthens patients' perception of health risks, increasing medication initiative (as seen in patients A1 and A4); second, OAG often requires long-term, high-frequency use of multiple medications, and patients with low health literacy-especially illiterate and elderly individuals (eg., A6, A12, A14)-have limited understanding of disease and medication knowledge, leading to misconceptions and poor comprehension of treatment regimens that compromise standardized medication use. Besides over half of the participants demonstrated incorrect eye-dropping techniques. These findings

highlight the need for healthcare providers to prioritize disease education and medication guidance. Current studies show non-personalized intervention plans have limited efficacy in improving adherence,[19] an issue also identified in our study. We recommend developing individualized education and guidance plans based on patients' educational backgrounds and comprehension abilities. For illiterate and elderly patients, intuitive methods (oral explanation, illustrated manual, step-by-step demonstration) should convey disease knowledge and medication techniques-particularly instillation methods and frequency. Family members should be encouraged to participate in joint learning to assist with medication management. For younger, more educated patients, science lectures, brochures, and online education can meet their health needs. After education, patients' knowledge mastery should be assessed via teach-back methods and telephone follow-up visits, with emphasis on long-term adherence. Mobile phone reminders and medication diaries can address forgetfulness (a common issue for patients like A14), comprehensively enhancing adherence awareness and compliance.

Optimization of Treatment Regimens

As shown in our Results, positive medication beliefs improve adherence, while poor perceived therapeutic benefit hinders it-consistent with studies by Jager C et al and Greffin K et al[20,21] Two reasons explain this: first, patients with strong beliefs in medication necessity recognize its health benefits, leading to proactive adherence (evidenced by patients A3 and A5); second, adherence declines when patients do not experience disease improvement with standardized treatment-especially illiterate and elderly patients. Healthcare institutions should develop tailored treatment plans based on patients' age, condition, and tolerance.[22] For illiterate and elderly patients, prioritize medications with proven efficacy and minimal adverse effects. Accessible language (eg., "you can see better") should replace technical data to build therapeutic confidence,[23] addressing skepticism noted in patients like A6 (who doubted treatment due to unperceived benefits and adverse reactions). For younger, more educated patients, select long-acting formulations to reduce dosing frequency, and timely communicate objective data (eg., reduced IOP, improved optic nerve function) to ensure they understand treatment effects.[24] Healthcare providers should prioritize patient feedback on adverse reactions, adjusting regimens or providing explanations promptly to alleviate negative emotions. Increasing patient participation in treatment plan selection improves comprehension and acceptance, thereby enhancing adherence and reducing early discontinuation (as seen in patient A9).

Improving the Multidimensional Social Support System

Our findings consistent with Results, indicate social support levels are positively associated with adherence, while lack of patience from healthcare providers hinders it, aligning with results by Almutairi AS and Tambunan EH et al[25,26] As observed in our participants, social support (from healthcare providers, family, and peers, reported by A8, A10, and A13) buffers stress, maintains positive emotions, helps patients acquire health knowledge, enhances self-confidence, and links closely to physical and mental health. Conversely, indifferent provider attitudes-reported by patients A8 and A10-cause resistance, increase disease uncertainty, and heighten anxiety, undermining adherence. We recommend medical institutions standardize doctor-patient communication, incorporating communication skills and emotional management into routine staff training-directly addressing inadequate provider patience identified in our Results.[27] Reserve at least 10 minutes of communication per visit; avoid technical terms for illiterate and elderly patients, proactively inquire about medication experiences, offer follow-up services, provide auxiliary tools (medicine boxes of various colors), establish personalized medication records, and conduct regular follow-ups to ensure adherence. For younger, more educated patients, emphasize listening and timely feedback to address their perceived neglect (reported by A10). Engage family members via lectures and workshops to assist with medication reminders, helping patients feel family warmth and improve adherence (as demonstrated by A8). Establish social groups (eg., patient forums, salons) to encourage experience sharing,[28] enhance peer communication, and build patients' confidence in overcoming the disease-extending peer support noted by A13.

Based on the above, medical institutions may further establish and implement a glaucoma patient case management system to achieve holistic, individualized, and standardized administration of medication monitoring, follow-up, health education, and psychological support, thereby continuously improving medication adherence from a systematic perspective.

This study has several limitations. First, the single-center design may restrict the generalizability of the findings to other hospitals or regions in China Second, purposive sampling carries an inherent risk of selection bias; Third, the cross-

sectional interview data reflect experiences only at a single time point Finally, the external validity of our findings may be limited when applied to populations outside the Chinese sociocultural context.

Summary

Good medication adherence is fundamental to maintaining intraocular pressure stability in patients with open-angle glaucoma. Systematically identifying and analyzing factors associated with adherence is essential for developing targeted clinical interventions. The study conducted in-depth interviews with 14 OAG patients to explore their experiences regarding medication use. Three facilitators of adherence were identified: good disease awareness, positive medication beliefs, and adequate social support. Three major barriers were also recognized: low health literacy, poor perceived therapeutic benefit, and insufficient patience from healthcare providers. A notable strength of this study is that participants were stratified into two subgroups (illiterate/elderly patients and younger, more educated patients) for subgroup analysis, which improves the specificity and applicability of future interventions. Based on these findings we recommend that clinicians and healthcare departments strengthen disease education and standardized medication instruction, optimize individualized treatment regimens, and establish a comprehensive multidimensional social support system, implement a glaucoma patient case management system, with the goal of improving long-term medication adherence and clinical outcomes. As Nanjing is an economically developed city with a representative sociodemographic structure, the findings of this study provide meaningful references for similar urban populations in China. Nevertheless, future studies with larger sample sizes, multicenter designs, and longer follow-up periods are warranted to enhance the generalizability of results.

Ethical Approval

2024NL-067-01

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that there is no conflict of interest in this work.

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