

Research Progress of Medication Adherence in Adolescents with Depression

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Abstract: Medication adherence in adolescents with depression is an important factor affecting the treatment effect and long-term prognosis of the disease. The purpose of this review is to discuss the overview, current situation analysis, influencing factors, methods to improve compliance, new research progress, and future research trends of adolescents with depression medication adherence, and to provide a reference for improving medication adherence of adolescents with depression and improving the therapeutic effect of antidepressants.

Keywords: Adolescent; Depression; Medication adherence; Summary

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1. Introduction

Adolescent depression is a growing concern with significant epidemiological and public health implications. Data from the Chinese Center for Disease Control and Prevention indicates that the detection rate of depression among Chinese adolescents reached 24.6% in 2020, with severe depression accounting for 7.4% [1]. This issue is particularly pronounced among young adults aged 18–34, who are regarded as the most anxious group among the adult population. Epidemiological surveys on adolescent depression show a prevalence rate of approximately 4–8% [2], and there has been a trend of gradual increase and younger age of onset in recent years. Depression arises from a combination of factors, including biological, psychological, and social influences. The family environment, personality traits, health status, and other factors may all play crucial roles in the development of depression. For instance, adolescents from single-parent families are more susceptible to depression, which may be associated with factors such as economic conditions, social pressure, and the family environment. Depression exerts a multifaceted impact on adolescents, encompassing symptoms like low mood, loss of interest, anhedonia, insomnia, decreased appetite, poor concentration, low self-esteem, and loss of confidence in the future. In severe cases, it may even lead to self-harm or suicidal behavior. While the clinical manifestations of depression in adolescents may resemble

those in adults, they can also include irritability, physical symptoms such as abdominal pain or headaches, and sleep disturbances. The treatment of adolescent depression typically requires a comprehensive approach, involving medication, psychotherapy, and the engagement of families and schools. The combination of psychotherapy and antidepressant medications is generally more effective than either alone, especially for adolescents. Medication adherence is of vital importance in the treatment of depression. It refers to the extent to which patients take medications in accordance with the prescribed dosage, timing, and duration ^[3]. Studies have shown that medication adherence among depressed patients is generally low, usually ranging from 35% to 50% ^[4]. Poor adherence can lead to an increased risk of disease recurrence and significantly impair the patient's quality of life. Moreover, numerous factors influence medication adherence in depressed patients, including disease- and treatment-related factors, doctor-related factors, patient-related factors, and cultural and environmental factors. To enhance medication adherence in depressed patients, a range of intervention measures should be implemented. These include targeted health education, mobilization of family support systems, effective communication between doctors and patients, and personalized treatment plans. For example, cognitive behavioral therapy can help patients address negative perceptions of the disease and medications, or modern technological tools such as digital therapeutics and smart pill bottles can be used to assist patients in taking medications regularly. Therefore, this review aims to examine the current status of medication adherence in adolescents with depression, its influencing factors, and intervention strategies to improve it, with the goal of providing insights to enhance the effectiveness of antidepressant treatment.

2. Definition and importance of medication adherence

Medication adherence refers to the degree to which patients follow the doctor's instructions regarding medication use, including compliance with the prescribed dosage, timing, and duration of treatment ^[5]. In the treatment of depression, medication adherence is a critical factor affecting treatment efficacy and disease recurrence. However, studies have consistently shown that medication adherence among depressed patients is generally low. Adherence not only emphasizes the extent to which patients passively follow medical advice but also highlights the role of doctors in the treatment process, including forming a therapeutic alliance with patients and actively participating in and influencing the entire course of treatment ^[6].

The significance of medication adherence is particularly pronounced in the treatment of adolescent depression. Due to adolescents being in a special stage of growth and development, their treatment adherence may be relatively poor. This can result in failure to take medications on time and in the correct dosage, affecting the effectiveness of pharmacotherapy and even increasing the risk of self-harm or suicide. Therefore, improving medication adherence in adolescents with depression is one of the key measures to ensure the safety and effectiveness of treatment and reduce the recurrence rate. Studies have indicated that improving patients' medication adherence requires consideration of disease- and treatment-related factors, doctor-related factors, patient-related factors, and cultural and environmental factors ^[7], and the main intervention measures should be implemented from both the doctor's and the patient's perspectives. In addition, medication adherence in adolescents with depression is also influenced by factors such as their understanding of the disease, duration of medication use, and satisfaction with their doctors. Patients with a better understanding of the disease, shorter duration of medication use, and higher satisfaction with their doctors tend to have better medication adherence ^[8]. Therefore, during the treatment process, doctors and family members need to provide appropriate education and support to help adolescent patients better

understand the disease and the importance of treatment, thereby improving their medication adherence.

3. Current status of medication adherence in adolescents with depression

Adolescent depression is a growing concern, with diverse research data and treatment approaches available. Research data on adolescents with depression shows that the average age of first diagnosis is 13.41 years, with boys accounting for 51.0%, and the average age of first school withdrawal is 13.74 years. Furthermore, the level of depression among Chinese adolescents has been on the rise year by year, which is significantly correlated with social indicators such as economic conditions, social connections, and overall threats.

In terms of treatment, non-pharmacological approaches are important for adolescents with depression, including exercise, social activities, art therapy, and so on^[9]. Meanwhile, pharmacotherapy is also a common treatment method for adolescent depression, but medication adherence remains a challenge. Studies have shown that medication adherence among depressed patients is low, and its influencing factors include disease- and treatment-related factors, doctor-related factors, patient-related factors, and cultural and environmental factors^[7]. Particularly for adolescents, their understanding of the disease, duration of medication use, and satisfaction with their doctors are important factors affecting medication adherence^[10]. To improve medication adherence in adolescents with depression, multi-faceted interventions are required, including strengthening health education, improving doctor-patient communication, simplifying medication regimens, and providing social support. In addition, the treatment of depressed patients needs to take into account individual differences, including demographic factors, clinically relevant factors, social and cultural barriers, as well as the application of traditional methods such as cognitive therapy and behavioral therapy^[11]. Through these measures, patient adherence can be improved, the recurrence rate of depression can be reduced, and patient recovery can be promoted.

4. Influencing factors of medication adherence in adolescents with depression

The factors influencing medication adherence in adolescents with depression include individual characteristics, disease-related factors, treatment-related factors, and psychosocial factors^[12]. Individual characteristics include age, gender, educational level, income status, and marital status. Some studies have shown a negative correlation between age and medication adherence, meaning that younger patients may have poorer adherence^[11]. In addition, shorter education duration, lower income, living alone, and experiencing negative life events may also be associated with lower medication adherence. Among disease-related factors, the severity of depression, disease course, and the patient's understanding of the disease all affect adherence. For example, patients with a better understanding of depression may have better medication adherence^[9]. Disease cognition and societal views on depression also influence whether patients follow medical advice to take medications. Among treatment-related factors, adverse drug reactions, perceived efficacy, treatment duration, drug dosage, and frequency of medication use all affect patient adherence. Adverse reactions may lead patients to reduce the dosage or discontinue medication on their own. In addition, longer treatment duration, heavy medication burden, complex medication administration methods, and high medication costs are also factors affecting adherence^[13]. In terms of psychosocial factors, social support, family environment, social stigma towards mental illness, and cultural beliefs all influence a patient's medication adherence. Good social support, especially encouragement and reminders from family members, is beneficial for patients to take medications regularly. Conversely, if family members hold a negative attitude towards pharmacotherapy for depression, patients may be more likely to discontinue treatment. In

summary, improving medication adherence in adolescents with depression requires comprehensive consideration of individual characteristics, disease-related factors, treatment-related factors, and psychosocial factors.

5. Intervention measures to improve medication adherence

Cognitive Behavioral Therapy (CBT) interventions have been proven to improve patients' medication adherence ^[14]. For example, a study showed that cognitive behavioral interventions for schizophrenic patients who relapsed after discontinuing medication can significantly improve their medication adherence, promote early recovery, and effectively prevent recurrence ^[15]. In addition, cognitive behavioral therapy helps patients identify and improve negative perceptions of the disease and medications ^[16]. Doctors can enhance patients' awareness of the importance of medication adherence by explaining the biological causes of depression. Family therapy emphasizes that family social support plays an important role in chronic disease management, especially in improving treatment adherence. Family support not only includes health education, peer communication, and supervision but also encouragement and reminders from family members, which help patients take medications regularly. On the contrary, the incorrect cognition of family members, such as believing that depression does not require medication or worrying about dependence on long-term medication, may lead patients to discontinue medication ^[17]. Medication therapy management emphasizes that optimizing the medication treatment plan is the key to improving adherence ^[18]. Simplifying the medication administration plan, selecting appropriate medications, adjusting dosages, and managing adverse reactions are all important aspects of improving adherence. For example, reducing the frequency of medication use, using long-acting medications, or sustained-release formulations can improve patient adherence. In addition, regular medical follow-ups can assess treatment efficacy and medication adherence, and adjust the treatment plan according to the patient's situation. These studies indicate that by comprehensively applying intervention measures such as cognitive behavioral therapy, family therapy, and medication therapy management, the medication adherence of adolescents with depression can be effectively improved.

6. Application of new technologies in improving medication adherence

Smart pillboxes: Smart pillboxes, such as MedMinder, ensure that medications are taken at the correct time through automatic medication distribution and locking functions. They are equipped with functions such as voice prompts, indicator lights, and alarms, and update the patient's medication intake status through wireless technology, allowing caregivers and family members to remotely monitor medication adherence.

Digital health tools: The application of digital health tools includes health information platforms, electronic health record systems, virtual care, and consultations. These tools improve patients' health outcomes and quality of life by providing immediate and personalized health management services.

Mobile applications: Mobile applications play an important role in health interventions. They can be used to monitor health conditions, provide health education, promote the development of healthy behaviors, or support disease self-management. The number of digital health intervention applications in app stores exceeds 350,000, indicating strong public interest in using these applications.

Telemedicine services: In some countries, such as the United States, telemedicine services became an important part of many medical services during the COVID-19 pandemic, providing basic medical services, especially in remote areas.

Smart pillboxes for the elderly: The development of smart pillboxes specifically for the elderly is of great

significance. Through structural innovations and functional integration, they help the elderly accurately control the timing, type, and dosage of medication, effectively avoiding problems such as forgetting to take medication, taking the wrong medication, or missing doses. The application of these technologies can not only improve patient adherence but also support the realization of personalized medicine through data analysis and artificial intelligence technology, providing patients with customized treatment and health management plans. At the same time, the development of these technologies also brings challenges, such as data privacy and security issues, as well as the accuracy and completeness of medical information, which require joint efforts from the industry and regulatory authorities to address.

7. Impact of cultural and social factors on adherence

Firstly, different cultural backgrounds may influence patients' perceptions and attitudes towards depression and antidepressant medications. For example, in some cultures, depression may be viewed as a personal weakness or caused by environmental stress rather than biological factors, which may lead patients to be skeptical of pharmacotherapy. Among social factors, social support, especially family support, is crucial for improving medication adherence in depressed patients. Family understanding and support can reduce the patient's sense of stigma, encourage them to actively participate in treatment, and adhere to medication. Conversely, if family members hold prejudices against depression or do not support pharmacotherapy, the patient's adherence may decrease ^[19]. Economic status is also an important social factor affecting adherence. Patients with low incomes may struggle to afford continuous medication purchases due to financial burdens, leading to reduced adherence. In addition, patients who pay for medical treatment out-of-pocket may find it more difficult to bear the costs of long-term treatment compared to those with medical insurance ^[9]. Educational level is also related to medication adherence in depressed patients. Studies have shown that patients with shorter education durations may have lower adherence, which may be related to their understanding of the disease and treatment. In addition, the patient's personal characteristics, such as age, marital status, and occupation, also affect adherence. For example, elderly patients, those without a spouse, farmers, and patients living alone may face more social and psychological barriers, thereby affecting their ability to follow medical advice. In summary, improving medication adherence in depressed patients requires comprehensive consideration of cultural, social, and individual factors ^[20] and the implementation of multifaceted intervention measures, such as providing health education, enhancing family and social support, improving economic affordability, and providing personalized treatment plans.

8. Limitations of existing studies and future directions

Psychotherapies such as CBT and Interpersonal Psychotherapy (IPT) play important roles in the treatment of adolescent depression, especially when pharmacotherapy is ineffective or patients have poor medication adherence. Psychotherapy helps improve patients' social skills and self-confidence, and may enhance their adherence to pharmacotherapy. Regarding studies on the influencing factors of adherence ^[7], medication adherence in depressed patients is affected by a variety of factors, including disease- and treatment-related factors, doctor-related factors, patient-related factors, and cultural and environmental factors. Future research needs to further explore how these factors specifically affect the adherence of adolescent patients and develop corresponding measurement tools. For personalized treatment plans, given the suboptimal medication adherence in adolescents with depression, future research should focus more on formulating individualized and comprehensive treatment plans, which may include

comprehensive consideration of factors such as the patient's understanding of the disease, duration of medication use, and satisfaction with the doctor. In summary, research on medication adherence in adolescents with depression needs to be explored in depth from multiple aspects, including the supplementary role of psychotherapy, detailed research on the influencing factors of adherence, and the formulation of personalized treatment plans. These research directions will help improve the treatment effect and quality of life of adolescents with depression.

9. Conclusion

Overall, the average medication adherence of adolescents with depression is relatively low, and many patients exhibit non-adherent behaviors. The influencing factors are diverse, including individual factors such as the patient's perception of the disease, duration of medication use, and satisfaction with the doctor, as well as social and cultural backgrounds. The complexity of treatment and adverse drug reactions are important factors affecting adherence. In addition, insufficient social support, stigma, cultural beliefs, and other social and cultural factors have a negative impact on adherence.

Therefore, improving medication adherence in adolescents with depression is critical. Based on current evidence, we recommend that clinicians prioritize a combined strategy that integrates cognitive-behavioral interventions with family support. Specifically, this involves changing patients' perceptions of their illness and treatment, while also increasing awareness of depression and its treatment among families and the general public to reduce misunderstanding and stigma, and enhance social acceptance. Families should be actively engaged, family relationships and communication improved, and individualized treatment plans—including drug selection and dosage adjustment—developed according to each patient's condition. In addition, bolstering support from families, schools, and communities and reducing discrimination can further promote adherence. After discharge, telephone or outpatient follow-up should be used to assess treatment efficacy and adherence, allowing timely adjustments to the treatment plan. Implementing these strategies can effectively improve medication adherence in adolescents with depression and enhance disease management and treatment outcomes.

Disclosure statement

The authors declare no conflict of interest.

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