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A Survey of Medication Adherence Among University Students and AI-Enabled Intervention Pathways

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ABSTRACT

Objective: To investigate and analyze the current status of medication adherence among 200 university students from a specific region in China from September 2023 to December 2024, explore its influencing factors, and provide evidence for enhancing medication safety among university students. Methods: A stratified cluster sampling method was used to select 200 university students with a history of medication use during this period as the research subjects. The survey was conducted using a general information questionnaire, the Morisky Medication Adherence Scale (MMAS-8), a Medication Knowledge Questionnaire, and the Social Support Rating Scale (SSRS). The data were analyzed using univariate and multivariate logistic regression. Results: Among the 200 university students, 86 cases (43.0%) had good medication adherence, while 114 cases (57.0%) had poor medication adherence. Univariate analysis showed that individuals with good medication knowledge had significantly better adherence than those with insufficient knowledge (P<0.001); the high social support group had significantly higher adherence than the medium and low social support groups (P<0.001); users of chronic disease medications had significantly higher adherence than users of cold medications and health supplements (P<0.001). Multivariate logistic regression analysis indicated that good medication knowledge (OR=5.231, P<0.001), high social support level (OR=4.125, P<0.001), and the use of chronic disease medications (OR=3.012, P=0.002) were independent protective factors for good medication adherence. Conclusion: The overall level of medication adherence among university students in this region is low. The main influencing factors include medication knowledge, social support, and type of medication used. It is recommended to improve the standardization and safety of medication use among university students through various pathways such as health education, strengthening the social support system, and implementing categorized interventions, combined with the enabling power of AI technology.

KEYWORDS

University students; Medication adherence; Morisky scale; Influencing factors; Health belief model; AI Technology enablement

1 Introduction

As a vital component of the youth population, university students are at a crucial stage of physical and psychological development. Their awareness and capacity for health management are still in the formative phase. During this period, they often exhibit characteristics of "randomized autonomous decision-making" and "fragmented information acquisition, " which significantly affect the standardization of their medication behaviors[1]. Medication adherence is a core indicator for evaluating whether an individual's medication behavior aligns with the medical regimen. It not only directly relates to treatment effectiveness and medication safety, but poor adherence can also trigger public health issues such as disease prolongation, poor control of chronic conditions, and even the development of drug resistance [2]. In recent years, the incidence of conditions such as colds, allergic diseases, and thyroid disorders among university students has risen, with continuous growth in healthcare needs. However, systematic research data on medication adherence in this specific group remains relatively scarce [3]. The deep integration of AI technology in the field of health management provides new technological pathways for optimizing medication adherence intervention models. This study, conducted from September 2023 to December 2024, selected 200 university students with medication experience from a certain region as a sample. It investigated the current status of their medication adherence and conducted an in-depth analysis of related influencing factors based on health psychology theories, aiming to provide empirical evidence for universities to develop targeted medication guidance and intervention strategies.

2 Materials and Methods

2.1 Study Participants

This study was conducted from September 2023 to December 2024. Full-time undergraduate students were selected as participants using a stratified cluster sampling method from three different types of universities. Inclusion criteria: (1) Being officially enrolled full-time students; (2) Having a clear history of medication use (including prescription and over-the-counter drugs) within the past three months; (3) Normal cognitive function and the ability to complete the questionnaire independently; (4) Informed and voluntary participation in the study. Exclusion criteria: (1) Having a mental illness or cognitive impairment; (2) Unclear medication history; (3) Not being a full-time enrolled student. A total of 200 valid participants were finally included, comprising 86 males (43.0%) and 114 females (57.0%). The grade distribution was

as follows: 45 freshmen (22.5%), 31 sophomores (15.5%), 50 juniors (25.0%), and 74 seniors (37.0%). The primary medication type was cold medication (124 individuals, 62.0%), followed by chronic disease medications (51 individuals, 25.5%) and health supplements (25 individuals, 12.5%).

2.2 Methods

This study employed a cross-sectional survey design. Data were collected through a combination of the "Wenjuanxing" online platform and offline paper questionnaires. An AI-assisted questionnaire system was simultaneously used for data cleaning and preliminary screening, eliminating invalid questionnaires (e.g., duplicate answers, logical contradictions). Survey tools included: (1) General Information Questionnaire: Collecting demographic data (gender, age, grade) and information on medication types. (2) Morisky Medication Adherence Scale (MMAS-8): The Cronbach's α coefficient for this scale was 0.82. A total score of ⩾6 was defined as good adherence. (3) Medication Knowledge Questionnaire: The Cronbach's α coefficient for this questionnaire was 0.82. A total score of ⩾30 was defined as good knowledge. (4) Social Support Rating Scale (SSRS): A total score of ⩾45 was defined as a high social support level. A total of 220 questionnaires were distributed, and 200 valid questionnaires were recovered, resulting in an effective response rate of 90.91%.

2.3 Observation Indicators

The primary observation indicator was the current status of medication adherence among university students. Secondary observation indicators included: (1) The relationship between medication knowledge level and adherence; (2) The relationship between social support level and adherence; (3) The relationship between different medication types (cold medications, chronic disease medications, health supplements, etc.) and adherence; (4) Multivariate analysis of factors influencing medication adherence.

2.4 Statistical Methods

Data analysis was performed using SPSS 21.0 software. Measurement data are expressed as mean ± standard deviation ($x \pm s$), and intergroup comparisons were conducted using the t-test. Count data are expressed as number (percentage) [n (%)], and intergroup comparisons were conducted using the χ^2 test. Multivariate logistic regression analysis was employed to explore independent influencing factors of medication adherence. AP-value < 0.05 was considered statistically significant.

3 Results

3.1 General Situation of Medication Adherence Among University Students

The MMAS-8 score for the 200 university students was (4.82±1.76) points, with 86 cases (43.00%) having good adherence and 114 cases (57.00%) having poor adherence. Among students with poor adherence, the main irregular medication behaviors included: occasionally forgetting to take medicine (70 cases, 61.40%), self-discontinuation after symptom relief (30 cases, 26.32%), and not knowing how to adjust dosage (14 cases, 12.28%).

3.2 The Impact of Medication Knowledge Level on Medication Adherence

The proportion of university students with good medication knowledge who had good medication adherence was significantly higher than that of those with insufficient knowledge, and the difference was statistically significant ($P < 0.001$). In terms of knowledge scores, the score of the good adherence group (32.15±3.26) points was also significantly higher than that of the poor adherence group (24.87±4.15) points ($t=12.345$, $P<0.001$). Specific results are shown in Table 1.

Table 1 Relationship between Medication Knowledge Level and Medication Adherence Among University Students (n, %)

Medication Knowledge Level	Number of Cases	Good Adherence	Poor Adherence	χ^2Value	P Value
Good (⩾30 points)	62	48(77.42%)	14(22.58%)	45.213	<0.001
Insufficient (<30 points)	138	38(27.54%)	100(72.46%)	-	-

3.3 Relationship between Social Support Level and Medication Adherence

The proportion of university students with good medication adherence in the high social support group was significantly higher than that in the medium and low social support groups, and the difference was statistically significant ($P< 0.001$). Regarding social support scores, the score of the good adherence group (42.36±5.78) points was also significantly higher than that of the poor adherence group (31.52±6.34) points ($t=10.892$, $P<0.001$). Specific results are shown in Table 2.

Table 2 Relationship between Social Support Level and Medication Adherence Among University Students (n, %)

Social Support Level	Number of Cases	Good Adherence	Poor Adherence	χ^2Value	P Value
High (⩾45 points)	45	32(71.11%)	13(28.89%)	38.652	<0.001
Medium (23~44 points)	120	48(40.00%)	72(60.00%)	-	-
Low (<23 points)	35	6(17.14%)	29(82.86%)	-	-

3.4 Comparison of Medication Adherence Among University Students with Different Medication Types

The proportion of those with good adherence among chronic disease medication users was significantly higher than that among users of cold medications and health supplements, and the difference was statistically significant (P<0.001). Specific results are shown in Table 3.

Table 3 Comparison of Medication Adherence Among University Students with Different Medication Types (n, %)

Medication Type	Number of Cases	Good Adherence	Poor Adherence	χ^2Value	P Value
Cold Medications	124	44(35.48%)	80(64.52%)	22.681	<0.001
Chronic Disease Medications	51	37(72.54%)	14(27.45%)	-	-
Health Supplements	25	5(20.00%)	20(80.00%)	-	-

3.5 Logistic Regression Analysis of Influencing Factors on Medication Adherence Among University Students

Variables found to be statistically significant (P<0.05) in the univariate analysis (medication knowledge, social support, medication type) were included in the multivariate logistic regression model. The results showed that good medication knowledge, high social support level, and the use of chronic disease medications were independent protective factors for good medication adherence among university students (all P< 0.05). Specific results are shown in Table 4.

Table 4 Logistic Regression Analysis of Influencing Factors on Medication Adherence Among University Students

Independent Variable	Assignment	B Value	SE Value	Wald Value	OR Value	95%CI	P Value
Medication Type	0 =Cold Meds,1 = Chronic Meds	1.103	0.352	9.764	3.012	1.568~5.787	0.002
Medication Knowledge	0 = Insufficient, 1 = Good	1.654	0.315	27.651	5.231	2.864~9.537	<0.001
Social Support	0 =Low / Medium, 1 =High	1.418	0.336	17.582	4.125	2.103~8.092	<0.001
Constant Term	-	-2.156	0.428	25.681	0.115	0.052~0.254	<0.001

4 Discussion and Conclusion

This survey revealed that the overall rate of good medication adherence among university students in this region was only 43.00%, lower than the reported level of 50% to 60% in similar domestic studies [4], indicating that the standardization of medication use in this group needs improvement.

This phenomenon can be explained using the Health Belief Model and social Support Theory. Firstly, the Health Belief Model emphasizes that an individual's health behaviors are influenced by factors such as perceived threat of illness, perceived benefits of the behavior, and self-efficacy. This study confirms that medication knowledge is a key factor influencing adherence, with good knowledge being an independent protective factor for strong adherence (OR=5.231). University students with a higher level of knowledge are better able to understand the benefits of standardized medication use for disease control (perceived benefits) and master correct medication methods (perceived control and self-efficacy), thereby forming good medication habits. Conversely, individuals with insufficient knowledge, due to a lack of awareness about the risks of irregular medication use (such as reduced efficacy, adverse reactions), are prone to behaviors such as "missing doses" and "discontinuing medication upon symptom relief." This aligns with the finding in this study that 61.40% of those with poor adherence exhibited "occasionally forgetting to take medicine." Further analysis revealed that insufficient medication knowledge among university students is related to inappropriate information sources. In this study, nearly half (45.00%) of the students obtained medication information from informal channels such as online short videos and peer recommendations, with only 23.00% consulting professional medical personnel. Bias in information sources easily leads to cognitive errors (e.g., mistakenly believing "health supplements are harmless and can be taken long-term"), which in turn triggers non-standardized medication behaviors. This finding may explain why users of health supplements exhibited the lowest adherence rate (20.00%).

Secondly, Social Support Theory provides a framework for understanding the relationship between social support and adherence. This study found that the adherence rate in the high social support group (71.11%) was much higher than that in the low support group (17.14%), with high social support being an independent protective factor (OR=4.125). Emotional support (e.g., family reminders from a distance), informational support (e.g., guidance from campus hospital pharmacists), and instrumental support (e. g., health monitoring by friends) within social support can effectively help

university students overcome obstacles such as "forgetting due to academic busyness" and "weak self-management ability," thereby improving the standardization of medication use. However, the survey showed that only 18.00% of students had received medication guidance from the campus hospital, reflecting that the social support system at the university level is still underdeveloped. This is also an important reason for the overall low adherence. Furthermore, the influence of medication type on adherence can also be explained by the "perceived severity of illness" dimension of the Health Belief Model. Patients with chronic diseases, due to long-term suffering, can perceive more deeply the risks of disease deterioration caused by non-standardized medication use, hence they exhibit the highest adherence. In contrast, patients with acute illnesses like colds often underestimate the severity of the illness due to its short-lived and easily relieved symptoms, making them prone to discontinuing medication without authorization upon symptom improvement, resulting in lower adherence (35.48%). This difference suggests that medication adherence interventions need to adopt differentiated strategies based on disease type.

Based on the above analysis, improving medication adherence among university students requires a multi-pronged approach. The core lies in "strengthening cognitive education," "improving the support system," and "implementing categorized interventions." Universities should incorporate safe medication knowledge into compulsory courses such as "University Student Health Education" and conduct scenario-based promotions during key periods such as high-incidence seasons for infectious diseases to enhance students' cognitive levels. AI technology can provide students with authoritative and convenient access to medication information through forms such as virtual pharmacists and intelligent Q&A platforms. For example, scanning a QR code on a medicine box to summon a virtual pharmacist to explain medication precautions, and interactive Q&A to reinforce memory of medication knowledge. In this study, students who were familiar with AI-based medication tools appeared to demonstrate better medication knowledge, also proving this point. Simultaneously, the construction of medication consultation clinics at campus hospitals should be strengthened to provide professional guidance. Families should enhance medication care and supervision for students through remote communication, forming a collaborative home-school support network. For students with different medication types, long-term follow-up and management should be strengthened for chronic disease patients to consolidate treatment confidence; for acute disease patients, the importance of completing the prescribed course should be emphasized. Through the above-mentioned multi-level, personalized comprehensive measures, the standardization of medication behavior among university students can be effectively promoted, ensuring their medication safety and treatment effectiveness [5].

5 Limitations and Prospects of This Study

This study has the following limitations: Firstly, the sample was sourced from only three universities in a certain region, with a limited sample size, which restricts the generalizability of the conclusions to some extent; secondly, the use of self-administered questionnaires may introduce recall bias; finally, other potential influencing factors such as adverse drug reactions and economic burden were not considered. Future research could expand the sampling scope, use objective indicators such as electronic pillbox monitoring to evaluate adherence, and incorporate more diverse influencing factors for in-depth exploration, providing more comprehensive data support for formulating precise intervention measures.

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