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Analysis of Clinical Characteristics and Health Status of Elderly Diabetic Patients in Northern Sichuan

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Abstract: *This study investigated the multidimensional clinical and health data of 874 elderly diabetic patients in northern Sichuan to support the development of a localized, multidimensional health assessment system for this population. The patients exhibited extremely suboptimal blood glucose control, widespread dyslipidemia, and high susceptibility to diabetic macrovascular complications. Over half of the patients suffered from renal impairment and elevated inflammatory and metabolic markers, indicating prevalent renal damage and chronic metabolic disorders. In terms of non-metabolic health conditions, skin abnormalities and sleep disorders were prevalent, whereas psychological abnormalities were rare. This study summarizes the unique demographic, biochemical, and multidimensional health characteristics of elderly diabetic patients in northern Sichuan, provides a reliable basis for establishing a targeted health assessment system to facilitate precise clinical intervention and standardized health management.*

Keywords: *Diabetes mellitus; Health status assessment; Skin abnormalities; sleep disorders; epidemiological characteristics*

1. Introduction

Diabetes mellitus (DM) is a complex inflammatory disease characterized by chronic hyperglycemia. Long-term uncontrolled hyperglycemia can damage multiple organ systems throughout the body, leading to a spectrum of severe complications [1]. These complications not only severely impair the physical health and quality of life of the elderly population, but also impose a heavy disease and economic burden on families and society, making the prevention and control of DM a key priority in the global public health arena [2].

Multiple factors, including age, gender, smoking and alcohol consumption history, glycemic control status, liver and kidney function, and inflammatory state, have been shown to affect disease progression, complication development, and clinical prognosis of patients [3-5]. Meanwhile, the health needs of the older population are no longer limited to the management of physical diseases, but also cover multiple dimensions including mental health, nutritional diet, safe care, and health education [6], which places higher demands on the comprehensiveness and systematicness of health status assessment [7].

With the rapid development of medical informatization, medical institutions at all levels have accumulated a massive volume of standardized diagnosis and treatment data [8]. With high authenticity, integrity, and clinical relevance, these data serve as the core data resource and critical support for establishing a localized, evidence-based health status evaluation system for geriatric DM [9, 10]. On this basis, this study enrolled 874 elderly patients with DM admitted to a tertiary grade A hospital in the northern Sichuan region of China as the research subjects. Through systematic analysis of the patients' data, this study aims to provide scientific clinical evidence and practical reference for the construction of a geriatric DM health status evaluation system that adapts to the epidemiological characteristics of the population in northern Sichuan.

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2. Materials and Methods

2.1 Study Subjects

The diagnosis and treatment data of elderly inpatients with diabetes mellitus admitted to the hospital over the recent 5 years were collected through the hospital's integrated scientific research platform.

Inclusion criteria: (1) Aged ≥65 years at the time of admission; (2) Hospitalization date between January 1, 2020 and October 31, 2025; (3) Discharge diagnosis of diabetes mellitus; (4) Complete clinical data available for statistical analysis of all indicators involved in this study. For patients with multiple hospitalizations during the study period, the earliest admission record was used as the benchmark for inclusion, and the first test result was adopted for duplicate laboratory indicators. This study was approved by the Medical Ethics Committee of the Affiliated Hospital of North Sichuan Medical College (2025ER618-1).

2.2 Study Methods

A retrospective review of the patients' electronic medical records was conducted, and the following research data were collected and sorted:

General demographic data: age, gender, smoking history, and alcohol drinking history; Clinical hospitalization data: number of hospitalizations during the study period; Laboratory examination indicators: blood pressure, heart rate, blood glucose, glycated hemoglobin (HbA1c), blood lipid profile, liver and kidney function, routine blood test, inflammatory markers, and metabolism-related indicators after admission. The number and proportion of patients with normal, abnormally elevated, and abnormally decreased values of each indicator were counted; Other health status assessment: results of skin assessment, psychological safety assessment, and sleep disorder assessment.

2.3 Statistical Analysis

Descriptive statistical analysis was performed for all data. Categorical variables were presented as frequency (n) and percentage (%), and continuous variables were described by distribution characteristics. All statistical calculations were performed based on the total sample size of 874 patients.

3. Results

3.1 General Demographic Characteristics

A total of 6740 medical records met the initial screening criteria, and 874 valid entries were finally included for analysis after data cleaning. All enrolled patients were aged 65 years and older (Figure 1A), with a generally balanced gender distribution (Figure 1C).

3.2 Characteristics of Hospitalization, Smoking and Alcohol Drinking History

During the study period, the number of hospitalizations varied substantially among patients. The specific distribution was as follows (Figure 1B). Most patients had no more than 5 hospitalizations, while a subset of patients experienced repeated hospitalizations, with the maximum number of hospitalizations reaching 13. This finding reflected poor disease control and recurrent complications in this portion of patients.

Smoking history: 641 patients (73.34%) were never smokers, 134 (15.33%) were former smokers, and 99 (11.33%) were current smokers. More than 70% of the patients had no smoking exposure, and only 11.33% of the patients had ongoing smoking behavior. Alcohol drinking history: 677 patients (77.46%) were never drinkers, 87 (9.95%) were former drinkers, and 110 (12.59%) were current drinkers. Nearly 80% of the patients had no alcohol exposure, and only 12.59% of the patients had ongoing alcohol drinking behavior (Figure 1D).

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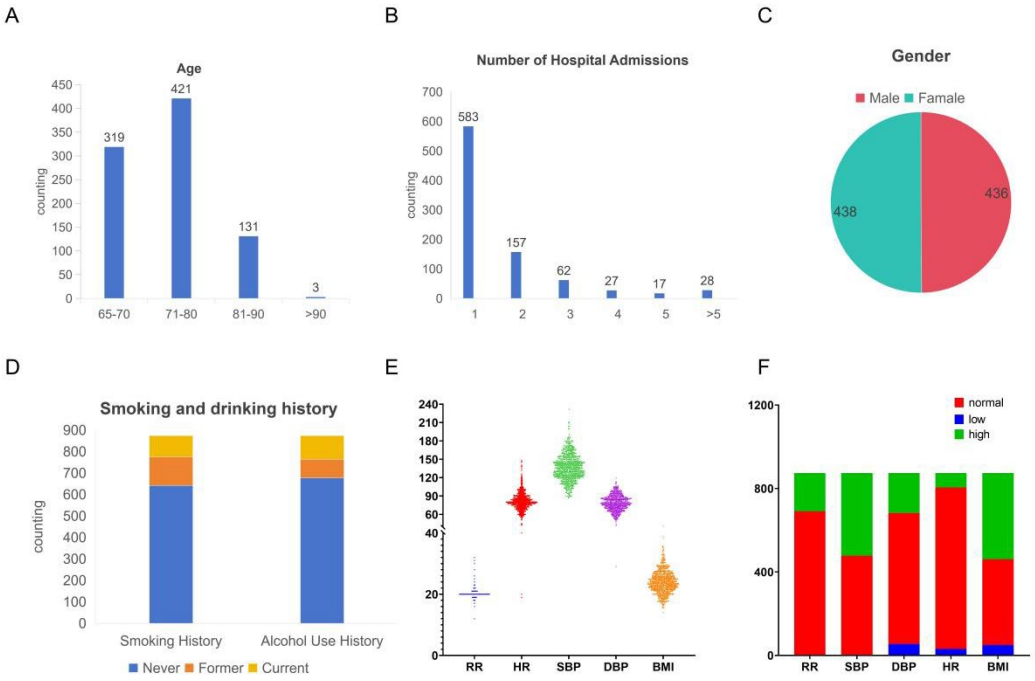

(A) Age; (B) Number of hospitalizations; (C) Gender; (D) Smoking and drinking history; (E) Distribution of routine vital signs and BMI; (F) Abnormal physical indicators.

Figure 1. General demographic characteristics and lifestyle history of subjects.

3.3 Abnormalities of Clinical Laboratory Parameters

3.3.1 Blood Pressure and Vital Sign-Related Indicators

Regarding blood pressure and vital sign-related indicators, systolic blood pressure (SBP) was abnormally elevated in 396 patients, accounting for 45.31% of the total study cohort, indicating that nearly half of the enrolled subjects presented with elevated SBP; diastolic blood pressure (DBP) was abnormally elevated in 191 patients, with a corresponding prevalence of 21.85%. Respiratory rate (RR) remained within the normal reference range in all 874 patients, with no abnormal values detected across the cohort. For heart rate (HR), 69 patients (7.90%) had abnormally elevated levels, while 31 patients (3.55%) exhibited abnormally decreased levels, resulting in an overall abnormal rate of 11.45%. In terms of body mass index (BMI), 50 patients presented with abnormally low values, whereas 413 patients had abnormally elevated BMI, reflecting a high proportion of overweight and obese individuals in this study population (Figure 1E, 1F).

3.3.2 Glycemic Control-Related Indicators

With respect to glycemic control-related indicators, an extremely low rate of achieving standard glycemic targets was identified as the most prominent core clinical feature of the enrolled elderly diabetic patients. Specifically, average blood glucose (ABG) was abnormally elevated in 813 patients, accounting for 93.02% of the total cohort, while only 61 patients (6.98%) had values within the normal reference range. Glycated hemoglobin A1c (HbA1c) was abnormally elevated in 829 patients, representing 94.85% of the study population, with merely 45 patients (5.15%) falling within the normal reference range. For total glycated hemoglobin, abnormally elevated levels were observed in 869 patients, accounting for 99.43% of the cohort, and only 5 patients (0.57%) presented with normal values (Figure 2A, 2C).

3.3.3 Blood Lipid-Related Indicators

For blood lipid-related indicators (Figure 2B, 2C), the lipid profile abnormalities in this study population were predominantly characterized by atherogenic alterations. Abnormally elevated total cholesterol (TC) was detected in 196 patients, accounting for 22.43% of the total cohort, and abnormally elevated triglyceride (TG) was found in 293 patients, with a prevalence of 33.52%. In addition, low-density lipoprotein cholesterol (LDL-C) was abnormally elevated in 113 patients (12.93%), while high-density lipoprotein cholesterol (HDL-C), a well-recognized protective lipid fraction, was abnormally decreased in 379 patients, representing 43.36% of the enrolled subjects. Abnormally elevated very low-

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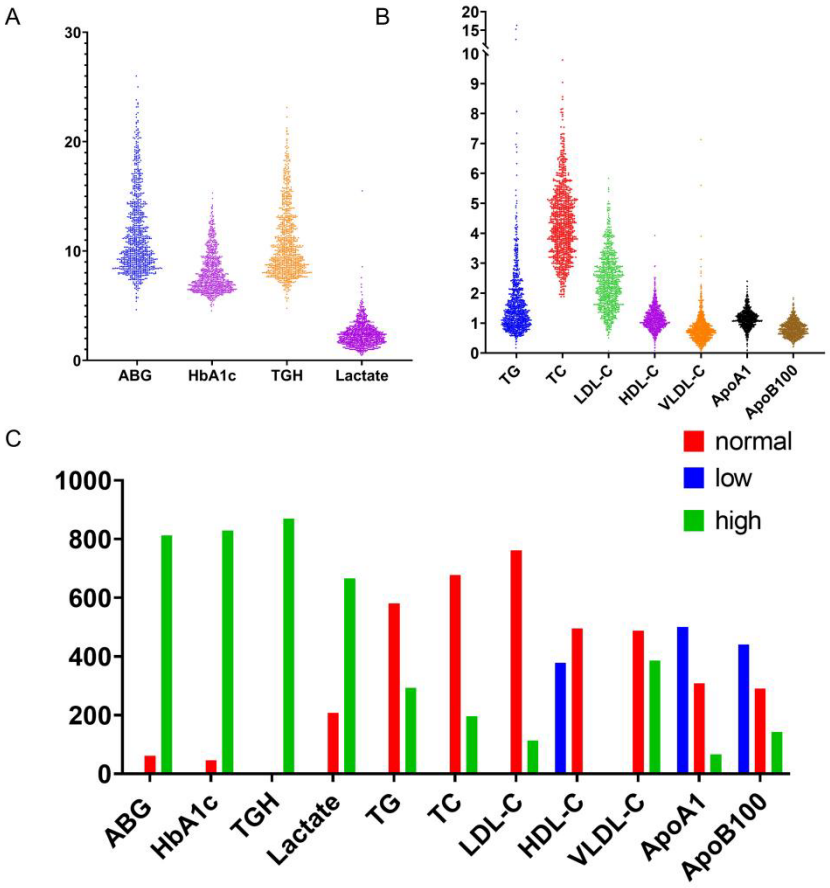
density lipoprotein cholesterol (VLDL-C) was observed in 386 patients (44.16%), along with abnormally decreased apolipoprotein A1 (ApoA1) in 500 patients (57.21%) and abnormally decreased apolipoprotein B100 (ApoB100) in 440 patients (50.34%).

3.3.4 Routine Blood Test-Related Indicators

For routine blood test-related indicators, the predominant abnormalities in the study cohort were decreased eosinophil count and elevated neutrophil count. Specifically, the absolute eosinophil count (AEC) was abnormally decreased in 272 patients, accounting for 31.12% of the total cohort; the absolute neutrophil count (ANC) was abnormally elevated in 181 patients, representing 20.71% of the enrolled subjects. Abnormally elevated white blood cell (WBC) count was detected in 164 patients, with a prevalence of 18.76%, while the absolute lymphocyte count (ALC) was abnormally decreased in 146 patients, accounting for 16.70% of the cohort. For red blood cell (RBC) count, abnormally decreased levels were observed in 154 patients, representing 17.62% of the study population. In terms of platelet (PLT) count, 90 patients (10.30%) presented with abnormally decreased levels and 75 patients (8.58%) had abnormally elevated levels, resulting in an overall abnormal rate of 18.88% (Figure 3A, 3C).



(A) Glycemic control-related indicators; (B) Blood lipid-related indicators; (C) Abnormal status of blood glucose and blood lipids.The full text of the article must be typeset in single column.

Figure 2. Blood glucose and blood lipid profiles.

3.3.5 Inflammation and Metabolism-Related Indicators

With regard to inflammation and metabolism-related indicators, an extremely high prevalence of chronic inflammatory status and metabolic disorders was observed in the enrolled elderly diabetic patients. Specifically, high-sensitivity C-reactive protein (hs-CRP) was abnormally elevated in 504 patients, accounting for 57.67% of the total cohort, with no cases of abnormally decreased levels detected across the study population. Lactate was abnormally elevated in 666 patients, representing 76.20% of the enrolled subjects, with no abnormally decreased values observed. For homocysteine (Hcy), abnormally elevated levels were found in 364 patients, accounting for 41.65% of the cohort, and no cases of abnormally decreased Hcy were identified (Figure 3B, 3C).

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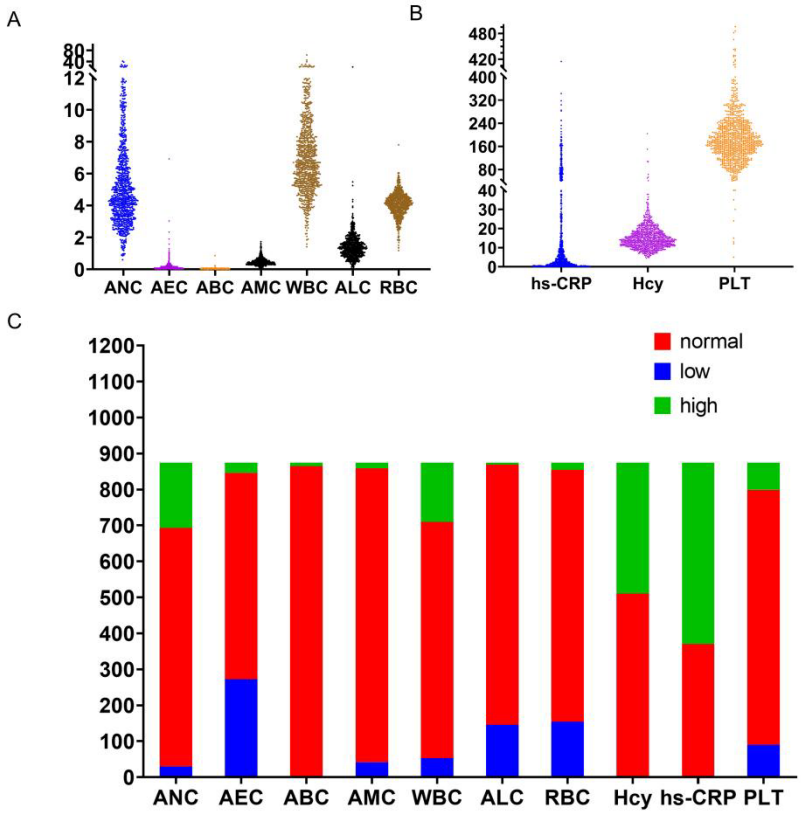

(A) Hematological examination indicators; (B) Inflammatory and metabolic indicators; (C) Abnormal status of hematology, inflammation and metabolism.

Figure 3. Hematological, inflammatory and metabolic profiles.

3.3.6 Liver and Kidney Function-Related Indicators

Renal function impairment was highly prevalent in the enrolled elderly diabetic patients in this study. Specifically, the estimated glomerular filtration rate (eGFR) was abnormally decreased in 473 patients, accounting for 54.12% of the total cohort, with no cases of abnormally elevated eGFR observed, indicating that more than half of the study population presented with renal function impairment. For serum creatinine (Cr), abnormally elevated levels were detected in 137 patients (15.67%) and abnormally decreased levels in 202 patients (23.11%), resulting in an overall abnormal rate of 38.78% . Blood urea (Urea) was abnormally elevated in 285 patients, representing 32.61% of the cohort. For uric acid (UA), 164 patients (18.76%) had abnormally elevated levels and 122 patients (13.96%) presented with abnormally decreased levels, with an overall abnormal rate of 32.72% (Figure 4A, 4C). Regarding liver function-related parameters, total bilirubin (TBIL) was abnormally elevated in 231 patients, accounting for 26.43% of the total study population, while indirect bilirubin (IBIL) was abnormally elevated in 339 patients, with a prevalence of 38.79%. In addition, abnormally elevated alanine aminotransferase (ALT) was observed in 131 patients, representing 14.99% of the cohort, and abnormally elevated aspartate aminotransferase (AST) was detected in 106 patients, accounting for 12.13% of the enrolled subjects (Figure 4B, 4C).

3.4 Results of Additional Health Status Assessments

For the additional health status assessments (Figure 4D), 665 patients (76.09%) had normal results in skin assessment, while 209 patients (23.91%) presented with abnormal findings. For psychological safety assessment, 867 patients (99.20%) showed normal results, with only 7 cases (0.80%) of abnormal outcomes. In terms of sleep disorder assessment, normal results were observed in 672 patients (76.89%), and abnormal findings were detected in 202 patients, accounting for 23.11% of the total cohort. The prevalence of skin abnormalities and sleep disorders was similar in the study population, both at approximately 23%, which were identified as the most predominant non-metabolic health issues among the enrolled elderly diabetic patients; in contrast, the prevalence of psychological safety abnormalities

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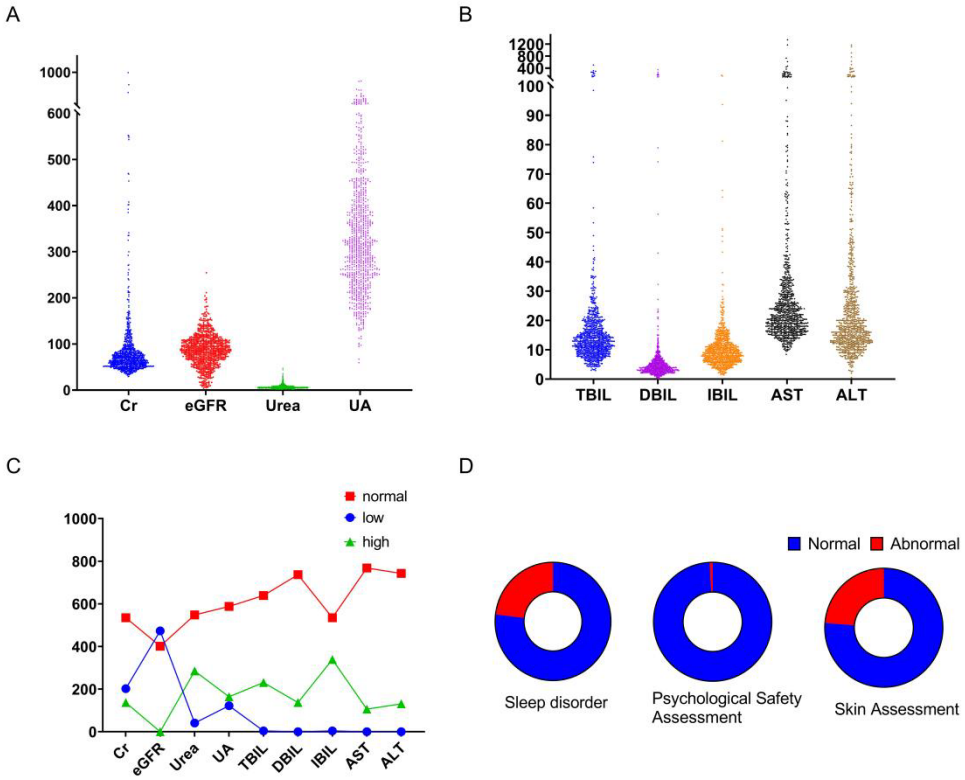
was extremely low, suggesting an overall favorable psychological status in the study cohort.



(A) Liver function-related indicators; (B) Renal function-related indicators; (C) Abnormal status of hepatic and renal function; (D) Evaluation of other health conditions.

Figure 4. Hepatic and renal function together with other health statuses.

4. Discussion

In this study, 3.20% of patients were hospitalized more than 5 times. Hospitalization frequency is a comprehensive outcome indicator reflecting disease severity, complication progression, treatment adherence, and prognostic risk in elderly diabetic patients, and directly represents their overall health status [11]. Smoking and excessive alcohol consumption are well-established modifiable risk factors for the development and progression of diabetic complications [12, 13]. Therefore, smoking history and drinking history should be included as two core indicators in the assessment system. These indicators can not only be used to evaluate patients' health risk levels but also to identify key populations for health education and behavioral interventions.

Laboratory examination indicators provide objective and quantitative evidence for evaluating physical health status, complication risk, and disease progression in elderly diabetic patients [8]. In this study, more than 90% of patients had abnormally elevated average blood glucose and HbA1c, and nearly 100% had abnormal total glycated hemoglobin, with a blood glucose control rate of less than 10%. Blood glucose control is the core of full-cycle management of elderly diabetes and the primary basic indicator for evaluating patients' health status [14], which should be assigned the highest weight in the system.

Meanwhile, nearly half of the patients in this study had elevated systolic blood pressure, more than 40% had decreased HDL-C and elevated VLDL-C. Dyslipidemia was mainly characterized by atherosclerotic lipid profile changes, indicating an extremely high risk of diabetic macrovascular complications in this population [15]. These parameters should be included as core evaluation dimensions in the system, and antihypertensive and lipid-lowering interventions should be strengthened simultaneously with hypoglycemic treatment to realize the guiding value of the assessment system for clinical practice [16, 17].

Notably, more than 50% of patients in this study had reduced eGFR, suggesting that renal impairment is extremely prevalent in this population and represents the most common diabetic microvascular

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complication [18]. Elderly diabetic patients are more susceptible to renal impairment, which is associated with both the natural physiological decline of renal function in the elderly and multiple factors including long-term hyperglycemia and hypertension-induced renal microvascular damage, drug-related renal burden, and infection-induced injury [19, 20]. Inflammatory and metabolic indicators play an important role in early warning of disease progression risk in the assessment system. In this study, more than 50% of patients had elevated hs-CRP, more than 75% had elevated lactic acid, and more than 40% had elevated Hcy, indicating a widespread chronic inflammatory state and metabolic disorder in this population. These findings suggest that hs-CRP, lactic acid, and Hcy can serve as supplementary indicators in the disease progression risk warning module of the assessment system. They can be used to identify patients at high risk of disease progression and critical illness, improve the risk warning function of the system, and provide evidence for early clinical intervention.

Health needs have long extended beyond physical disease control to encompass multiple dimensions including physical function, sleep health, and mental health [3, 4]. In this study, the prevalence rates of skin abnormalities and sleep disorders were both approximately 23%, representing the most common non-metabolic health problems in this population. Skin abnormalities are common complications of diabetes, serving as both external manifestations of target organ damage and important factors affecting patients' quality of life [21]. Sleep disorders are associated with multiple factors including altered circadian rhythms in the elderly, blood glucose fluctuations, and neuropathic pain, while they further exacerbate insulin resistance, increase blood glucose variability, and elevate the risk of cardiovascular events, forming a vicious cycle with patients' health status [5, 22]. These results confirm the importance of skin health assessment and sleep health assessment in the health status evaluation system, enabling comprehensive evaluation of patients' quality of life. The prevalence of psychological safety abnormalities in this study was extremely low, only 0.80%, indicating that the overall psychological state of the elderly diabetic patients included was good. However, this finding also suggests that mental health assessment should be included as a routine screening dimension in the health status evaluation system [23]. Even with a low abnormality rate, it needs to be incorporated into the system for comprehensive screening to provide psychological basis for disease management and adherence improvement in patients.

5. Conclusion

Through the systematic analysis of multidimensional clinical data from 874 elderly patients with diabetes mellitus in northern Sichuan Province, this study can provide standardized evaluation basis for the stratified management and individualized interventions of elderly diabetic patients in northern Sichuan Province.

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