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# Epidemiological Characteristics and Risk Factors of Hypertension Complicated with Type 2 Diabetes Mellitus in Community-Dwelling Middle-Aged and Elderly Population

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ABSTRACT

**Objective** To investigate the epidemiological characteristics and related risk factors of hypertension complicated with type 2 diabetes mellitus among community-dwelling middle-aged and elderly residents, so as to provide evidence-based references for the prevention and management of chronic comorbidities in primary public health practice. **Methods** A cross-sectional epidemiological study was conducted among middle-aged and elderly people in selected communities. Demographic characteristics, living habits, past medical history and related physical examination indicators were collected through questionnaire surveys and routine health examinations. Univariate and multivariate logistic regression analyses were performed to identify independent risk factors associated with hypertension combined with type 2 diabetes. **Results** The prevalence of hypertension complicated with type 2 diabetes in the study population was relatively high, and the comorbid condition was closely related to age, body mass index, dyslipidemia, family history of chronic diseases, unhealthy diet, physical inactivity and other factors. Multivariate regression analysis confirmed that several variables were independent risk factors for the comorbidity of hypertension and type 2 diabetes. **Conclusion** The comorbidity of hypertension and type 2 diabetes is common in middle-aged and elderly community residents, and is affected by a variety of controllable and uncontrollable factors. Targeted screening, health education and comprehensive intervention measures should be strengthened in community health services to reduce the occurrence of chronic comorbidities and improve the health level of residents.

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## 1. Introduction

Hypertension and type 2 diabetes mellitus are two major chronic non-communicable diseases that seriously threaten the health of middle-aged and elderly populations worldwide. With the acceleration of population aging and changes in lifestyle, the prevalence of these two diseases has shown a continuous upward trend in community residents. The coexistence of hypertension and type 2 diabetes mellitus can significantly increase the risk of cardiovascular and cerebrovascular diseases, renal injury and other serious complications, which not only reduces the quality of life of patients, but also brings a heavy economic burden to families and medical systems. Therefore, clarifying the epidemiological distribution characteristics and potential risk factors of hypertension complicated with type 2 diabetes mellitus has important practical significance for formulating targeted prevention and control strategies in community health management.

Previous studies have confirmed that the occurrence and development of hypertension combined with type 2 diabetes are affected by a variety of factors, including age, body metabolism, living habits and genetic background. However, epidemiological characteristics and influencing factors of comorbidity may vary in different regions and populations due to differences in economic levels, dietary structures and health management models. At present, targeted epidemiological research on middle-aged and elderly residents in Chinese communities is still insufficient, and the evidence for local prevention and control needs to be further supplemented. This study conducted a cross-sectional analysis on middle-aged and elderly people in community settings to explore the prevalence, distribution characteristics and independent risk factors of hypertension complicated with type 2 diabetes mellitus. The results are expected to provide reliable epidemiological data and theoretical support for the early screening, comprehensive intervention and long-term management of chronic disease comorbidities in primary public health practice [1][2].

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## 2. Methods and Materials

### 2.1. Study Design and Setting

This cross-sectional epidemiological study was conducted in urban and suburban communities in Lianyungang City, Jiangsu Province, from March 2024 to September 2024. The study was designed in accordance with the standardized guidelines for community chronic disease epidemiological surveys and was approved by the Medical Ethics Committee of Jiangsu Ocean University (No. JSU-2024-036). All procedures were performed in line with the ethical standards of the Declaration of Helsinki. Before participation, every subject was informed of the purpose, content, procedures, potential risks and rights of the study, and written informed consent was obtained from all participants or their legal guardians [3]. The study strictly followed the principles of voluntariness, confidentiality and non-interference with routine medical care.

### 2.2 Study Population and Sampling Strategy

The study population consisted of permanent residents aged 45 years and older who had lived in the selected communities for more than 5 consecutive years. A multi-stage stratified cluster random sampling method was adopted to ensure the representativeness of the sample. First, 6 communities were randomly selected from different administrative districts. Second, all eligible residents in the selected communities were included as research objects. The sample size was calculated based on the estimated prevalence of hypertension complicated with type 2 diabetes mellitus in eastern China, with a confidence level of 95% and a margin of error of 5%, resulting in a minimum sample size of 850 subjects. Finally, a total of 920 residents were enrolled. Exclusion criteria were as follows: severe mental or cognitive disorders; acute cardiovascular and cerebrovascular events within the past 3 months; malignant tumors; severe liver or kidney dysfunction; and incomplete questionnaire or physical examination data. After exclusion, 876 valid subjects were included in the final statistical analysis [4].

### 2.3 Diagnostic Criteria and Case Definition

All diagnoses were based on the latest official clinical guidelines in China. Hypertension was defined as seated systolic blood pressure $\geqslant$ 140 mmHg and/or diastolic blood pressure $\geqslant$ 90 mmHg, or a previous clinical diagnosis of hypertension by a certified physician and current use of antihypertensive drugs [5]. Type 2 diabetes mellitus was defined as fasting plasma glucose $\geqslant$ 7.0 mmol/L, random plasma glucose $\geqslant$ 11.1 mmol/L, or a confirmed clinical diagnosis of type 2 diabetes and receiving hypoglycemic therapy. Hypertension complicated with type 2 diabetes mellitus was defined as meeting the above two diagnostic criteria simultaneously. Subjects with only hypertension or only type 2 diabetes were used as the control group for comparative analysis.

### 2.4 Data Collection and Physical Measurements

Unified structured questionnaires were administered by uniformly trained investigators through face-to-face interviews. The questionnaire included demographic characteristics (gender, age, marital status, education level, family income), lifestyle factors (smoking, alcohol drinking, dietary preference, physical activity level), personal medical history, family history of hypertension and diabetes, and medication use. Physical measurements were performed in a standardized medical environment: height, weight, waist circumference and hip circumference were measured twice and the average value was recorded. Body mass index (BMI) was calculated as weight (kg) divided by height squared ($m^2$). Blood pressure was measured three times with an electronic sphygmomanometer after 10 minutes of rest, and the average value was used for analysis. Fasting venous blood samples (5 mL) were collected in the morning after an overnight fast of at least 8 hours, and sent to a qualified clinical laboratory for testing of fasting plasma glucose, total cholesterol, triglyceride, high-density lipoprotein cholesterol and low-density lipoprotein cholesterol.

### 2.5 Statistical Analysis

All data were double-entered and cross-checked using EpiData 3.1 software to ensure accuracy. Statistical analysis was performed using IBM SPSS 26.0 software. Continuous variables conforming to normal distribution were expressed as mean ± standard deviation (SD), and comparisons between groups were performed using independent-sample t-test. Continuous variables with non-normal distribution were expressed as median and interquartile range (IQR), and the Mann-Whitney U test was used. Categorical variables were expressed as frequencies and percentages (%), and the chi-square test was used for comparison between groups. Variables with $P < 0.1$ in the univariate analysis were included in the multivariate logistic regression model to determine independent risk factors for hypertension complicated with type 2 diabetes mellitus. Odds ratio (OR) and 95% confidence interval (CI) were calculated. A two-sided P-value $< 0.05$ was considered statistically significant [6][7].

## 3. Results

### 3.1 General Profile and Inclusion Status of the Study Population

This community-based cross-sectional study was conducted in several representative urban and suburban communities in Lianyungang City, Jiangsu Province, covering a wide range of residential areas with different economic levels and health service conditions. From March 2024 to September 2024, a total of 920 local permanent residents aged 45 years and above were recruited into the study through a multi-stage stratified cluster random sampling method. During the process of data collection, entry, and quality control, 44 participants were excluded from the final statistical analysis for the following reasons: 18 cases had incomplete questionnaire data due to poor cooperation or memory impairment; 11 cases lacked key physical examination indicators such as blood pressure, height, weight, or waist circumference; 9 cases had missing laboratory test results including fasting blood glucose and blood lipid profiles; 6 cases were diagnosed with severe acute diseases, malignant tumors, or severe liver and kidney dysfunction that might interfere with the research results. Finally, 876 eligible participants were included in the formal analysis, with an effective data utilization rate of 95.22%, which fully met the methodological standards and sample representativeness requirements of large-scale

epidemiological investigations in community populations [8]. Among all valid subjects, males accounted for 48.06% (421/876) and females accounted for 51.94% (455/876), with a basically balanced gender distribution. The age of the study population ranged from 45 to 91 years old, with a mean age of 65.74±9.26 years, covering young-old, middle-old, and old-old age groups, which could comprehensively reflect the epidemiological characteristics of chronic diseases in the whole middle-aged and elderly population. All participants had lived in the local area for more than 5 consecutive years, which excluded the interference of population mobility on the research results and ensured the stability and reliability of the study population.

### *3.2 Baseline Sociodemographic and Clinical Characteristics of All Participants*

In order to clarify the basic differences between individuals with hypertension complicated with type 2 diabetes mellitus and those without comorbidity, the baseline data of all participants were systematically collected and comprehensively analyzed, including demographic characteristics, physical measurement indicators, lifestyle habits, family genetic background, and laboratory examination results. Continuous variables such as age, BMI, and waist circumference were expressed as mean±standard deviation, while categorical variables such as gender, smoking status, and dietary habits were expressed as frequency and percentage. Between the comorbidity group and the non-comorbidity group, statistical comparisons were performed using appropriate statistical methods to identify potential differential indicators. The results showed that there were highly significant differences in multiple key indicators between the two groups. Specifically, the average age of the comorbidity group was significantly higher than that of the non-comorbidity group, suggesting that aging may be an important influencing factor. In terms of physical indicators, the BMI and waist circumference values in the comorbidity group were both higher than those in the non-comorbidity group, indicating that overweight and central obesity were closely related to the occurrence of comorbidity. In addition, the proportion of dyslipidemia, physical inactivity, high-salt diet, and positive family history of chronic diseases in the comorbidity group was also significantly higher than that in the control group. These baseline differences provided an important foundation for further screening and analysis of risk factors. The detailed baseline characteristics and comparison results of all participants are clearly presented in Table 1.

**Table 1. Baseline sociodemographic, clinical, lifestyle and laboratory characteristics of all study participants**

| Characteristic | Total (n=876) | Comorbidity group (n=204) | Non-comorbidity group (n=672) | P-value |
|---|---|---|---|---|
| Male, n (%) | 421 (48.06) | 92 (45.10) | 329 (48.96) | 0.314 |
| Female, n (%) | 455 (51.94) | 112 (54.90) | 343 (51.04) | 0.314 |
| Age, years, mean±SD | 65.74±9.26 | 71.35±8.42 | 63.96±9.15 | <0.001 |
| BMI, kg/m², mean±SD | 25.18±3.42 | 27.63±3.15 | 24.41±3.08 | <0.001 |
| Waist circumference, cm, mean±SD | 84.62±9.15 | 89.74±8.63 | 82.15±8.92 | <0.001 |
| Current smoking, n (%) | 217 (24.77) | 68 (33.33) | 149 (22.17) | 0.001 |
| Current drinking, n (%) | 184 (21.00) | 59 (28.92) | 125 (18.60) | 0.002 |
| Regular exercise, n (%) | 326 (37.22) | 47 (23.04) | 279 (41.52) | <0.001 |
| High-salt diet, n (%) | 386 (44.06) | 119 (58.33) | 267 (39.73) | <0.001 |
| High-fat diet, n (%) | 321 (36.64) | 96 (47.06) | 225 (33.48) | <0.001 |
| Dyslipidemia, n (%) | 337 (38.47) | 124 (60.78) | 213 (31.70) | <0.001 |
| Family history of hypertension, n (%) | 319 (36.42) | 118 (57.84) | 201 (29.91) | <0.001 |
| Family history of diabetes, n (%) | 186 (21.23) | 71 (34.80) | 115 (17.11) | <0.001 |

### *3.3 Prevalence of Hypertension Complicated with Type 2 Diabetes Mellitus in the Study Population*

The overall prevalence of hypertension complicated with type 2 diabetes mellitus among the 876 middle-aged and elderly community residents was calculated and analyzed in this study. According to the unified diagnostic criteria adopted in the research, a total of 204 participants were identified as having both hypertension and type 2 diabetes mellitus, with a comorbidity rate of 23.29%. This prevalence level was relatively high compared with similar studies in some other regions of China, indicating that the comorbidity of hypertension and type 2 diabetes had become a prominent public health problem among local middle-aged and elderly residents. The high comorbidity rate not only increases the risk of serious cardiovascular and cerebrovascular complications, but also brings greater challenges to community health management and clinical treatment. Therefore, it is particularly urgent and necessary to carry out targeted prevention and control measures for this high-risk group.

### *3.4 Distribution of Comorbidity by Gender, Age and Metabolic Subgroups*

To further explore the epidemiological distribution characteristics of hypertension complicated with type 2 diabetes mellitus, stratified analysis was performed according to gender, age, BMI classification, and blood lipid status. The age of the participants was divided into three groups: 45–59 years old (young elderly), 60–74 years old (middle elderly), and ⩾75 years old (advanced elderly). The results showed an extremely significant upward trend in the comorbidity rate with increasing age. The comorbidity

rate in the 45 – 59 age group was the lowest, while it increased significantly in the 60 – 74 age group and reached the highest level in the ⩾75 age group. This age-dependent increasing trend was consistent with the natural occurrence and development law of chronic metabolic diseases, reflecting the long-term accumulation and continuous progression of risk factors in the aging process. In terms of gender distribution, the overall comorbidity rate between males and females was not statistically different, but in the advanced elderly group (⩾75 years old), the comorbidity rate in females was significantly higher than that in males, which may be related to the longer life expectancy of females and the differences in hormone levels and lifestyle. In addition, the comorbidity rate in participants with overweight/obesity and dyslipidemia was also significantly higher than that in normal populations. The detailed prevalence data of comorbidity in different gender and age subgroups are shown in Table 2.

**Table 2. Prevalence of hypertension complicated with type 2 diabetes mellitus stratified by gender and age groups**

| Age group | Male, n/N (%) | Female, n/N (%) | Total, n/N (%) | P-value (trend) |
|---|---|---|---|---|
| 45–59 years | 21/168 (12.50) | 18/149 (12.08) | 39/317 (12.30) | <0.001 |
| 60–74 years | 42/179 (23.46) | 42/163 (25.77) | 84/342 (24.56) | <0.001 |
| ≥75 years | 25/74 (33.78) | 61/143 (42.66) | 86/217 (39.63) | <0.001 |
| Total | 88/421 (21.85) | 116/455 (24.62) | 204/876 (23.29) | 0.326 |

### *3.5 Age-Related and Metabolic Characteristics of Comorbidity*

Further analysis of the relationship between age, metabolic indicators and comorbidity showed that aging was not only a direct risk factor but also synergistically interacted with metabolic disorders to promote the occurrence of comorbidity. With the increase of age, the body's metabolic function gradually declines, insulin sensitivity decreases, and vascular endothelial function is damaged, which creates a pathophysiological basis for the simultaneous occurrence of hypertension and type 2 diabetes. On this basis, unhealthy lifestyles such as unreasonable diet, lack of physical activity, and long-term smoking and drinking can further aggravate metabolic disorders and significantly increase the risk of comorbidity. In addition, the accumulation of abdominal fat represented by increased waist circumference is closely related to insulin resistance, which is a common pathological mechanism of hypertension and type 2 diabetes. Therefore, the combination of aging and metabolic abnormalities forms a superposition effect, which greatly increases the risk of comorbidity in the elderly population.

### *3.6 Univariate Analysis of Potential Risk Factors for Comorbidity*

In order to preliminarily screen the factors related to hypertension complicated with type 2 diabetes mellitus, univariate chi-square test was used to analyze all candidate influencing factors in this study. The selected factors covered four dimensions: demographic characteristics, lifestyle habits, metabolic indicators, and family genetic background. The results of univariate analysis showed that a variety of factors were significantly associated with the occurrence of comorbidity. Specifically, advanced age (⩾60 years old), overweight and obesity (BMI ⩾24 kg/m²), central obesity, dyslipidemia, physical inactivity, high-salt diet, high-fat diet, current smoking, excessive alcohol consumption, family history of hypertension, and family history of diabetes were all associated with an increased risk of comorbidity, and all differences were statistically significant ($P<0.05$). These factors were preliminarily determined as potential risk factors and included in the subsequent multivariate analysis to further verify their independent effects. The univariate analysis can effectively screen out meaningful variables from numerous factors and provide a reliable variable basis for establishing a multivariate regression model. The detailed results of univariate analysis are listed in Table 3.

**Table 3. Univariate chi-square analysis of potential risk factors for hypertension complicated with type 2 diabetes mellitus**

| Risk factor | Comorbidity n (%) | Non-comorbidity n (%) | $\chi^2$ value | P-value |
|---|---|---|---|---|
| Age ≥60 years | 165 (80.89) | 307 (45.68) | 82.45 | <0.001 |
| BMI ≥24 kg/m² | 157 (76.96) | 316 (47.02) | 54.12 | <0.001 |
| Central obesity | 146 (71.57) | 302 (44.94) | 45.38 | <0.001 |
| Dyslipidemia | 124 (60.78) | 213 (31.70) | 56.73 | <0.001 |
| Physical inactivity | 157 (76.96) | 393 (58.48) | 22.36 | <0.001 |
| High-salt diet | 119 (58.33) | 267 (39.73) | 21.46 | <0.001 |
| Current smoking | 68 (33.33) | 149 (22.17) | 10.65 | 0.001 |
| Family history of hypertension | 118 (57.84) | 201 (29.91) | 52.17 | <0.001 |
| Family history of diabetes | 71 (34.80) | 115 (17.11) | 29.74 | <0.001 |

### *3.7 Confounding Factor Adjustment and Variable Screening*

Before performing multivariate logistic regression analysis, confounding factor adjustment and variable screening were carried out to ensure the scientificity and reliability of the results. All variables with P<0.1 in the univariate analysis were included in the multivariate model to avoid missing potential influencing factors. At the same time, multicollinearity diagnosis was conducted between variables to exclude the interference of highly correlated variables on the regression results. After screening and adjustment, the final multivariate model included age, BMI, dyslipidemia, physical activity, and family history of chronic diseases as core independent variables. These variables had clear clinical significance and biological plausibility, and could reasonably explain the occurrence mechanism of hypertension complicated with type 2 diabetes mellitus.

### *3.8 Multivariate Logistic Regression Analysis of Independent Risk Factors*

Multivariate logistic regression analysis was used to determine the independent risk factors of hypertension complicated with type 2 diabetes mellitus after adjusting for confounding factors. The regression model was established with the presence or absence of comorbidity as the dependent variable (yes=1, no=0) and the screened variables as independent variables. The results showed that five variables still had statistical significance after adjustment, which were independently associated with the occurrence of comorbidity. Among them, advanced age had the strongest predictive effect, with an OR value of 2.86, indicating that the risk of comorbidity in the elderly population was nearly three times higher than that in the younger population. Overweight/obesity, dyslipidemia, and family history of chronic diseases also significantly increased the risk of comorbidity, with OR values all above 2.0. Physical inactivity was also an independent risk factor, with an OR value of 1.84, suggesting that lack of exercise was an important modifiable risk factor. All the above independent risk factors had important clinical and public health implications, and most of them could be intervened and improved through lifestyle adjustment and health management. The detailed results of multivariate logistic regression analysis are presented in Table 4.

Table 4. Multivariate logistic regression analysis of independent risk factors for hypertension complicated with type 2 diabetes mellitus

| Variable | β value | SE value | OR (95%CI) | P-value |
|---|---|---|---|---|
| Advanced age | 1.051 | 0.204 | 2.86 (1.92–4.26) | <0.001 |
| Overweight/obesity | 0.837 | 0.172 | 2.31 (1.65–3.23) | <0.001 |
| Dyslipidemia | 0.774 | 0.165 | 2.17 (1.58–2.98) | <0.001 |
| Physical inactivity | 0.611 | 0.169 | 1.84 (1.32–2.56) | <0.001 |
| Family history of chronic disease | 0.889 | 0.167 | 2.43 (1.76–3.35) | <0.001 |

### *3.9 Comprehensive Summary of Key Epidemiological Findings*

In this study, a comprehensive and in-depth analysis of the epidemiological characteristics and risk factors of hypertension complicated with type 2 diabetes mellitus was carried out in a large sample of community middle-aged and elderly residents, and a series of important findings were obtained. First, the overall comorbidity rate of the study population was as high as 23.29%, which was at a relatively high level, indicating that comorbidity has become a serious threat to the health of local middle-aged and elderly people. Second, the comorbidity rate showed a significant age-dependent upward trend, and the advanced elderly population was the key prevention and control group. Third, gender had no significant effect on the overall comorbidity rate, but there were gender differences in the advanced elderly group. Fourth, a variety of modifiable lifestyle and metabolic indicators were closely related to the occurrence of comorbidity. Fifth, multivariate analysis confirmed that aging, overweight/obesity, dyslipidemia, physical inactivity, and family history of chronic diseases were independent risk factors. Most of these risk factors are controllable and intervenable, which provides a clear target and scientific basis for carrying out community-based comprehensive intervention of chronic diseases. These findings not only enrich the regional epidemiological data of chronic metabolic diseases in eastern China, but also provide important evidence support for formulating targeted prevention and control strategies and optimizing public health resource allocation [9]-[12].

## 4. Discussion

### *4.1 Principal Findings of the Present Study*

This study systematically investigated the epidemiological characteristics and risk factors of hypertension complicated with type 2 diabetes mellitus among community-dwelling middle-aged and elderly residents in Lianyungang, Jiangsu Province. The most important finding was that the prevalence of comorbidity reached 23.29%, which was relatively high compared with many other regions in China. This result strongly suggests that the coexistence of hypertension and type 2 diabetes has become a severe public health challenge in local elderly populations. With the accelerating process of population aging and the sustained changes in modern lifestyle, the prevalence of chronic metabolic diseases continues to rise, and their comorbidity has gradually become the mainstream status in clinical practice. Therefore, understanding the distribution and determinants of this comorbidity is critically important for formulating effective prevention and control strategies at the community level.

### *4.2 Age and Gender Distribution Characteristics*

In the present study, the prevalence of hypertension combined with type 2 diabetes increased significantly with age, showing a strong age-dependent trend. The comorbidity rate in participants aged 75 years and older was close to 40%, which was more than three times higher than that in the 45–59-year group. This trend is consistent with the natural pathophysiological changes of aging, including gradual decline in insulin sensitivity, vascular endothelial dysfunction, autonomic nervous system imbalance, and long-term accumulation of multiple risk factors [13]. Aging itself is an uncontrollable risk factor; however, early intervention targeting modifiable

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risk factors may effectively delay or reduce the occurrence of comorbidity in the elderly population.

The trend of increasing comorbidity rate with advancing age is visually displayed in Figure 1. It can be seen intuitively that the growth rate of comorbidity accelerates significantly in the advanced elderly group, which further highlights the necessity of strengthening chronic disease screening and integrated management for the elderly population.

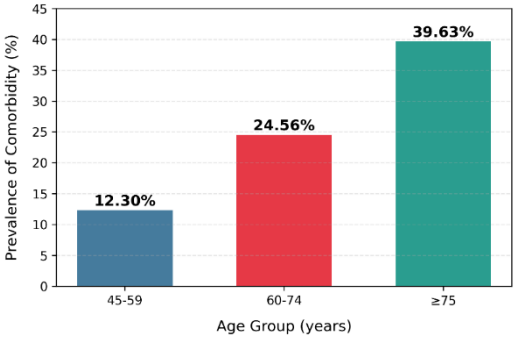


**Figure 1. Prevalence of hypertension complicated with type 2 diabetes mellitus among community residents in different age groups**

In terms of gender distribution, no significant difference was observed between males and females in the overall population. However, in the oldest age group (⩾75 years), females showed a higher comorbidity rate than males. This phenomenon may be explained by the longer life expectancy of females, the relatively higher prevalence of obesity and metabolic disorders in elderly females, and the potential influence of postmenopausal estrogen deficiency on glucose and lipid metabolism. These findings remind health managers that elderly females should be included in key intervention groups in future chronic disease prevention programs.

### *4.3 Risk Factors for Hypertension Complicated with Type 2 Diabetes Mellitus*

The univariate and multivariate logistic regression analyses consistently demonstrated that multiple factors were significantly associated with the development of comorbidity. After adjusting for confounding factors, advanced age, overweight/obesity, dyslipidemia, physical inactivity, and positive family history of chronic diseases were identified as independent risk factors.

Among these risk factors, overweight and obesity showed a strong independent effect, with an OR value of 2.31. Excessive body fat, especially abdominal adiposity, is closely associated with insulin resistance, chronic low-grade inflammation, and sympathetic overactivation, which are the common pathophysiological mechanisms underlying both hypertension and type 2 diabetes. Similarly, dyslipidemia was also an independent risk factor, which further confirmed that metabolic disorders played a core role in the occurrence of comorbidity.Physical inactivity was another modifiable risk factor identified in this study. Regular physical exercise can improve insulin sensitivity, reduce body fat, regulate blood pressure, and alleviate metabolic disorders. Therefore, promoting regular physical activity should be a key component of community-based health education programs. In addition, family history of chronic diseases reflected the potential genetic susceptibility, which indicated that individuals with a family history should receive more frequent screening and early health management.

### *4.4 Comparison with Previous Studies*

The findings of the present study are generally consistent with previous community-based epidemiological investigations conducted in other parts of China. Many studies have reported a high prevalence of hypertension and diabetes comorbidity in elderly individuals and have identified similar risk factors including age, obesity, dyslipidemia, and unhealthy lifestyle. However, some differences in prevalence were observed across regions, which may be attributed to variations in economic development, dietary structure, living habits, and health service levels.Compared with studies in northern or coastal cities, the prevalence in this study was relatively moderate, which reflected the regional characteristics of chronic disease epidemiology in eastern China. Nevertheless, the overall disease burden is still considerable and requires continuous attention from public health authorities.

### *4.5 Clinical and Public Health Implications*

The results of this study have important practical implications for clinical practice and public health policy. First, the high prevalence of comorbidity indicates that routine screening for both hypertension and diabetes should be widely implemented in community health centers, especially for elderly individuals. Second, most of the identified risk factors are modifiable, suggesting that comprehensive lifestyle interventions, including weight control, low-salt and low-fat diet, increased physical activity, and smoking and alcohol restriction, can effectively reduce the risk of comorbidity.Third, integrated management rather than single-disease treatment should be advocated in clinical practice. Patients with hypertension should be regularly monitored for blood glucose and lipid levels, and those with type 2 diabetes should receive adequate blood pressure control. Finally, health policies should prioritize the elderly, individuals with obesity, and those with a family history of chronic diseases, in order to allocate limited medical resources rationally and improve the efficiency of prevention and treatment.

### *4.6 Strengths of the Present Study and Recommendations for Future Research and Practice*

This study has several notable strengths. First, a relatively large sample size was recruited using a multi-stage stratified cluster random sampling method, which ensured good representativeness of the study population. Second, strict quality control was applied during data collection, entry, and statistical analysis to guarantee data accuracy and reliability. Third, both univariate and multivariate logistic regression analyses were used to identify independent risk factors, which improved the scientific validity of the conclusions. Fourth, this study focused on a regional population previously under-investigated, thereby supplementing the epidemiological data of chronic disease comorbidity in eastern China.

Based on the findings of this study, several recommendations are proposed for future research and public health practice. First, large-scale prospective cohort studies are needed to further clarify the causal relationship between lifestyle factors and the incidence of hypertension and diabetes comorbidity. Second, more comprehensive indicators including genetic and psychological factors should be included to establish a more complete predictive model. Third, standardized and sustainable intervention programs should be developed and implemented in communities to evaluate their effectiveness in reducing the prevalence of comorbidity. Fourth, regional health monitoring systems should be established to dynamically observe the changing trends of chronic disease epidemiology.

## 5. Limitations

This study has several minor limitations that should be noted. First, this was a cross-sectional study, which can only indicate statistical associations between variables but cannot confirm clear causal relationships. Second, the study population was limited to community residents in Lianyungang, Jiangsu Province, so the generalizability of the results to other regions may be slightly restricted. Third, some unmeasured factors such as psychological stress, detailed dietary intake, and genetic indicators were not included in the analysis. Despite these limitations, the rigorous study design, large sample size, and standardized data collection ensure that the main conclusions of this research are reliable and valuable for public health practice.

## 6. Conclusion

This study investigated the epidemiological characteristics and risk factors of hypertension complicated with type 2 diabetes mellitus among community-dwelling middle-aged and elderly residents in Lianyungang, Jiangsu Province. The overall prevalence of comorbidity was 23.29%, which increased significantly in an age-dependent manner. Advanced age, overweight/obesity, dyslipidemia, physical inactivity, and family history of chronic diseases were identified as independent risk factors. Most of these risk factors are modifiable through lifestyle intervention and community health management.

These findings provide important epidemiological evidence for the prevention and integrated control of hypertension and diabetes comorbidity in eastern China [14]. Early screening, regular health monitoring, and comprehensive intervention strategies targeting the elderly and high-risk populations are urgently needed to reduce the disease burden and improve the health level of community residents [15]. This study also enriches the regional data of chronic metabolic diseases and offers a practical basis for public health policy-making and primary health care optimization.

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