Post-print of the Study on the Prevalence of Metabolic Syndrome and the Influencing Factors of Behavioral Lifestyles among Middle-aged and Elderly Residents in Shijingshan District, Beijing

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Abstract

Abstract

Background: Metabolic syndrome (MS) is a syndrome characterized by the clustering of multiple cardiometabolic risk factors. It has a high prevalence among middle-aged and elderly populations and can significantly increase the risk of various serious diseases, severely impacting population health and the aging process. It is influenced by multiple factors including demographics, lifestyle, and genetics. Among these, behavioral lifestyles are preventable and controllable, making them a key focus for chronic disease prevention and control. There are significant differences in the living habits of residents across different regions of China. Conducting relevant research in this region can provide a basis for the prevention and control of metabolic syndrome among the middle-aged and elderly population in Beijing.

Objective: To explore the current status of metabolic syndrome and its behavioral lifestyle influencing factors among middle-aged and elderly people in Shijingshan District, Beijing, and to provide a theoretical basis for the prevention of metabolic syndrome from the perspective of behavioral lifestyle.

Methods: The data for this study were derived from the Beijing Vascular Health Stratification Study (BVHS Study). A cross-sectional survey was conducted from July to September 2020 in the Jindingjie community of Shijingshan District, Beijing. A total of 1,647 permanent residents were selected as survey subjects, and 1,569 samples were included for data analysis based on inclusion and exclusion criteria. The questionnaire survey included demographic characteristics, behavioral lifestyles, and the prevalence of chronic diseases. Univariate

analysis and multivariate logistic regression were used to analyze the influencing factors of metabolic syndrome prevalence risk.

Results: Among the 1,569 subjects, there were 374 cases of MS, with a prevalence rate of 23.8384%. They were divided into the MS group ($n = 374$) and the non-MS group ($n = 1,195$). Among the prevalence of MS and its component diseases, overweight and/or obesity had the highest prevalence at 65.2% (1,023 cases), followed by hyperlipidemia at 42.32% (664 cases), hypertension at 39.45% (619 cases), and diabetes at 19.50% (306 cases). Among the various composite diseases, the prevalence of overweight and/or obesity combined with hypertension, and overweight and/or obesity combined with hyperlipidemia both exceeded 30%. The co-morbidity rate of the four component diseases of MS was 6.44%. Among the 374 MS patients, the overweight and/or obese population was the largest, accounting for 95.47% (358 cases). Univariate analysis results showed that there were statistically significant differences between the non-MS group and the MS group in terms of age, education level, exercise status, nap duration, daily sleep duration, smoking status reports, staple food intake, egg intake, and vegetable intake ($P < 0.05$). Multivariate Logistic regression analysis showed that after controlling for age and education level, meeting exercise standards ($OR = 0.667$, $95\%CI = 0.456$–0.976), sleep duration of 6–8 h ($OR = 0.641$, $95\%CI = 0.495$–0.830), sleep duration > 8 h ($OR = 0.566$, $95\%CI = 0.368$–0.871), and weekly egg intake of 8–13 ($OR = 0.361$, $95\%CI = 0.184$–0.708) were protective factors for MS, while nap duration > 60 min ($OR = 1.508$, $95\%CI = 1.079$–2.109) was a risk factor for MS ($P < 0.05$).

Conclusion: The prevalence of MS among 1,569 middle-aged and elderly subjects in the Beijing area was 23.8384%, with overweight/obesity (65.2%) being the most common composite condition. Meeting exercise standards, adequate sleep, and moderate egg intake are protective factors for MS, while long nap duration and advanced age are risk factors. High staple food intake showed a trend toward increased risk, and higher education levels can reduce the risk of prevalence. Metabolic syndrome in the elderly is associated with behavioral lifestyles in various aspects, including exercise, diet, and sleep.

Full Text

Prevalence of Metabolic Syndrome and Influencing Behavioral Lifestyles Among Middle-aged and Elderly Residents in Shijingshan District, Beijing

Abstract

Objective: To investigate the prevalence of metabolic syndrome (MetS) among middle-aged and elderly residents in Shijingshan District, Beijing, and to analyze the impact of behavioral lifestyles on its occurrence.

Methods: A cross-sectional study was conducted using data from the Beijing

Vascular Health Stratification (BVHS) Study. A total of 1,569 permanent residents aged 40 years and older from the Jindingjie community in Shijingshan District were included. Data were collected through questionnaire interviews, physical examinations, and laboratory tests. MetS was defined according to the diagnostic criteria established by the Diabetes Society of the Chinese Medical Association. Univariate analysis and multivariate logistic regression analysis were employed to identify the behavioral and lifestyle factors associated with MetS.

Results: Among the 1,569 participants, 374 cases of MetS were identified, representing a prevalence of 23.84%. Among the components of MetS, overweight and/or obesity was the most common (65.2%), followed by hyperlipidemia (42.32%) and hypertension (39.45%). Multivariate logistic regression analysis revealed that after adjusting for age and educational level, meeting physical activity standards ($OR = 0.667$, $95\%CI = 0.456$–0.976), sleeping 6-8 hours per day ($OR = 0.641$, $95\%CI = 0.495$–0.830), sleeping > 8 hours per day ($OR = 0.566$, $95\%CI = 0.368$–0.871), and consuming 8-13 eggs per week ($OR = 0.361$, $95\%CI = 0.184$–0.708) were independent protective factors against MetS. Conversely, a midday nap duration > 60 minutes ($OR = 1.508$, $95\%CI = 1.079$–2.109) and advanced age (≥ 60 years) were identified as risk factors.

Conclusion: The prevalence of MetS among middle-aged and elderly residents in Shijingshan District is high. Public health interventions should focus on promoting healthy behavioral lifestyles, such as regular physical activity, adequate sleep hygiene, and balanced egg consumption, to mitigate the burden of metabolic syndrome in this population.

Keywords: Metabolic syndrome; Lifestyle; Middle-aged; Elderly; Analysis of influencing factors; Beijing

1 Introduction

Metabolic syndrome (MetS) is a cluster of metabolic risk factors for cardiovascular disease occurring within an individual. Its primary components include obesity (particularly visceral obesity), diabetes or impaired glucose regulation, dyslipidemia, and hypertension. According to previous literature, the prevalence of MetS among middle-aged and elderly populations is approximately 22% [**?**]. MetS not only represents endocrine dysfunction but is also closely associated with a series of severe diseases. To improve the quality of life for the elderly and promote healthy aging, it is of great significance to explore strategies for reducing the prevalence of MetS in this demographic.

The factors influencing MetS are diverse, encompassing demographic characteristics and behavioral lifestyles. Among these, behavioral and lifestyle factors have become a primary focus of chronic disease prevention due to their modi-

fiability. Given the regional variations in climate, economic environment, and culture across China, this study utilizes residents of Shijingshan District as a sample to provide theoretical support for reducing the prevalence of MetS among the elderly in the Beijing area.

2 Objects and Methods

2.1 Study Population

The data for this study were obtained from the Beijing Vascular Health Stratification (BVHS) Study (Clinical Trial Registration Number: ChiCTR2000034085). Between July and September 2020, 1,647 permanent residents were recruited from the Jindingjie Community Health Service Center. After applying inclusion and exclusion criteria, 1,569 subjects were included in the final analysis. This study was approved by the Medical Ethics Committee of Peking University Shougang Hospital (Approval No.: IRBK-2020-014-01).

2.2 Diagnostic Criteria

The diagnosis of MetS was based on the criteria recommended by the Diabetes Society of the Chinese Medical Association [**?**]. MetS is diagnosed when three or more of the following four components are present: 1. Overweight and/or obesity: $BMI \geq 25.0$ kg/m^2. 2. Hyperglycemia: Fasting plasma glucose ≥ 6.1 mmol/L, and/or 2-hour postprandial glucose ≥ 7.8 mmol/L, and/or confirmed diagnosis of type 2 diabetes. 3. Hypertension: Blood pressure $\geq 140/90$ mmHg, and/or confirmed diagnosis of hypertension. 4. Dyslipidemia: Fasting triglycerides ≥ 1.7 mmol/L, and/or fasting HDL-C < 0.9 mmol/L (men) or < 1.0 mmol/L (women).

2.3 Data Collection and Preprocessing

Demographic data and behavioral lifestyles (exercise, sleep, and diet) were collected via self-administered questionnaires. Laboratory indicators included fasting blood glucose, lipid profiles, and blood pressure.

Exercise compliance was defined as ≥ 150 minutes of moderate-intensity exercise or ≥ 75 minutes of high-intensity exercise per week. Sedentary behavior was defined as ≥ 5 hours of sitting per day. Sleep duration was categorized as < 6 h, 6–8 h, and > 8 h. Midday nap duration was categorized as ≤ 30 min, 30–60 min, and > 60 min. Dietary intake (staple foods, meat, eggs, vegetables, and fruits) was quantified based on weekly or daily consumption frequencies.

2.4 Statistical Analysis

Data analysis was performed using SPSS 26.0. Continuous variables are expressed as $\bar{x} \pm s$ and compared using t-tests. Categorical data are presented as percentages and compared using the χ^2 test. Variables showing significance

in univariate analysis were included in a multivariate logistic regression model. $P < 0.05$ was considered statistically significant.

3 Results

3.1 Prevalence of MetS and Components

Among the 1,569 subjects, 374 cases of MetS were identified (23.84%). Overweight and/or obesity had the highest prevalence at 65.2%, followed by hyperlipidemia (42.32%), hypertension (39.45%), and diabetes (19.50%). The co-occurrence rate of all four components was 6.44% . Within the MetS group, 95.47% of patients were overweight or obese .

3.2 Univariate Analysis

Significant differences were observed between the MS and non-MS groups regarding age, education level, physical activity, midday nap duration, daily sleep duration, smoking status, and intake of staple foods, eggs, and vegetables ($P < 0.05$) .

3.3 Multivariate Logistic Regression

After adjusting for age and education level, meeting exercise standards ($OR = 0.667$), sleeping 6–8 hours ($OR = 0.641$), sleeping > 8 hours ($OR = 0.566$), and consuming 8–13 eggs per week ($OR = 0.361$) were protective factors. A midday nap duration > 60 minutes ($OR = 1.508$) and age ≥ 60 years ($OR = 1.517$) were independent risk factors .

4 Discussion

The prevalence of MetS in Shijingshan District (23.84%) is lower than reported in some other regions like Xinjiang (35.8%) or Wuhan (39.04%), likely due to regional lifestyle variations. Overweight and obesity remain the most prominent components, suggesting that weight management is a primary target for intervention.

Our findings emphasize the importance of sleep hygiene. While adequate nocturnal sleep (6–8 hours) is protective, prolonged midday napping (> 60 min) increases MetS risk, possibly due to circadian rhythm disruption and reduced energy expenditure. Regarding diet, a non-linear relationship was found with egg consumption; moderate intake (8–13 eggs/week) was protective, likely due to high-quality protein and phospholipids improving insulin sensitivity, whereas excessive intake may negate these benefits due to high cholesterol.

In conclusion, MetS in the elderly is closely linked to modifiable behaviors. Primary healthcare institutions should promote 150 minutes of moderate exercise per week, encourage sufficient nocturnal sleep while limiting naps to ≤ 30 min-

utes, and provide guidance on balanced egg and staple food intake to reduce the metabolic disease burden.

References

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Note: Figure translations are in progress. See original paper for figures.