Epidemiological Characteristics and Influencing Factors of Osteoarthropathy Among the Elderly Population in Henan Province (Postprint)

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Abstract

Background: Osteoarticular diseases are common and frequently-occurring chronic conditions in the elderly population, which are significantly associated with higher mortality, increased disability, declined functional status, and lower quality of life, imposing a substantial disease burden. Currently, there is no research on the epidemiology and influencing factors of this disease in Henan Province.

Objective: To investigate the epidemiological characteristics and influencing factors of osteoarticular diseases among the elderly population in Henan Province, and to provide a scientific basis for implementing precise prevention and control measures.

Methods: Using a multi-stage random cluster sampling method, demographic characteristics, past medical history, physical activity, and physical indicators of permanent residents aged $ $18 years in Henan Province in 2018 were collected through questionnaires, medical examinations, and laboratory tests. This study included 1,055 individuals aged $ $60 years as study subjects. Multifactorial Logistic regression analysis based on complex sampling was employed to analyze the characteristics and influencing factors of osteoarticular diseases among elderly populations with different features in Henan Province.

Results: The weighted prevalence of osteoarticular diseases among the elderly population in Henan Province in 2018 was 28.13% (95%CI=28.10%~28.15%). The prevalence was higher among elderly individuals who were female, urban residents, overweight or obese, centrally obese, had dyslipidemia or hyperlipidemia, had no smoking history, had a history of snoring, and engaged in moderate-intensity physical activity, with all differences being statistically significant (P<0.05). Multifactorial Logistic regression analysis revealed that

male sex (OR=0.717, 95%CI=0.550~0.933, P=0.013) was a protective factor for osteoarticular diseases in the elderly population; overweight or obesity (OR=1.329, 95%CI=1.050~1.684, P=0.018) and central obesity (OR=1.305, 95%CI=1.047~1.626, P=0.018) were risk factors for osteoarticular diseases in the elderly population.

Conclusion: Osteoarticular diseases among the elderly population in Henan Province are associated with sex, BMI, and central obesity. Targeted health education and comprehensive interventions should be implemented for elderly individuals who are female, overweight or obese, and centrally obese.

Full Text

Epidemic Characteristics and Influencing Factors of Bone and Joint Diseases among the Elderly Population in Henan Province

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Abstract

Background: Bone and joint diseases are common chronic conditions among the elderly population, significantly associated with higher mortality, increased disability, functional decline, and lower quality of life, creating a substantial disease burden. Currently, no research exists on the prevalence and influencing factors of these diseases in Henan Province. **Objective:** To understand the epidemic characteristics and influencing factors of bone and joint diseases among the elderly population in Henan Province, providing a scientific basis for implementing precise prevention and control measures. **Methods:** Using a multi-stage random cluster sampling method, we collected data on demographic characteristics, medical history, physical activity, and physical indicators from permanent residents aged $ $18 years in Henan Province in 2018 through questionnaires, medical physical examinations, and laboratory testing. This study included 1,055 individuals aged $ $60 years. Multivariate Logistic regression based on complex sampling was used to analyze the characteristics and influencing factors of bone and joint diseases among different subgroups of the elderly population in Henan Province. **Results:** The weighted prevalence of bone and joint diseases among the elderly population in Henan Province in 2018 was 28.13% (95%CI=28.10%~28.15%). The prevalence was significantly higher among women, urban residents, those with overweight or obesity, central obesity, dyslipidemia or hyperlipidemia, non-smokers,

those with a snoring history, and those engaged in moderate-intensity activity (P<0.05). Multivariate Logistic regression analysis showed that male sex (OR=0.717, 95%CI=0.550~0.933, P=0.013) was a protective factor, while overweight or obesity (OR=1.329, 95%CI=1.050~1.684, P=0.018) and central obesity (OR=1.305, 95%CI=1.047~1.626, P=0.018) were risk factors for bone and joint diseases in the elderly population. **Conclusion:** Bone and joint diseases in the elderly population of Henan Province are associated with gender, BMI, and central obesity. Targeted health education and comprehensive interventions should be implemented for women, overweight or obese individuals, and those with central obesity among the elderly population.

Keywords: Joint diseases; Osteoarthritis; Osteoarthrosis; Aged; Population characteristics; Root Cause Analysis; Henan

Introduction

Data from the seventh national population census show that China's population aged 60 years and above reached 264 million, accounting for 18.7% of the total population [1]. Over the next 30 years, China's population aging will intensify further and exhibit a trend toward advanced age, with the elderly population expected to exceed 400 million by 2050, including 150 million people aged 80 and above. The current standard for defining elderly in China is individuals aged 60 years and above [2]. As population aging accelerates, health issues among the elderly have become increasingly prominent major public health concerns. In addition to common chronic diseases such as hypertension, diabetes, and coronary heart disease, bone and joint diseases are also prevalent chronic conditions among the elderly, significantly associated with higher mortality, increased disability, functional decline, and lower quality of life, imposing a substantial burden on family medical costs and social public health expenditures [3-7]. Henan Province is a populous province that will enter a deeply aging society during the "14th Five-Year Plan" period. Currently, no representative report exists on the prevalence of bone and joint diseases among the elderly population in Henan Province. This study utilizes data from 14 chronic disease and risk factor surveillance sites in Henan Province in 2018 to analyze the epidemic characteristics and influencing factors of bone and joint diseases among the elderly population in Henan, providing a scientific basis for precise prevention and control of these diseases.

Methods

1.1 Study Population Data were obtained from the 2018 Henan Province Chronic Disease and Risk Factor Surveillance, which used a multi-stage random cluster sampling method as follows: (1) First stage: Using the population-proportionate-to-size (PPS) method, three townships were randomly selected from each of the 14 surveillance sites; (2) Second stage: Within each selected township, two administrative villages were randomly selected using PPS; (3) Third stage: Within each selected administrative village, resident households

were divided into villager/resident groups with at least 60 households each, and one group was randomly selected using simple random sampling; (4) Fourth stage: Within each selected group, approximately 45 households were chosen, and permanent residents aged $ $18 years in these households were included in the study. After data cleaning, a total of 7,783 survey subjects were obtained. After excluding those with missing important information, this study included 1,055 individuals aged $ $60 years with complete key variable data as the study population to analyze the epidemic characteristics and influencing factors of bone and joint diseases among the elderly population in Henan Province. This study was approved by the Ethics Review Committee of the Chinese Center for Disease Control and Prevention Chronic Non-communicable Disease Prevention and Control Center (Approval No. 201819), and all participants signed informed consent forms.

1.2 Research Methods and Content Data were collected through face-to-face questionnaires, including demographic information (gender, age, education level, etc.), physical activity, and chronic disease status including bone and joint diseases. Standard methods were used to measure height, weight, and waist circumference. Blood biochemical tests included blood glucose, uric acid, and lipids.

1.3 Definitions 1.3.1 Bone and Joint Disease Survey: Included arthritis, fractures, etc., all self-reported as diagnosed by clinical physicians in secondary or higher-level medical institutions.

1.3.2 Marital Status: Categorized based on stable marital or emotional status as: married or cohabiting; unmarried or divorced or widowed or separated.

1.3.3 BMI Classification: According to the Guidelines for Prevention and Control of Overweight and Obesity in Chinese Adults [8], BMI was calculated as weight (kg)/height $(m)^2$ and categorized as: low weight or normal weight (<24 kg/m^2); overweight or obesity ($ 24.0kg/m^{2}).

1.3.4 Health Behavior Definitions: Smoking history referred to current or past daily smoking; drinking history referred to alcohol consumption (any amount within 1 year); snoring history referred to snoring [9] (occurring at least 3 days per week with choking or gasping).

1.3.5 Physical Activity Intensity: Occupational and commuting activities were classified by intensity: moderate intensity included activities requiring moderate physical exertion such as wood sawing, laundry, cleaning, brisk walking, or tai chi that mildly increased breathing and heart rate; high intensity included activities requiring substantial physical exertion such as heavy lifting, digging, long-distance running, swimming, or soccer that significantly increased breathing and heart rate.

1.3.6 Central Obesity: Defined as waist circumference $ $90.0 cm for men and $ $85.0 cm for women [10].

1.3.7 Hyperuricemia: Defined as fasting serum uric acid >420 mmol/L on two separate occasions under normal diet conditions [11].

1.4 Statistical Methods SPSS 21.0 statistical software was used for data cleaning, description, and analysis. The prevalence of bone and joint diseases in the population was estimated using complex sampling and weighting methods [12]. Rao-Scott ^{2} tests adjusted for sampling design were used to compare prevalence differences among different characteristic groups [13]. Complex sampling Logistic regression models were used to analyze the association between major influencing factors and bone and joint diseases in the elderly population. All statistical tests were two-sided, with P<0.05 considered statistically significant.

Results

2.1 General Characteristics of Study Subjects This study included 1,055 elderly individuals, comprising 404 men (38.29%) and 651 women (61.71%), with a mean age of (67.4$±$5.9) years. There were 996 individuals aged 60~<80 years (94.41%), 260 urban residents (58.77%), 914 individuals with education below high school level (86.64%), 919 married or cohabiting individuals (87.11%), 1,004 individuals with medical insurance (98.77%), 723 individuals with overweight or obesity (68.53%), 627 individuals with central obesity (59.43%), 62 individuals with hyperuricemia (5.85%), 330 individuals with dyslipidemia or hyperlipidemia (31.28%), 268 individuals with smoking history (25.40%), 287 individuals with drinking history (27.20%), 416 individuals with snoring history (39.43%), 116 individuals with high-intensity activity (11.00%), 672 individuals with moderate-intensity activity (63.70%), 19 individuals with high-intensity exercise or recreation (1.81%), 162 individuals with moderate-intensity exercise or recreation (15.36%), and 649 individuals who walked or cycled (61.52%). See Table 1 .

2.2 Prevalence of Bone and Joint Diseases in Different Elderly Subgroups The prevalence of bone and joint diseases was significantly higher among women, urban residents, those with overweight or obesity, central obesity, dyslipidemia or hyperlipidemia, non-smokers, those with a snoring history, and those engaged in moderate-intensity activity (P<0.05). See Table 1.

2.3 Multivariate Logistic Regression Analysis Using bone and joint disease diagnosis as the dependent variable (assignment: yes=1, no=0) and factors showing significant prevalence differences as independent variables—including gender (assignment: male=1, female=0), urban/rural residence (assignment: urban=1, rural=0), BMI (assignment: overweight or obesity=1, low weight or normal weight=0), central obesity (assignment: yes=1, no=0), dyslipidemia or hyperlipidemia (assignment: yes=1, no=0), smoking history (assignment: yes=1, no=0), snoring history (assignment: yes=1, no=0), and moderate-intensity activity (assignment: yes=1, no=0)—multivariate Logistic regression analysis

showed that gender, BMI, and central obesity were influencing factors for bone and joint diseases among the elderly population in Henan Province (P<0.05). Specifically, elderly women had a 28.3% higher risk of bone and joint diseases compared to men, and the risk among elderly individuals with overweight or obesity and central obesity was 1.329 times and 1.305 times higher, respectively, than those with low/normal weight and without central obesity (P<0.05). See Table 2 .

Discussion

Bone and joint diseases are common chronic conditions among the elderly population that can cause pain, deformity, and functional impairment, significantly affecting quality of life and substantially increasing the risks of cardiovascular events, lower extremity deep vein thrombosis, and all-cause mortality. These diseases are characterized by high incidence, disability, and medical costs, creating a heavy burden on families and society [5]. Currently, research on factors associated with bone and joint diseases among China's elderly population is limited, and no representative study on influencing factors exists for the elderly population in Henan Province.

This study found that the prevalence of bone and joint diseases among the elderly population in Henan Province in 2018 was 28.13% (95%CI=28.10%~28.15%), which is lower than that reported among community-dwelling elderly in Changsha (32%) [14]. The prevalence was higher among women, urban residents, those with overweight or obesity, central obesity, dyslipidemia or hyperlipidemia, non-smokers, those with a snoring history, and those engaged in moderate-intensity activity. Gender, BMI, and central obesity were identified as influencing factors for bone and joint diseases among the elderly population in Henan Province (P<0.05).

In this study, the prevalence among men was 24.45% (95%CI=24.44%~24.51%), significantly lower than the 31.45% (95%CI=31.42%~31.49%) among women, consistent with multiple studies [14-19]. Bone and joint diseases are closely related to and interact with degenerative changes, immune dysfunction, and susceptibility to infection. Research indicates that female menopause occurs 10-15 years earlier than male androgen decline [20], with faster hormonal reduction, making women more prone to degenerative changes, immune dysfunction, and concurrent infections, thereby increasing the risk of bone and joint diseases. Additionally, gender differences in bone and joint disease incidence are also related to differences in dietary habits, lifestyle, and health awareness between men and women.

The higher prevalence in urban versus rural areas in this study contradicts findings from Zhou Xinru et al. [21] that urban residence is a protective factor but aligns partially with results from JIANG et al. [19]. This discrepancy may be related to dietary and lifestyle patterns in urban areas that promote increased BMI, as well as longer work duration, higher work frequency, and greater work-

load among urban populations compared to rural areas. Overweight or obesity and central obesity are risk factors for bone and joint diseases in the elderly population, consistent with multiple studies [22-24] confirming they are risk factors for various chronic diseases and with previous research [17,25-26]. International studies have also found that bone and joint diseases are associated with BMI and age [27-28], particularly in women [29-30], aligning with our findings. Central obesity, characterized primarily by increased abdominal fat, especially intra-abdominal fat, represents a typical type of overweight and obesity [31]. Research shows that obesity-induced systemic low-grade chronic inflammation through lipid accumulation and adipokines can damage cartilage, leading to the development and progression of bone and joint diseases [32]. Since dyslipidemia or hyperlipidemia can accelerate atherosclerosis formation and affect blood circulation in bone joints, causing local tissue damage [33], this represents the underlying mechanism for the high prevalence among elderly individuals with overweight or obesity, central obesity, and dyslipidemia or hyperlipidemia.

The higher prevalence among non-smokers is consistent with findings from community elderly populations in Haikou and Northeast China [17,19] but contradicts research by FERNÁNDEZ-TORRES et al. [34] identifying smoking as an inducing and aggravating factor for bone and joint diseases. Nicotine in tobacco can increase heart rate and reduce appetite, thereby lowering BMI among smokers, which may explain the lower prevalence among elderly individuals with smoking history compared to non-smokers.

Research has shown that individuals with central obesity have significantly higher snoring rates, and high BMI increases the risk of snoring [9]. Snoring is a primary clinical symptom of obstructive sleep apnea syndrome (OSAHS), which can cause vascular lesions through mechanisms such as endothelial dysfunction, inflammatory responses, and sympathetic nervous system activation [35], affecting blood supply to bone joints and thereby inducing bone and joint diseases. This may explain the higher prevalence among elderly individuals with a snoring history. CHLOE et al. [36] found that long-term moderate-intensity activity can increase the risk of bone and joint diseases, consistent with our results, possibly due to prolonged activity duration, high frequency, and improper activity leading to injuries.

In this study, the impact of gender and BMI (β=-0.333, 0.285) on bone and joint diseases among the elderly population in Henan Province was more pronounced than in community elderly populations in Haikou [17] (β=-0.148, 0.016), possibly related to differences in geography, lifestyle, and economic levels between northern and southern regions.

This study has several limitations. First, the bone and joint disease survey data were based on self-reporting rather than real-time diagnosis by medical professionals. Due to cognitive decline and memory issues among the elderly, underreporting or misreporting may have occurred, potentially introducing bias. Second, this study did not include some variables that might affect the results, such as economic level, nutrition, comorbid chronic conditions, genetic factors,

environmental factors, and psychological factors, making the analysis of influencing factors incomplete. Additionally, this study did not analyze each specific disease included in bone and joint diseases separately, which may prevent identification of disease-specific influencing factors. Future research should conduct more comprehensive studies on different types of bone and joint diseases and their influencing factors to identify more targeted and comprehensive factors associated with bone and joint diseases among the elderly population in Henan Province.

Based on our findings, implementing precise prevention and control of bone and joint diseases among the elderly population in Henan Province should adopt personalized health management models targeting different genders and physical conditions, emphasizing prevention first, combining prevention with treatment, and implementing whole-process management. This includes widely disseminating relevant scientific knowledge in society to establish the concept that "everyone is the first person responsible for their own health" and putting it into practice; implementing lifestyle, psychological, and hormone replacement therapy interventions for elderly women; and conducting comprehensive interventions including lifestyle, pharmacological, surgical, and psychological measures for individuals with central obesity and overweight/obesity. Additionally, a linkage model combining social and individual efforts as well as medical and public health approaches should be implemented to establish a comprehensive health management system covering the entire population and entire life cycle. With societal aging, in-depth research on comprehensive prevention and control of chronic diseases among the elderly population is a key area requiring attention and an important component of integrating medical care and public health efforts.

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