

Prevalence of Chronic Diseases and Multimorbidity Among Urban Community-Dwelling Elderly Individuals in Northeastern China

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Research article

Keywords: Chronic disease, Multimorbidity, Prevalence, Elderly, China

Posted Date: March 16th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-310895/v1>

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Abstract

Background: To evaluate the prevalence of chronic diseases and multimorbidity in the elderly population in an urban community in northeastern China.

Methods: A quantitative, descriptive, cross-sectional study was conducted among an elderly population (≥ 60 years) in the community of Changchun, China, in 2018. The following were used: a sociodemographic questionnaire, anthropometric data, and laboratory examinations. A total of 2171 elderly residents (1328 male) were finally enrolled. Data on 5 chronic diseases—hypertension, diabetes, dyslipidemia, coronary heart disease (CHD) and chronic kidney disease (CKD) —were collected by interviews and physical check-ups and confirmed by physicians.

Results: The age-adjusted prevalences of the five chronic diseases (hypertension, diabetes, dyslipidemia, CHD and CKD) were the following: 67.60%, 63.30%, 61.50%, 51.00% and 8.98%, respectively, in men and 64.10%, 59.70%, 71.10%, 44.80% and 19.70%, respectively, in women. A total of 77.0% of hypertensive subjects were aware of their hypertension status, and 61.0% had their blood pressure controlled. The awareness rate of diabetes was 82.1%, and the controlled rate was 68.4%. A total of 75.4% of the population had two or more chronic conditions, which is called multimorbidity. The elderly individuals had the highest frequency of multiple chronic conditions.

Conclusion: The prevalence of chronic diseases in the elderly was high, and a significant proportion was affected by multimorbidity in urban China. Chronic diseases are important diseases threatening the health of the elderly population.

Background

Today, the phenomenon of the increasing ageing population is a worldwide issue that will result in workforce shortages and increased medical expenditures, in addition to other negative consequences. The percentage of the global population aged 60 and over was 11% by the end of 2011¹. As the world's largest developing country, China is also facing severe aging problems, with the aging population currently accounting for 13% (177 million) according to the latest national census in 2010². However, the elderly population is expected to increase to 25% by 2030³. China has undergone a swift health transition due to the rapid aging process. The spectrum of people's diseases is now dominated by chronic diseases, such as cardiovascular diseases, hypertension, diabetes and chronic kidney disease, especially in the aged, which are the leading causes of death in China, accounting for 86.6% of all deaths as well as 70% of disability-adjusted life-years lost in 2012⁴. They cause a tremendous burden, not only for the affected individuals but also for society as a whole.

A large-scale CNNHS survey on the prevalence of chronic conditions and chronic disease risk factors was conducted in China^{5,6}. Nonetheless, the sample was the general population and lacked representation of

older adults. Although some studies on chronic diseases in elderly individuals have been conducted in China^{3,5,7,8}, data from the northeast are relatively rare.

The concept of multimorbidity has attracted growing interest in recent years. It is recognized that this is of particular relevance to older adults. Patients suffer from more than one kind of chronic disease, defined as multimorbidity⁹. To our knowledge, some epidemiologic studies on multimorbidity have been conducted in most countries. For example, almost two-thirds of people aged over 65 years have been affected by multimorbidity¹⁰; the mean number of chronic conditions was found to be 17 among care home residents in one German study¹¹. In China, there is also some data on multimorbidity^{12,13}. However, information about elderly individuals in general is still greatly needed in northeastern China.

In the current study, we evaluated the prevalence of five chronic diseases and the status of multimorbidity among the elderly population of an urban community in Changchun, which is located in northeastern China.

Methods

Study setting and data collection

This study used a cross-sectional design to observe the prevalence of the five chronic diseases and the multimorbidity of the elderly population in Changchun city, which is the capital of Jilin Province in northeastern China. We used a multistage and stratified random sampling method to select subjects aged ≥ 60 in Changchun City. The sample size was calculated based on a 31.7% prevalence (P) of chronic diseases³ with a 3.0% uncertainty level (E) using the formula $N = Z^2PQ/E^2$ (where $Z = 1.96$ with 95% confidence intervals). We estimated that a total of 924 subjects would be needed.

These subjects underwent interviews, physical examinations and related laboratory tests. A total of 2184 elderly people participated in this study, excluding those with incomplete data, and 2171 subjects aged 60-88 were finally enrolled.

Information was collected through face-to-face interviews with the respondents or with a household member for those who were disabled for reading or answering.

The questionnaire assessed sociodemographic characteristics: sex, age, household monthly income, education level, occupation, health behavior, past illness history, etc. The age groups were categorized as 60–64, 65–69, 70-74 and ≥ 75 years old.

Anthropometric data included height, weight, waist circumference (WC) and blood pressure (BP). Standing height was recorded to the nearest 0.1 cm. Body weight was measured to the nearest 0.1 kg using an electronic scale. Body mass index (BMI) was calculated as weight (kg) divided by the square of height (m^2)¹⁴. Blood pressure was recorded three times at 1-minute intervals by a trained nurse using an upper arm electronic monitor (Omron). The mean values for each participant were then calculated¹⁵.

In addition, we performed laboratory tests on the subjects (after at least 8 hours of fasting), including blood routine, urine routine (urinary protein, urine glucose, urine sediment), fasting blood glucose (FBG), albumin (ALB), alanine aminotransferase (ALT), serum lipids (total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) and triglycerides (TG)), serum creatinine (Scr) and blood urea nitrogen (BUN).

Disease Definition

In this study, chronic diseases included hypertension, diabetes, dyslipidemia, CHD and CKD. Self-reported chronic disease status was obtained by asking the question, "Have you been diagnosed by a physician with the following conditions?"

Diabetes was defined as FPG \geq 7.0 mmol/L, previous diagnosis by a physician or the use of insulin or oral hypoglycemic agents ¹⁶.

Hypertension was defined if the subjects had a mean systolic blood pressure (SBP) \geq 140 mmHg or a mean diastolic blood pressure (DBP) \geq 90 mmHg¹⁵, were already taking antihypertensive medication, or had any self-reported history of hypertension.

Dyslipidemia was defined as a physician's diagnosis and/or abnormal blood lipids (TC \geq 5.18 mmol/L, TG \geq 1.7 mmol/L, HDL-C $<$ 1.04 mmol/L or LDL-C \geq 3.37 mmol/L)¹⁷.

Coronary heart disease (CHD) was defined as a positive response by self-report⁸.

An eGFR (glomerular filtration rate) less than 60 (min \times 1.73 m²) or proteinuria was defined as CKD¹⁸. eGFR was calculated according to the Modification of Diet in Renal Disease (MDRD) Study¹⁹. We defined proteinuria as the presence of protein (>1+) in a spot urine dipstick analysis due to the lack of quantitative data²⁰.

Statistical analysis

Continuous variables were tested using the Kolmogorov-Smirnov test for normality, and nonnormal data are presented as medians and quartiles. The Mann-Whitney U test and Wilcoxon signed ranks test were used to assess differences between the two groups. Categorical variables are presented as frequencies (percentages) and were analyzed using the chi-squared test. The prevalence of chronic diseases was standardized by age (ASR) using direct standardization based on the population composition of the Sixth National Population Census of China (2010). For standardization, we divided the participants into four age groups (60-64 years, 65-69 years, 70-74 years and \geq 75 years). Data were collected and analyzed using SPSS 20 (SPSS, Inc., Chicago, IL, USA). P values < 0.05 were considered statistically significant.

Results

1. Characteristics of urban elderly individuals aged over 60 years in Changchun in 2018

A total of 2171 community elderly residents (1328 male) were finally enrolled in the 2018 survey (as shown in Table 1). All participants were of Han origin. We divided the participants by sex. Men had significantly higher WC, DBP, Scr, and eGFR levels than women. However, women's TG and TC were significantly higher than those of men. The other variables were not significantly different between the two sexes.

2. Prevalence of the five chronic diseases among the elderly in the community

The crude and age-standardized prevalences of the chronic diseases are shown in Table 2. The prevalence of hypertension, diabetes and CHD was higher in men than in women. However, the prevalence of dyslipidemia and CKD was lower in men than in women. More than half of the elderly had hypertension, diabetes and dyslipidemia.

In the available data, we analyzed the awareness and treatment rates of hypertension and diabetes. Among 1440 hypertension patients, 77.0% were aware of their hypertension status overall (79.9% in men vs 75.1% in women, $p=0.035$), and 61.0% had their blood pressure controlled (BP<140/90 mmHg) (63.2% in men vs. 59.5% in women, $p=0.168$). Of 1304 subjects diagnosed with DM, 82.1% (1070/1304) of the patients were aware of their diabetic status. Their awareness rate was 83.7% (442/528) in men and 80.9% (628/776) in women ($p=0.212$). Of 1070 patients, 892 (68.4%) patients had their FBG controlled (FBG<7.0 mmol/L) (71.0% in men vs. 66.6% in women, $p=0.101$)

3. Multimorbidity in the elderly population

Overall, 95.5% (2074/2171) had at least one of the five chronic diseases, and 75.4% (1638/2171) had two or more conditions. Detailed data are shown in Table 3. Elderly people over the age of 60, regardless of age group, had the highest frequency of two or three conditions. Compared with people under the age of 70, the proportion of elderly people over the age of 70 with 4-5 chronic diseases increased significantly.

Discussion

In this study, we analyzed the prevalence of hypertension, diabetes, dyslipidemia, CHD and CKD and their multimorbidity status in the urban elderly population in northeastern China. We defined the above five diseases as chronic diseases. Within a sample of elderly individuals, we found that the prevalence of chronic diseases was high, with a prevalence of hypertension and dyslipidemia as high as 60%, followed by diabetes and CHD affecting more than 50% of men.

The prevalence of hypertension was 67.6% in men and 64.1% in women in our study. Wang *et al.* reported that the prevalence of hypertension was 76.4% among elderly individuals in rural areas of Shandong⁸, which was higher than our result. However, another study of elderly individuals showed that the prevalence of hypertension was 26.0% in Haikou, China, which was significantly lower than the above research results. This may be related to the region, since previous studies have confirmed that hypertension is related to living environments²¹. The awareness and controlled rates of hypertension

among elderly individuals in this study were 77.0% and 61.0%, respectively, which were significantly better than the results for elderly hypertension in Hebei²². Awareness and controlled hypertension among subjects with hypertension were 82.1% and 51.8%, respectively, among US adults aged ≥ 18 in 2011 to 2012²³. However, our awareness rate of hypertension was still lower than that of Americans, although the age range of the study population was different.

The prevalence of diabetes in elderly individuals was 63.3% in men and 59.7% in women; meanwhile, 82.1% of diabetic subjects were aware of their condition, and 68.4% had well-controlled glucose levels in the present study. Liu Miao *et al.* reported that in 2010, the prevalence of diabetes among the elderly was 24.8%, the awareness rate was 73.6%, and the controlled rate was 20.1% in Beijing²⁴. Although the awareness and control rate of diabetes was better in our study than in previous studies, the increase in the prevalence of diabetes is still a problem that cannot be ignored.

Dyslipidemia is an independent risk factor for atherosclerotic cardiovascular disease and it is a common chronic disease among the elderly. Our study showed that the prevalence of dyslipidemia was 63.3% in men and 71.1% in women. According to the 2016 blood lipid control guidelines in China, the overall prevalence of dyslipidemia is 40.4%²⁵. The blood lipid level tends to increase with age. A large-scale epidemiological study confirmed the above trends in China in 2010²⁶. Wang *et al.* reported that the prevalence of dyslipidemia among elderly individuals in rural areas of Shandong was 54.2%⁸. Our results were significantly higher than those of the above studies. This may be related to higher levels of consumption of cooking oil or meat in the urban population, but further verification is needed.

We found the prevalence of CHD was 51.0% in men, while it was 44.8% in women, which is not only higher than that in a study of elderly people (24.5% and 22.8% in men and women) between June 2015 and November 2017 in Iran²⁷ but also higher than a study reporting 34% between June 2010 and July 2011 in rural Shandong in China⁸.

The overall crude prevalence of CKD was 14.9% in our study. This was higher than a previous study at 11.5%, based on a 45-year-old population in 2012²⁸. In contrast, the prevalence of CKD estimated in our study was still well below the level of the USA in 2013²⁹.

It was not surprising that the prevalence of the above chronic diseases was high because they are affected by current lifestyle and environmental factors. In addition, we also analyzed the multimorbidity of the elderly population. We found that the prevalence of multimorbidity was 75.4% in our sample. This fits within the range of the overall prevalence from a systematic review in China but is close to the high value of the range³⁰. A recent multicenter study showed that the average frequency of multimorbidity was 69.3% among elderly individuals, and these data were from medical wards of tertiary-care hospitals in China. In addition, this multicenter study showed that the prevalence of multimorbidity was higher in the northern area (71.7%), which was similar to our results, compared to the south (66%)³¹. In another survey conducted in eastern China, the prevalence of multimorbidity was 90.5% in the rural elderly population,

which was higher than in our study⁸. This may be related to the higher health awareness of urban residents than rural residents. It is worth mentioning that the inclusion and definitions of chronic diseases in the above studies were not exactly the same, which would result in inaccurate comparisons.

This population-based study targeted elderly people living in an urban region in China and covered five general chronic diseases. To our knowledge, this is the first study about the prevalence of chronic diseases and multimorbidity among elderly individuals in urban areas of northeastern China. However, our study had some limitations. First, there were potential errors in self-reporting of chronic conditions, participant recall bias and interviewer bias. Second, the population aged above 80 years accounted for only a tiny proportion (4.6%) of the total sample. Third, the cross-sectional study design limited our ability to establish causal relationships. Furthermore, future studies should collect more information on chronic diseases in the elderly.

Conclusion

In conclusion, despite its potential limitations, this study provided important insights into the prevalence of five chronic conditions and multimorbidity in an elderly population in northeastern China. Elderly people in northeastern China are exposed to health-harming behaviors, such as failure to control their weight, a high salt intake, and a lack of exercise. This baseline evidence may be helpful for identifying health priorities for this population; this knowledge could provide practical guidance for developing relevant health policies. However, the prevalence of chronic diseases and their associated factors in the target population should continue to be monitored in the long term.

Abbreviations

BMI, body mass index; WC, waist circumference; SBP, systolic blood pressure; DBP, diastolic blood pressure; Scr, serum creatinine; BUN, blood urea nitrogen; ALB, albumin; ALT, alanine aminotransferase; WBC, white blood cell; RBC, red blood cell; PLT, platelet; FBG, fasting blood glucose; TG, triglycerides; TC, total cholesterol; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; eGFR, glomerular filtration rate; CHD, coronary heart disease; CKD, chronic kidney disease.

Declarations

Ethics approval and consent to participate

All of the participants provided written informed consent. This study protocol was approved by The First Hospital of Jilin University Ethics Committee. All participants consented to participate.

Consent for publication

Not Applicable.

Availability of data and material

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

There were no competing interests.

Funding

This study was funded by the 11th Youth Fund Project of the First Hospital of Jilin University (JDYY11202036). Funding bodies did not participate to the design of the study, to the collection, analysis and interpretation of data or to the writing of the manuscript.

Author Contributions

Conceived and designed the study: W.J.; Collected the data: Y.Y., and W.JY.; Analyzed the data: W.J. and Y.Y.; Wrote the paper: Y.HM. and L.YY.; All authors reviewed the manuscript.

Acknowledgments

We thank Xue Wei, Qiang Zhang, Dan Yang and Xianguo Kong for the collection and management of the questionnaires and Chunyan Wang and Hengzhao's support and help with the project.

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Tables

Table 1 General characteristics of the study population in 2018

	Male (N=843)	Female (N=1328)	p value
Age	67(63,73)	66(63,72)	0.082
BMI	24.54(22.6,26.45)	24.49(22.34,26.77)	0.865
WC	89(82,94)	83(78,90)	<0.001*
SBP	136(128,149)	136(128,149)	0.848
DBP	80(74,86)	79(72,84)	<0.001*
Scr	88.3(76.35,97.15)	82(71.5,91.33)	<0.001*
BUN	5.6(5.0,6.7)	5.5(4.89,6.6)	0.063
ALB	42.1(41.0,45.0)	42.5(41,44.8)	0.256
ALT	19(14,26)	19(14,26)	0.776
WBC	6.3(5.4,7.7)	6.3(5.3,7.7)	0.843
RBC	4.5(4.21,4.84)	4.5(4.20,4.85)	0.751
PLT	213(172,252)	211(174,247)	0.598
FBG	5.64(5.15,6.46)	5.72(5.17,6.52)	0.19
TG	1.15(0.9,1.6)	1.2(0.9,1.8)	0.005*
TC	5.1(4.5,5.7)	5.37(4.68,6.07)	<0.001*
HDL-C	1.53(1.28,1.64)	1.52(1.26,1.64)	0.195
LDL-C	2.64(2.53,2.94)	2.64(2.53,2.95)	0.37
eGFR	82.43(72.85,98.48)	71.45(62.53,84.77)	<0.001*

BMI, body mass index; WC, waist circumference; SBP, systolic blood pressure; DBP, diastolic blood pressure; Scr, serum creatinine; BUN, blood urea nitrogen; ALB, albumin; ALT, alanine aminotransferase; WBC, white blood cell; RBC, red blood cell; PLT, platelet; FBG, fasting blood glucose; TG, triglycerides; TC, total cholesterol; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; eGFR, glomerular filtration rate.

*indicates statistical significance.

Table 2 Prevalence of the five chronic diseases in the elderly

	Male		Female		p value
	Crude	ASR	Crude	ASR	
Hypertension	68.00%	67.60%	65.30%	64.10%	<0.001*
Diabetes	62.60%	63.30%	58.40%	59.70%	<0.001*
Dyslipidemia	61.60%	61.50%	70.90%	71.10%	<0.001*
CHD	50.20%	51.00%	43.40%	44.80%	<0.001*
CKD	8.50%	8.98%	18.90%	19.70%	<0.001*

ASR, age-standardized prevalence rate (using the standard Chinese population in 2010); CHD, coronary heart disease; CKD, chronic kidney disease

P value: male vs female.

*indicates statistical significance.

Table 3 The percentage distribution of the number of chronic diseases in different age groups.

Numbers of chronic diseases Number of patients and percentage (n/%)	Age Ranges				All
	60-64	65-69	70-74	≥75	
0	31/3.90%	39/6.40%	15/3.50%	12/3.60%	97/4.5%
1	176/22.1%	118/19.4%	86/19.9%	56/16.8%	436/20.1%
2	305/38.3%	231/37.9%	163/37.7%	124/37.2%	823/37.9%
3	231/29.0%	172/28.2%	122/28.2%	92/27.6%	617/28.4%
4	33/4.1%	34/5.6%	27/6.2%	31/9.3%	125/5.8%
5	21/2.6%	15/2.5%	19/4.4%	18/5.4%	73/3.4%

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