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Dietary Patterns and Common Diseases in Chinese Elderly: Exploring Associations and Providing Guidance for Personalized Interventions

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Abstract

The current state of geriatric disease prevention and treatment in China has not yet been able to meet the urgent needs brought about by an aging population, and specific dietary patterns can significantly improve or exacerbate the risk of certain diseases. However, the relationship between geriatric diseases and the dietary patterns of the Chinese elderly population has not been fully explored. CLHLS 2018 were analyzed in the present study. Principal component analysis was employed to identify the main dietary patterns of the Chinese elderly, and binary logistic regression models were used to analyze the associations between these dietary patterns and the 16 common diseases. Four main dietary patterns were identified in the Chinese elderly population: Egg-Milk Pattern, Salt-preserved vegetable-Nut Pattern, Vegetable-Fruit Pattern, and Fish-Meat Pattern. Higher scores for the Egg-Milk Pattern were associated with a greater risk of heart disease, stroke or cardiovascular disease, respiratory disease, glaucoma, prostate tumor, and Parkinson's disease in older adults ($p<0.05$). Higher scores for Salt-preserved vegetable-Nut Pattern correlated with a greater risk of hypertension, heart disease, and uterine tumors and a lower risk of rheumatism or rheumatoid disease in older adults ($P<0.05$). The higher scores of the Vegetable-Fruit Pattern were associated with a lower risk of heart disease in older adults ($p<0.05$). Finally, higher scores of the Fish-Meat Pattern correlated with a lower risk of heart disease, stroke, and cardiovascular disease and a greater

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risk of rheumatic or rheumatoid disease in older adults ($p<0.05$). The same dietary pattern may have contrasting effects on different diseases. The correlations between dietary patterns and diseases derived from this study may provide a basis for the prevention and individualized management of diseases in the elderly.

Introduction

According to World Population Prospects, the global aging rate will reach nearly 16% in 2050.[1] Current evidence suggests that the Chinese population aged 60 and above has reached 260 million, accounting for 18.7% of the total population.[2] It is expected that by 2050, the elderly population in China will account for 26.9% of the total population.[3] Age-related health problems reportedly pose a significant challenge in China's aging population, as the physiological and immune functions of the elderly gradually deteriorate, opening the door to common geriatric diseases, which have emerged as a substantial but often overlooked threat to the well-being and longevity of the elderly.[4] However, the current state of geriatric disease prevention and treatment in China falls short of addressing the pressing needs imposed by the aging population.[5]

It is important to prolong or reverse the onset of age-related diseases through health behavioural interventions. Diet is an important factor influencing disease trajectory,[6] and it is primarily used to prevent disease by altering gut microbiota patterns to enable the body to build immune tolerance and influence disease development through antioxidant and anti-inflammatory components of food.[7] The study of a single food or nutrient is not a robust indicator of the effect of the overall food combination. In contrast, dietary patterns can reflect the overall dietary intake of an individual and assess the complex combination of food components and nutrients. Importantly, the interaction and cumulative effect of dietary factors in the development of the disease can be comprehensively assessed through the study of dietary patterns.[8] Some studies have shown that specific dietary patterns significantly ameliorate or worsen the risk of certain diseases. A study revealed that a flour- or meat-based dietary pattern significantly increased the risk of non-alcoholic fatty liver disease in the Korean adult population.[9] Besides, in a Spanish population of children aged 6-7 years, a dietary pattern of fat and sugar significantly reduced the risk of asthma.[10] Last but not least, it has been reported that a Western dietary pattern significantly increased the risk of pre-diabetes, and a mainland dietary pattern reduced the risk of pre-diabetes in the Taiwanese population.[11] However, most existing studies have been limited to one disease,[9-11] and the relationship between multiple geriatric diseases and dietary patterns remains unclear. The dietary patterns in the current literature may not apply to the Chinese elderly population, given the wide variation in dietary habits among people born in different countries.

The Chinese Longitudinal Healthy Longevity Survey (CLHLS) is the largest study on older people in China and the world regarding healthy longevity.[12] The database records the intake status of 13 common types of food and the prevalence of 16 common diseases using the simple food chart method. In recent years, scholars have used this data as a basis to analyze the association between dietary diversity and physical function in Chinese older adults,[13] the association between anti-inflammatory dietary diversity and depressive symptoms,[14] and the association between chronic disease co-morbidity and cognitive function, physical function, and mortality.[14] The data are considered a good representation of dietary intake and prevalence in Chinese older adults. Based on the CLHLS 2018 cross-sectional data, our study aims to establish the link between dietary patterns and a range of geriatric diseases among older adults in China, with the objective of formulating tailored dietary guidance protocols for older patients with diverse diseases.

Construction and Content

Data Source and Subjects

CLHLS, initiated in 1998, was a prospective study conducted among Chinese older adults.[15] CLHLS involved 16 common geriatric diseases in Chinese older adults, involving hypertension, diabetes, heart disease, stroke or cardiovascular disease, respiratory disease (bronchitis, emphysema,

pneumonia, asthma), glaucoma, prostate tumor, gastric or duodenal ulcer, Parkinson's disease, arthritis, epilepsy, cholecystitis or cholelithiasis, rheumatic or rheumatoid disease, chronic nephritis, uterine tumor, and hepatitis.

Information on all patients was extracted from the CLHLS database in 2018. All participants in the CLHLS 2018 database were included in the present study. Participants aged less than 60 years, those with insufficient diet-related information, and those with missing disease-related data were excluded.To ensure a large sample size, this study screened the elderly population for different diseases on a case-by-case basis. Figure 1 shows a detailed flowchart depicting the participant screening process.

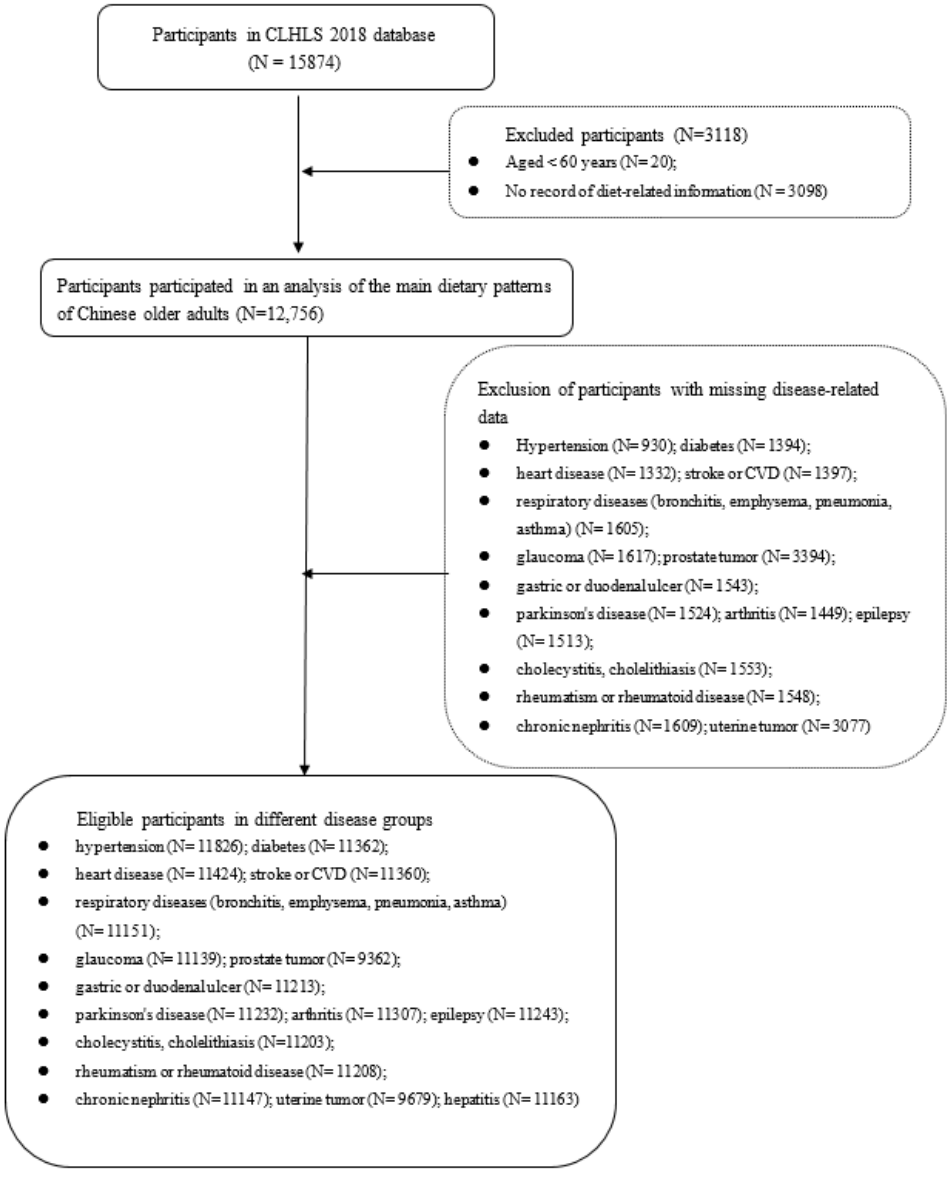

Figure 1 Participant selection process

Fig. 1: Participant selection process

Assessment of Dietary Pattern

In this study, the 13 food types surveyed in the CLHLS database using the simple food frequency table method were used to analyze the main dietary patterns of older Chinese people. These food types included fresh fruits, fresh vegetables, meat, fish, eggs, soybean products, salted vegetables, sugar, garlic, dairy products, nut products, mushrooms or algae, and tea. The food intake was recorded according to the original questionnaire, and the frequency of each food was redefined in this study based on the study by Aihemaitijiang S.[12] In this study, "high frequency intake" was represented by the code "1" and included categories such as "Every day/almost every day," "Often," "Almost every day," and "At least once a week." Conversely, "low frequency intake" was represented by the code "0" and encompassed categories like "Sometimes," "Rarely or never," "At least once a month," and "Occasionally." In this study, principal component analysis in exploratory factor analysis was used to extract the major dietary patterns of the Chinese elderly population. The number of major dietary patterns retained was determined according to Kaiser's criteria.[13] In this study, a score of 1 was assigned to "high-frequency intake" diets, while a score of 0 was assigned to "low-frequency intake" diets. The scores were summed according to the food composition of each dietary pattern to calculate the final score for each pattern.

Table 1: Dietary pattern factor load

Egg–Milk Pattern		**Salt-preserved vege -table–Nut Pattern**		**Vegetable–Fruit Pattern**		**Fish–Meat Pattern**	
food category	**Factor load**	**food category**	**Factor load**	**food category**	**Factor load**	**food category**	**Factor load**
eggs	0.71	salt-preserved vegetables	0.61	fresh vegetable	0.78	fish	0.73
milk products	0.69	nut	0.55	fresh fruit	0.73	meat	0.71
bean products	0.47	garlic	0.53				
sugar	0.45	mushroom or algae	0.53				

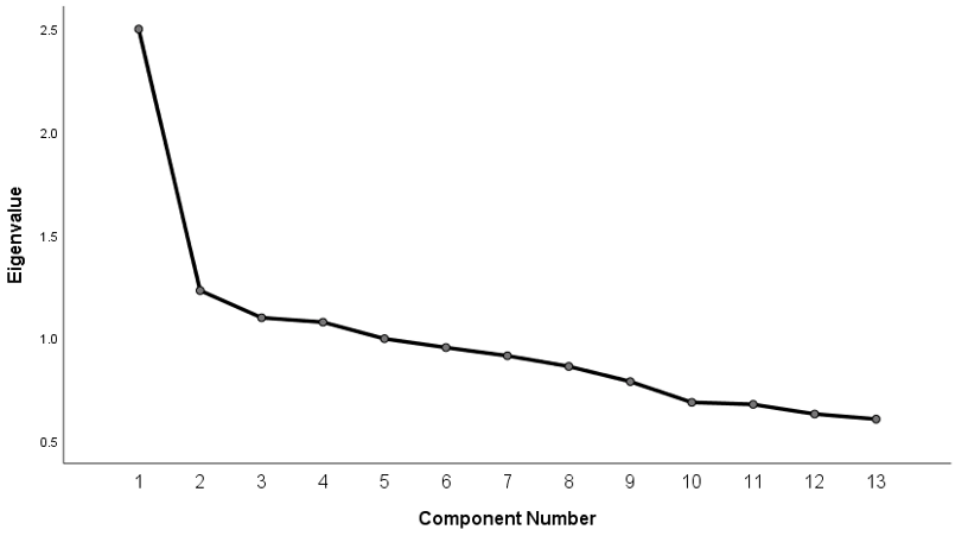

Fig. 2: Gravel diagram of the exploratory factor analysis

Table 2: Basic characteristics of patients with different disease populations

Variable		hypertension (n=11827)	diabete(n=11363) (n=11425)	heart disease	stroke or cvd (n=11360)
Number of patients		5229(44.21%)	1241(10.92%)	2154(18.85%)	1392(12.25%)
age, years		85.00(75.00,95.00)	85.00(75.00,96.00)	85.00(75.00,96.00)	85.00(75.00,96.00)
BMI, kg/m2		23.51(20.36,24.22)	23.47(20.33,24.22)	23.47(20.31,24.22)	23.47(20.32,24.22)
sex, %	male	5097(43.09%)	4914(43.25%)	4926(43.12%)	4920(43.31%)
	female	6730(56.90%)	6449(56.75%)	6499(56.88%)	6440(56.69%)
residenc, %	city	2968(25.09%)	2807(24.70%)	2841(24.87%)	2804(24.68%)
	town	3931(33.24%)	3803(33.47%)	3802(33.28%)	3788(33.35%)
	rural	4928(41.67%)	4753(41.83%)	4782(41.86%)	4768(41.97%)
marital status, %	married and living with spouse	4712(39.84%)	4513(39.72%)	4519(39.55%)	4513(39.73%)
	separated	179(1.51%)	170(1.49%)	173(1.51%)	174(1.53%)
	divorced	35(0.29%)	32(0.28%)	33(0.29%)	31(0.27%)
	widowed	6809(57.57%)	6561(57.74%)	6615(57.89%)	6555(57.70%)
	never married	92(0.78%)	87(0.77%)	85(0.74%)	87(0.77%)
quality of life, %	very good	2596(21.95%)	2486(21.88%)	2499(21.87%)	2487(21.89%)
	good	6008(50.79%)	5773(50.81%)	5821(50.95%)	5774(50.88%)
	so so	2875(24.31%)	2771(24.39%)	2773(24.27%)	2762(24.31%)
	bad	305(2.58%)	293(2.58%)	293(2.57%)	296(2.61%)
	very bad	43(0.36%)	40(0.35%)	39(0.34%)	41(0.36%)
type of drinking	boiled water	11593(98.02%)	11139(98.03%)	11196(97.99%)	11131(97.98%)
water, %	un-boiled water	234(1.98%)	224(1.97%)	229(2.00%)	229(2.02%)
source of drinking	from a well	2064(17.45%)	1979(17.42%)	1992(17.44%)	1977(17.40%)
water, %	from a river or lake	105(0.89%)	101(0.89%)	102(0.89%)	104(0.92%)
	from a spring	247(2.09%)	240(2.11%)	237(2.07%)	237(2.09%)
	from a pond or pool	10(0.09%)	10(0.09%)	10(0.09%)	10(0.09%)
	tap water	9401(79.49%)	9033(79.49%)	9084(79.51%)	9032(79.51%)
smoke , %	yes	1675(14.16%)	1619(14.25%)	1620(14.18%)	1616(14.23%)
	no	10152(85.84%)	9744(85.75%)	9805(85.82%)	9744(85.78%)
drink , %	yes	1634(13.82%)	1592(14.01%)	1595(13.96%)	1590(13.99%)
	no	10193(86.18%)	9771(85.99%)	9830(86.04%)	9770(86.00%)
exercise, %	yes	3637(30.75%)	3480(30.63%)	3501(30.64%)	3475(30.59%)
	no	8190(69.25%)	7883(69.37%)	7924(69.36%)	7885(69.41%)
done physical labor	yes	8902(75.27%)	8561(75.34%)	8616(75.41%)	8568(75.42%)
regularly, %	no	2925(24.73%)	2802(24.66%)	2809(24.56%)	2792(24.58%)
feel energetic	always	1509(12.76%)	1470(12.94%)	1475(12.91%)	1472(12.96%)
	often	4937(41.74%)	4745(41.76%)	4770(41.75%)	4755(41.86%)
	sometimes	3294(27.85%)	3147(27.70%)	3157(27.63%)	3121(27.47%)
	seldom	1883(15.92%)	1797(15.81%)	1819(15.92%)	1807(15.91%)
	never	204(1.72%)	204(1.80%)	204(1.79%)	205(1.80%)
main flavor you	insipidity	566(4.79%)	541(4.76%)	555(4.86%)	552(4.86%)
have, %	salty	1499(12.67%)	1438(12.66%)	1446(12.66%)	1433(12.61%)
	sweet	4843(40.95%)	4656(40.98%)	4694(41.09%)	4658(41.00%)
	hot	2920(24.69%)	2793(24.58%)	2790(24.42%)	2785(24.52%)

	crude	1999(16.90%)	1935(17.03%)	1940(16.98%)	1932(17.01%)
Egg–Milk-Bean-Sugar Pattern score,points		1.00(0.00,2.00)	1.00(0.00,2.00)	1.00(0.00,2.00)	1.00(0.00,2.00)
Salt-preserved vegetable–Nut-Mushroom or Algae-Garlic Pattern score,points		0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)
Vegetable–Fruit Pattern score,points		1.00(0.00,1.00)	1.00(0.00,1.00)	1.00(0.00,1.00)	1.00(0.00,1.00)
Fish–Meat Pattern score,points		0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)

Table 2 Continued table 1

Variable		**respiratory disea -ses (n=11152)**	**glaucoma (n=11140)**	**gastric or duode-nal ulcer(n=11214)**	**proatate tumor (n=9408)**
Number of patients		1247(11.18%)	225(2.02%)	574(5.12%)	574(6.10%)
age, years		85.00(75.00,96.00)	85.00(75.00,96.00)	85.00(75.00,96.00)	85.00(75.00,95.00)
BMI, kg/m2		22.87(20.31,24.21)	23.47(20.33,24.22)	23.47(20.31,24.22)	23.47(20.41,24.16)
sex, %	male	4832(43.33%)	4816(43.23%)	4866(43.39%)	4812(51.15%)
	female	6320(56.67%)	6324(56.77%)	6348(56.61%)	4596(48.85%)
residenc, %	city	2761(24.76%)	2735(24.55%)	2746(24.49%)	2434(25.87%)
	town	3706(33.23%)	3742(33.59%)	3757(33.50%)	3167(33.66%)
	rural	4685(42.01%)	4663(41.86%)	4711(42.01%)	3807(40.47%)
marital status, %	married and living with spouse	4420(39.63%)	4431(39.78%)	4463(39.79%)	3945(41.93%)
	separated	166(1.49%)	165(1.48%)	164(1.46%)	154(1.64%)
	divorced	32(0.29%)	31(0.28%)	32(0.29%)	30(0.32%)
	widowed	6447(57.81%)	6428(57.70%)	6470(57.69%)	5201(55.28%)
	never married	87(0.78%)	85(0.76%)	85(0.76%)	78(0.829%)
quality of life, %	very good	2423(21.73%)	2435(21.86%)	2450(21.85%)	2107(22.39%)
	good	5674(50.88%)	5680(50.99%)	5718(50.99%)	4745(50.44%)
	so so	2727(24.45%)	2697(24.21%)	2721(24.26%)	2294(24.38%)
	bad	287(2.57%)	289(2.59%)	286(2.55%)	231(2.46%)
	very bad	41(0.37%)	39(0.35%)	39(0.35%)	31(0.33%)
type of drinking water, %	boiled water	10927(97.98%)	10913(97.96%)	10986(97.97%)	9214(97.94%)
	un-boiled water	225(2.02%)	227(2.04%)	228(2.03%)	194(2.06%)
source of drinking water, %	from a well	1956(17.54%)	1954(17.54%)	1961(17.49%)	1681(17.87%)
	from a river or lake	99(0.89%)	99(0.89%)	101(0.90%)	87(0.93%)
	from a spring	238(2.13%)	235(2.11%)	234(2.09%)	209(2.22%)
	from a pond or pool	10(0.09%)	10(0.09%)	10(0.09%)	5(0.05%)
	tap water	8849(79.35%)	8842(79.37%)	8908(79.44%)	7426(78.93%)
smoke , %	yes	1584(14.20%)	1600(14.36%)	1612(14.38%)	1544(16.41%)
	no	9568(85.79%)	9540(85.64%)	9602(85.63%)	7864(83.59%)
drink , %	yes	1559(13.98%)	1575(14.14%)	1582(14.18%)	1476(15.69%)
	no	9593(86.02%)	9565(85.86%)	9632(85.89%)	7932(84.31%)
exercise, %	yes	3411(30.59%)	3419(30.69%)	3435(30.63%)	3049(32.41%)

	no	7741(69.41%)	7721(69.31%)	7779(69.37%)	6359(67.59%)
done physical labor	yes	8421(75.51%)	8401(75.41%)	8464(75.48%)	7033(74.76%)
regularly, %	no	2731(24.49%)	2739(24.59%)	2750(24.52%)	2375(25.24%)
feel energetic	always	1437(12.89%)	1453(13.04%)	1459(13.01%)	1249(13.28%)
	often	4668(41.86%)	4659(41.82%)	4678(41.72%)	3887(41.32%)
	sometimes	3078(27.60%)	3075(27.60%)	3094(27.59%)	2636(28.02%)
	seldom	1767(15.84%)	1755(15.75%)	1782(15.89%)	1480(15.73%)
	never	202(1.81%)	198(1.78%)	201(1.79%)	156(1.66%)
main flavor you	insipidity	540(4.84%)	539(4.84%)	549(4.89%)	472(5.02%)
have, %	salty	1416(12.69%)	1393(12.50%)	1413(12.60%)	1159(12.32%)
	sweet	4576(41.03%)	4551(40.85%)	4578(40.82%)	3782(40.20%)
	hot	2724(24.43%)	2746(24.65%)	2753(24.55%)	2389(25.39%)
	crude	1896(17.00%)	1911(17.15%)	1921(17.13%)	1606(17.07%)
Egg–Milk-Bean-Sugar Pattern score,points		1.00(0.00,2.00)	1.00(0.00,2.00)	1.00(0.00,2.00)	1.00(0.00,2.00)
Salt-preserved vegetable–Nut-Mushroom orAlgae-Garlic Pattern score,points		0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)
Vegetable–Fruit 1 Pattern score,points		.00(0.00,1.00)	1.00(0.00,1.00)	1.00(0.00,1.00)	1.00(0.00,1.00)
–Meat Pattern score,points		0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)

Table 2 Continued table 2

Variable		**parkinson's dise -ase(n=11233)**	**arthritis (n=11308)**	**epilepsia (n=11244)**	**cholecystitis (n=11204)**
Number of patients		105(0.93%)	1337(11.82%)	35(0.31%)	506(4.52%)
age, years		85.00(75.00,96.00)	85.00(75.00,96.00)	85.00(75.00,96.00)	85.00(75.00,96.00)
BMI, kg/m2		23.469(20.31,24.22)	23.47(20.32,24.22)	23.47(20.31,24.22)	23.47(20.32,24.22)
sex, %	male	4862(43.28%)	4896(43.29%)	4858(43.21%)	4848(43.27%)
	female	6371(56.72%)	6412(56.70%)	6386(56.79%)	6356(56.73%)
residenc, %	city	2748(24.46%)	2761(24.42%)	2745(24.41%)	2747(24.52%)
	town	3760(33.47%)	3788(33.49%)	3765(33.49%)	3763(33.59%)
	rural	4725(42.06%)	4759(42.09%)	4734(42.10%)	4694(41.89%)
marital status, %	married and living with spouse	4456(39.67%)	4499(39.79%)	4456(39.63%)	4445(39.67%)
	separated	167(1.49%)	169(1.49%)	169(1.50%)	168(1.49%)
	divorced	32(0.29%)	32(0.28%)	32(0.29%)	32(0.29%)
	widowed	6490(57.78%)	6519(57.65%)	6498(57.79%)	6471(57.76%)
	never married	88(0.78%)	89(0.79%)	89(0.79%)	88(0.79%)
quality of life, %	very good	2453(21.84%)	2468(21.83%)	2450(21.79%)	2450(21.87%)
	good	5720(50.92%)	5764(50.98%)	5737(51.02%)	5698(50.86%)
	so so	2731(24.31%)	2743(24.26%)	2729(24.27%)	2727(24.34%)
	bad	290(2.58%)	292(2.58%)	289(2.57%)	290(2.59%)
	very bad	39(0.35%)	41(0.36%)	39(0.35%)	39(0.35%)
type of drinking water, %	boiled water	11003(97.95%)	11081(97.99%)	11014(97.95%)	10977(97.97%)
	un-boiled water	230(2.05%)	227(2.01%)	230(2.05%)	227(2.03%)

source of drinking	from a well	1961(17.46%)	1974(17.46%)	1959(17.42%)	1961(17.50%)
water, %	from a river or lake	100(0.89%)	103(0.91%)	101(0.89%)	102(0.91%)
	from a spring	240(2.14%)	241(2.13%)	241(2.14%)	239(2.13%)
	from a pond or pool	10(0.09%)	10(0.09%)	10(0.09%)	10(0.09%)
	tap water	8922(79.43%)	8980(79.41%)	8933(79.45%)	8892(79.37%)
smoke , %	yes	1603(14.27%)	1613(14.26%)	1606(14.28%)	1611(14.38%)
	no	9630(85.73%)	9695(85.74%)	9638(85.72%)	9593(85.62%)
drink , %	yes	1580(14.07%)	1591(14.07%)	1582(14.07%)	1581(14.11%)
	no	9653(85.93%)	9717(85.93%)	9662(85.93%)	9623(85.89%)
exercise, %	yes	3443(30.65%)	3466(30.65%)	3449(30.67%)	3437(30.68%)
	no	7790(69.35%)	7842(69.35%)	7795(69.33%)	7767(69.32%)
done physical	yes	8479(75.48%)	8547(75.58%)	8491(75.52%)	8451(75.43%)
labor regularly, %	no	2754(24.52%)	2761(24.42%)	2753(24.48%)	2753(24.57%)
feel energetic	always	1461(13.01%)	1458(12.89%)	1460(12.98%)	1453(12.97%)
	often	4700(41.84%)	4725(41.78%)	4711(41.90%)	4689(41.85%)
	sometimes	3087(27.48%)	3122(27.61%)	3091(27.49%)	3088(27.56%)
	seldom	1783(15.87%)	1800(15.92%)	1780(15.83%)	1773(15.82%)
	never	202(1.80%)	203(1.80%)	202(1.80%)	201(1.79%)
main flavor you	insipidity	549(4.89%)	557(4.93%)	549(4.88%)	546(4.87%)
have, %	salty	1420(12.64%)	1432(12.66%)	1417(12.60%)	1412(12.60%)
	sweet	4593(40.89%)	4616(40.82%)	4595(40.87%)	4583(40.91%)
	hot	2753(24.51%)	2778(24.57%)	2765(24.59%)	2748(24.53%)
	crude	1918(17.08%)	1925(17.02%)	1918(17.06%)	1915(17.09%)
Egg–Milk-Bean-Sugar Pattern score, points		1.00(0.00,2.00)	1.00(0.00,2.00)	1.00(0.00,2.00)	1.00(0.00,2.00)
Salt-preserved vegetable –Nut-Mushroom or Algae-Garlic Pattern score,points		0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)
Vegetable–Fruit Pattern score,points		1.00(0.00,1.00)	1.00(0.00,1.00)	1.00(0.00,1.00)	1.00(0.00,1.00)
Fish–Meat Pattern score,points		0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)

Table 2 Continued table 3

Variable		**rheumatism or rheumatoid dise -ase(n=11209)**	**chronic nephritis (n=11148)**	**uterine tumor (n=9680)**	**hepatitis (n=11164)**
Number of patients		636(5.67%)	125(1.12%)	56(0.58%)	54(0.48%)
age, years		85.00(75.00,96.00)	85.00(75.00,96.00)	86.00(76.00,96.00)	85.00(75.00,96.00)
BMI, kg/m2		23.47(20.32,24.22)	23.47(20.33,24.22)	22.85(20.20,24.17)	23.47(20.33,24.22)
sex, %	male	4851(43.28%)	4824(43.27%)	3403(35.16%)	4843(43.38%)
	female	6358(56.72%)	6324(56.73%)	6277(64.85%)	6321(56.62%)
residenc, %	city	2752(24.55%)	2740(24.58%)	2450(25.31%)	2739(24.53%)
	town	3752(33.47%)	3733(33.49%)	3243(33.50%)	3730(33.41%)
	rural	4705(41.98%)	4675(41.94%)	3987(41.19%)	4695(42.06%)
marital status, %	married and living with spouse	4451(39.71%)	4426(39.70%)	3588(37.07%)	4437(39.74%)

	separated	169(1.51%)	167(1.49%)	148(1.53%)	168(1.56%)
	divorced	32(0.29%)	32(0.29%)	30(0.31%)	31(0.27%)
	widowed	6466(57.69%)	6435(57.72%)	5843(60.36%)	6439(57.68%)
	never married	91(0.81%)	88(0.79%)	71(0.73%)	89(0.79%)
quality of life, %	very good	2448(21.84%)	2440(21.89%)	2169(22.41%)	2439(21.85%)
	good	5712(50.96%)	5675(50.91%)	4933(50.96%)	5693(50.99%)
	so so	2719(24.26%)	2707(24.28%)	2285(23.61%)	2706(24.24%)
	bad	290(2.59%)	288(2.58%)	257(2.66%)	287(2.57%)
	very bad	40(0.35%)	38(0.34%)	36(0.37%)	39(0.35%)
type of drinking	boiled water	10984(97.99%)	10921(97.96%)	9482(97.96%)	10937(97.97%)
water, %	un-boiled water	225(2.01%)	227(2.04%)	198(2.05%)	227(2.03%)
source of drinking	from a well	1961(17.49%)	1951(17.50%)	1714(17.71%)	1944(17.41%)
water, %	from a river or lake	100(0.89%)	100(0.89%)	92(0.95%)	101(0.91%)
	from a spring	243(2.17%)	235(2.11%)	216(2.23%)	235(2.11%)
	from a pond or pool	10(0.089%)	10(0.09%)	9(0.09%)	10(0.09%)
	tap water	8895(79.356%)	8852(79.40%)	7649(79.02%)	8874(79.49%)
smoke , %	yes	1609(14.355%)	1596(14.32%)	1173(12.12%)	1595(14.29%)
	no	9600(85.645%)	9552(85.68%)	8507(87.88%)	9569(85.71%)
drink , %	yes	1582(14.114%)	1572(14.10%)	1180(12.19%)	1574(14.09%)
	no	9627(85.886%)	9576(85.89%)	8500(87.81%)	9590(85.90%)
exercise, %	yes	3447(30.752%)	3419(30.67%)	2975(30.73%)	3417(30.61%)
	no	7762(69.248%)	7729(69.33%)	6705(69.27%)	7747(69.39%)
done physical labor	yes	8459(75.466%)	8403(75.38%)	7243(74.82%)	8419(75.41%)
regularly, %	no	2750(24.534%)	2745(24.62%)	2437(25.18%)	2745(24.59%)
feel energetic	always	1453(12.96%)	1452(13.02%)	1267(13.09%)	1450(12.99%)
	often	4685(41.80%)	4665(41.85%)	4049(41.83%)	4670(41.83%)
	sometimes	3092(27.58%)	3070(27.54%)	2673(27.61%)	3071(27.51%)
	seldom	1777(15.85%)	1762(15.81%)	1531(15.82%)	1772(15.87%)
	never	202(1.80%)	199(1.79%)	160(1.65%)	201(1.80%)
main flavor	insipidity	550(4.907%)	541(4.85%)	475(4.91%)	547(4.90%)
you have, %	salty	1410(12.58%)	1406(12.61%)	1237(12.78%)	1405(12.59%)
	sweet	4576(40.82%)	4550(40.81%)	4018(41.51%)	4561(40.86%)
	hot	2757(24.59%)	2742(24.59%)	2379(24.58%)	2742(24.56%)
	crude	1916(17.09%)	1909(17.12%)	1571(16.23%)	1909(17.10%)
Egg–Milk-Bean-Sugar Pattern score,points		1.00(0.00,2.00)	1.00(0.00,2.00)	1.00(0.00,2.00)	1.00(0.00,2.00)
Salt-preserved vegetable–Nut-Mushroom or Algaes -Garlic Pattern score,point		0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)
Vegetable–Fruit Pattern score,points		1.00(0.00,1.00)	1.00(0.00,1.00)	1.00(0.00,1.00)	1.00(0.00,1.00)
Fish–Meat Pattern score,points		0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)	0.00(0.00,1.00)

Table 3: Logistic regression analysis of dietary patterns and geriatric diseases

Dietary pattern	Model	hypertension		diabetes		heart disease		stroke or cvd	
		OR(95%CI)	p	OR(95%CI)	p	OR(95%CI)	p	OR(95%CI)	p
Egg–Milk Pattern	1	1.051(1.014,1.088)	0.006	1.187(1.124,1.253)	<0.001	1.249(1.198,1.305)	<0.001	1.191(1.131,1.255)	<0.001
	2	0.994(0.956,1.033)	0.762	1.026(0.964,1.092)	0.415	1.094(1.042,1.148)	<0.001	1.071(1.011,1.133)	0.019
	3	0.990(0.952,1,030)	0.625	1.035(0.971,1.104)	0.287	1.112(1.058,1.168)	<0.001	1.115(1.052,1.183)	<0.001
Salt-preserved vegetable–Nut Pattern	1	1.150(1.092,1.211)	<0.001	1.276(1.180,1.380)	<0.001	1.189(1.114,1.270)	<0.001	1.078(0.994,1.169)	0.068
	2	1.045(0.990,1.102)	0.109	1.052(0.969,1.143)	0.227	1.053(0.983,1.127)	0.141	0.970(0.893,1.054)	0.474
	3	1.063(1.006,1.122)	0.03	1.083(0.995,1.179)	0.064	1.024(0.912,1.060)	0.021	1.027(0.944,1.118)	0.534
Vegetable–Fruit Pattern	1	1.148(1.093,1.206)	<0.001	1.262(1.166,1.3670	<0.001	1.250(1.173,1.332)	<0.001	1.035(0.959,1.117)	0.373
	2	1.008(0.957,1.062)	0.764	0.956(0.879,1.040)	0.189	1.039(0.972,1.110)	0.263	0.890(0.823,0.962)	0.004
	3	1.015(0.962,1.071)	0.576	0.999(0.916,1.090)	0.989	0.984(0.912,1.160)	0.021	0.962(0.887,1.043)	0.346
Fish–Meat Pattern	1	1.055(0.996,1.118)	0.068	1.242(1.135,1.358)	<0.001	0.993(0.921,1.070)	0.845	0.942(0.861,1.032)	0.199
	2	0.984(0.927,1.045)	0.598	1.058(0.962,1.163)	0.248	0.865(0.800,0.935)	<0.001	0.836(0.761,0.918)	<0.001
	3	0.994(0.935,1.056)	0.839	1.077(0.978,1.185)	0.132	0.878(0.811,0.950)	0.001	0.865(0.787,0.951)	0.003

Model 1: no covariates were included; Model 2: adjusted for gender, residence, age, education, occupation, marital status, and BMI; Model 3: adjusted for Model 2 + self-rated quality of life, type of water drunk, source of water drunk, alcohol consumption, smoking status, exercise status, physical effort, social activity, energy, and taste.

Table 3 Continued table 1

Dietary pattern	Model	respiratory diseases		glaucoma		prostate tumor		gastric or duodenal ulcer	
		OR(95%CI)	p	OR(95%CI)	p	OR(95%CI)	p	OR(95%CI)	p
Egg–Milk Pattern	1	1.120(1.060,1.184)	<0.001	1.407(1.263,1.567)	<0.001	1.381(1.281,1.487)	<0.001	1.042(0.961,1.130)	0.317
	2	1.060(0.999,1.125)	0.055	1.262(1.122,1.418)	<0.001	1.145(1.050,1.248)	0.002	1.002(0.919,1.093)	0.963
	3	1.103(1.037,1.172)	0.002	1.267(1.124,1.429)	<0.001	1.155(1.057,1.262)	0.002	1.038(0.950,1.136)	0.409

Salt-preserved vegetable–Nut Pattern	1	0.974(0.890,1.065)	0.563	1.225(1.041,1.440)	0.014	1.110(0.986,1.248)	0.083	1.069(0.948,1.206)	0.276
	2	0.949(0.866,1.040)	0.265	1.104(0.937,1.301)	0.238	0.967(0.851,1.098)	0.602	1.007(0.891,1.139)	0.912
	3	0.997(0.909,1.904)	0.949	1.106(0.936,1.307)	0.238	0.987(0.867,1.124)	0.847	1.057(0.933,1.197)	0.383
Vegetable–Fruit Pattern	1	0.995(0.918,1.078)	0.901	1.177(0.995,1.392)	0.057	1.298(1.158,1.456)	<0.001	0.968(0.864,1.086)	0.583
	2	0.963(0.886,1.048)	0.367	1.009(0.852,1.195)	0.918	1.083(0.960,1.222)	0.195	0.882(0.784,0.992)	0.036
	3	1.033(0.949,1.124)	0.457	1.013(0.852,1.204)	0.886	1.098(0.969,1.245)	0.142	0.943(0.835,1.065)	0.342
Fish–Meat Pattern	1	0.992(0.903,1.090)	0.868	1.115(0.920,1.352)	0.266	1.216(1.069,1.383)	0.003	1.000(0.875,1.143)	0.996
	2	0.936(0.850,1.031)	0.18	1.010(0.829,1.230)	0.923	0.973(0.847,1.118)	0.702	0.956(0.834,1.095)	0.514
	3	0.966(0.876,1.064)	0.483	1.011(0.831,1.231)	0.91	0.983(0.854,1.130)	0.807	0.978(0.853,1.122)	0.752

Model 1: no covariates were included; Model 2: adjusted for gender, residence, age, education, occupation, marital status, and BMI; Model 3: adjusted for Model 2 + self-rated quality of life, type of water drunk, source of water drunk, alcohol consumption, smoking status, exercise status, physical effort, social activity, energy, and taste.

Table 3 Continued table 2

Dietary pattern	Model	parkinson's disease		arthritis		epilepsy		cholecystitis, cholelith disease	
		OR(95%CI)	p	OR(95%CI)	p	OR(95%CI)	p	OR(95%CI)	p
Egg–Milk Pattern	1	1.253(1.055,1.487)	0.01	1.036(0.980,1.094)	0.212	1.347(1.008,1.798)	0.044	1.120(1.030,1.217)	0.008
	2	1.200(0.998,1.442)	0.053	0.966(0.910,1.026)	0.263	1.274(0.933,1.740)	0.127	1.012(0.924,1.109)	0.792
	3	1.275(1.056,1.540)	0.011	1.004(0.944,1.068)	0.898	1.309(0.952,1.801)	0.097	1.011(0.922,1.109)	0.816
Salt-preserved vegetable–Nut Pattern	1	0.987(0.737,1.321)	0.929	1.042(0.958,1.133)	0.34	1.439(0.982,2.110)	0.062	1.168(1.035,1.319)	0.012
	2	0.973(0.724,1.307)	0.856	0.958(0.879,1.043)	0.321	1.373(0,931,2.024)	0.11	1.044(0.923,1.181)	0.489
	3	1.046(0.776,1.408)	0.77	1.004(0.920,1.096)	0.922	1.415(0.952,2.102)	0.086	1.046(0.923,1.186)	0.476
Vegetable–Fruit Pattern	1	0.958(0.737,1.245)	0.748	1.043(0.965,1.127)	0.288	1.011(0.644,1.587)	0.963	1.211(1.074,1.367)	0.002
	2	0.938(0.718,1.226)	0.639	0.923(0.852,1.000)	0.05	0.930(0.589,1.469)	0.757	1.031(0.911,1.166)	0.631
	3	1.040(0.792,1.365)	0.777	0.994(0.915,1.079)	0.879	0.959(0.600,1.532)	0.861	1.049(0.925,1.191)	0.455
Fish–Meat Pattern	1	1.150(0.8561.544)	0.354	1.045(0.955,1.143)	0.337	0.976(0.573,1.660)	0.927	1.064(0.925,1.224)	0.384

	2	1.105(0.817,1.493)	0.518	0.987(0.900,1.083)	0.781	0.920(0.535,1.581)	0.763	0.968(0.839,1.117)	0.653
	3	1.152(0.851,1.559)	0.361	1.009(0.919,1.107)	0.858	0.939(0.545,1.620)	0.822	0.970(0.840,1.119)	0.676

Model 1: no covariates were included; Model 2: adjusted for gender, residence, age, education, occupation, marital status, and BMI; Model 3: adjusted for Model 2 + self-rated quality of life, type of water drunk, source of water drunk, alcohol consumption, smoking status, exercise status, physical effort, social activity, energy, and taste.

Table 3 Continued table 3

Dietary pattern disease	Model	rheumatism or rheumatoid		chronic nephritis		uterine tumor		hepatitis	
		OR(95%CI)	p	OR(95%CI)	p	OR(95%CI)	p	OR(95%CI)	p
Egg–Milk Pattern	1	0.878(0.808,0.954)	0.002	1.129(0.959,1.330)	0.145	1.355(1.078,1.702)	0.009	1.215(0.955,1.545)	0.113
	2	0.885(0.810,0.996)	0.006	0.948(0.791,1.137)	0.567	1.100(0.854,1.418)	0.459	1.209(0.930,1.571)	0.156
	3	0.921(0.841,1.007)	0.072	0.996(0.827,1.199)	0.964	1.104(0.853,1.429)	0.401	1.240(0.950,1.620)	0.114
Salt-preserved vegetable–Nut Pattern	1	0.841(0.735,0.962)	0.012	1.10990.868,1.418)	0.407	1.786(1.380,2.311)	<0.001	1.404(1.027,1.920)	0.034
	2	0.825(0.721,0.946)	0.006	0.941(0.731,1.210)	0.635	1.388(1.062,1.814)	0.016	1.261(0.909,1.747)	0.164
	3	0.861(0.751,0.988)	0.033	1.094(0.835,1.434)	0.515	1.426(1.080,1.882)	0.012	1.3270.950,1.854)	0.097
Vegetable–Fruit Pattern	1	0.971(0.871,1.083)	0.598	1.399(1.102,1.776)	0.006	1.486(1.042,2.119)	0.029	1.047(0.729,1.505)	0.803
	2	0.942(0.841,1.055)	0.297	1.108(0.869,1.413)	0.407	1.031(0.724,1.470)	0.865	0.883(0.607,1.287)	0.518
	3	1.002(0.891,1.1270	0.974	1.002(0.776,1.295)	0.985	1.044(0.722,1.509)	0.819	0.931(0.634,1.369)	0.716
Fish–Meat Pattern	1	1.186(1.049,1.340)	0.006	1.279(0.983,1.666)	0.067	1.631(1.123,2.367)	0.01	1.154(0.766,1.738)	0.493
	2	1.212(1.070,1.373)	0.002	1.094(0.835,1.434)	0.515	1.330(0.907,1.948)	0.144	1.059(0.698,1.607)	0.788
	3	1.246(1.099,1.413)	0.001	1.233(0.959,1.584)	0.102	1.325(0.903,1.943)	0.15	1.072(0.705,1.629)	0.746

Model 1: no covariates were included; Model 2: adjusted for gender, residence, age, education, occupation, marital status, and BMI; Model 3: adjusted for Model 2 + self-rated quality of life, type of water drunk, source of water drunk, alcohol consumption, smoking status, exercise status, physical effort, social activity, energy, and taste.

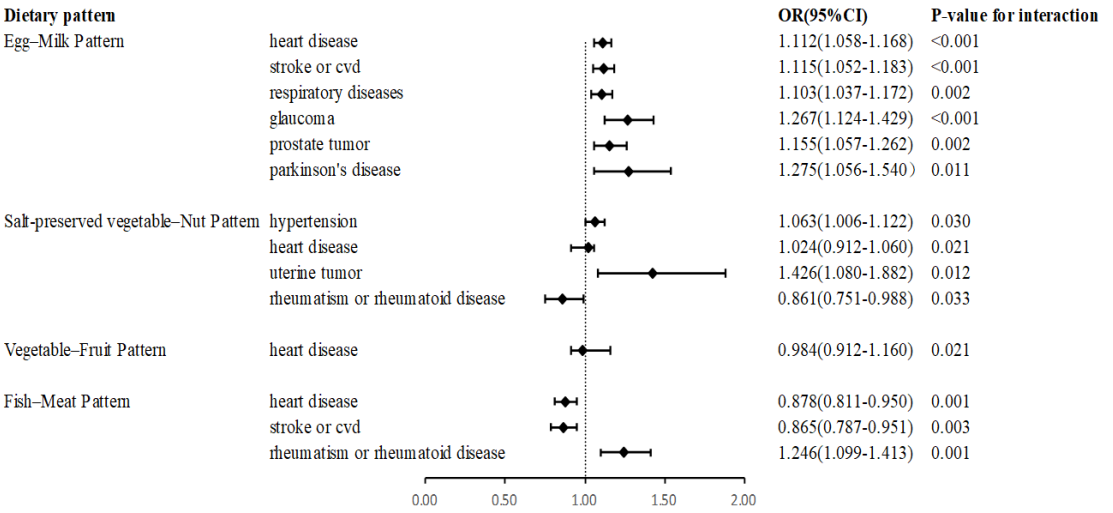

Fig. 3: Forest plots of four dietary pattern scores and risk of disease

Assessment of Covariates

In this study, gender, residence, age, education, occupation, marital status, BMI, self-rated quality of life, type of water drunk, source of water drunk, alcohol consumption, smoking status, exercise status, physical work, social activity, energy, and taste were used as covariates in the data analysis.

Statistical Analysis

In this study, each disease population was analyzed descriptively and basic characteristics of patients in different disease populations were presented. Since none of the measurement data followed a normal distribution, the median (quartiles) was employed to represent the measurement information. Count data were expressed using frequency (composition ratio). Principal component analysis in exploratory factor analysis was used to extract the main dietary patterns of the Chinese elderly population. Binary logistic regression analyses were conducted with the prevalence of 16 common geriatric diseases as the dependent variable and the four dietary pattern scores as the independent variables, and three regression models were developed to eliminate the effects of covariates on the odds ratios (ORs). The logistic regression results showed the odds ratios (OR) for each disease when the dietary pattern scores increased. Data processing, analysis, and the generation of fragmentation graphs were conducted using SPSS 26.0 software, while the forest plot was created using R 4.2.1 software. All tests were two-sided, and a P-value<0.05 was statistically significant.

Results

In this study, principal component analysis with exploratory factor analysis was used to extract the main dietary patterns of the Chinese elderly population. The applicability test of EFA yielded a Kaiser-Meyer-Olkin (KMO) value of 0.738, indicating that the selected food items or food groups were suitable for PCA. Bartlett's sphericity test yielded significant results ($\chi 2 = 12587.3$ and $p < 0.001$), indicating a high correlation among the food groups and justifying the application of factor analysis. The gravel diagram of the exploratory factor analysis is shown in Figure 2, with four components with initial eigenvalues > 1. According to Kaiser's criteria, this study retained four factors with a cumulative contribution of 45.38%. These factors were interpreted as the major dietary patterns observed among the Chinese elderly population, and their specific compositions are provided in Table 1.

To maximize the sample size, separate calculations of the four dietary pattern scores were conducted for each specific disease population in this study, followed by descriptive analyses for each disease population. Table 2 provides a detailed overview of the basic characteristics of patients in the different disease populations. Our study included patients with hypertension (n=5529), diabetes (n=1241),

heart disease (n=2154), stroke or cardiovascular disease (n=1392), respiratory diseases (n=1247), glaucoma (n=225), gastric or duodenal ulcers (n=574), prostate tumors (n=574), Parkinson's disease (n=105), arthritis (n=1337), epilepsy (n=35), cholecystitis or cholelithiasis (n=506), rheumatic or rheumatoid diseases (n=636), chronic nephritis (n=125), uterine tumors (n=56), and hepatitis (n=54).

In this study, three model regression models were developed to eliminate the effect of covariates on prevalence as much as possible, and a binary logistic regression analysis was performed with the prevalence of 16 diseases as the dependent variable and each of the four dietary pattern scores as the independent variable.

After adjusting for three models, the logistic regression results showed that as the Egg-Milk Pattern score increased, the risk of cardiovascular disease (OR=1.112), stroke or cardiovascular disease (OR=1.115), respiratory system disease (OR=1.103), glaucoma (OR=1.267), prostate tumor (OR=1.155), and Parkinson's disease (OR=1.275) increased in elderly people. Moreover, as the Salt-preserved vegetable-Nut Pattern score increased, the risk of hypertension (OR=1.063), heart disease (OR=1.024), and uterine tumors (OR=1.426) increased, while the risk of rheumatoid arthritis or rheumatic diseases decreased (OR=0.861). As the Vegetable-Fruit Pattern score increased, the risk of heart disease (OR=0.984) decreased in elderly people. Finally, as the Fish-Meat Pattern score increased, the risk of heart disease (OR=0.878) and stroke or cardiovascular disease (OR=0.865) decreased, while the risk of rheumatoid arthritis or rheumatic diseases increased (OR=1.246). The specific OR values are detailed in Table 3. To better illustrate the relationship between dietary pattern scores and disease risk, we presented the OR values of model 3 in the form of a forest plot, as shown in Figure 3.

Discussion

This study found four main dietary patterns in the Chinese elderly population: Egg-Milk Pattern, Salt-preserved vegetable-Nut Pattern, Vegetable-Fruit Pattern, and Fish-Meat Pattern, consistent with the study by Yuan.[16] Although previous studies have investigated the main dietary patterns of Chinese older adults based on a 24-hour dietary review over 3 consecutive days,[17] the effects of diet on health are cumulative over time, and short-term dietary surveys may not reflect long-term food intake levels. In the present study, the simple food frequency scale method was used to investigate the long-term average food intake levels of individuals in the population, which is more suitable for studying the association between diet and disease risk.[18] It is well-established that the dietary habits of Chinese elderly people are influenced by various aspects such as culture, region, farming, and nutritional needs, and their dietary patterns differ significantly from elderly people in other countries[19]. Therefore, conducting a dedicated study and survey can enhance our comprehension of the dietary patterns among the elderly population in China, enabling the development of tailored nutritional healthcare strategies for their specific needs.

In this study, elevated Egg-Milk Pattern scores were associated with an increased risk of heart disease, stroke or cardiovascular disease, respiratory disease, glaucoma, prostate tumors, and Parkinson's disease in the elderly. It is well-established that eggs contain high amounts of cholesterol,[20] and dietary cholesterol intake is associated with the incidence of cardiovascular disease[21] and prostate tumors.[22] LDL cholesterol in eggs has a key role in cardiovascular events in atherosclerotic plaque formation.[23] In contrast, the high cholesterol content of eggs may lead to abnormalities in the function of lipid rafts in prostate cancer cell membranes, thus allowing abnormal signaling of cell proliferation and apoptosis and promoting the growth of tumor cells.[24] Although no studies have investigated the association between egg intake and glaucoma risk, total blood cholesterol levels have been significantly associated with increased intraocular pressure,[25] which can increase the risk of primary open-angle glaucoma.[26] In addition, eggs represent a common atopic food, and their intake may cause an IgG-mediated immune response that triggers asthma.[27] In Egg-Milk Pattern, the uric acid-lowering effect of milk and pesticide contamination in milk make it an important risk factor for Parkinson's disease.[28] Additionally, the sugars found in the Egg-Milk Pattern may contribute to the accelerated formation of advanced glycation end products, potentially impairing the function of the retinal pigment

epithelium and increasing the susceptibility to glaucoma among the elderly.[29] In addition, milk and eggs are commonly known as atopic foods, potentially heightening the risk of asthma in older adults.[30] Notably, although Omega-3 in milk and eggs and estrogen in beans in the Egg-Milk Pattern are protective against prostate cancer,[31-32] this dietary pattern increases the risk of prostate tumors in the presence of cholesterol in eggs. Therefore, clinical trials are warranted to comprehensively investigate the combined mechanisms of action underlying the Egg-Milk Pattern.

With an increased Salt-preserved vegetable-Nut Pattern score, older adults have an increased risk of hypertension, heart disease, uterine tumors, and a decreased risk of rheumatic or rheumatoid disease. It has been shown that a high-salt diet is an important factor in causing hypertension and cardiovascular injury[33] and that a high-salt diet decreases levels of *Bifidobacterium fragilis* and arachidonic acid in the gut, increases gut-derived corticosterone production and corticosterone levels, and promotes elevated blood pressure.[34] Besides, the intake of pickled vegetables has been shown to increase the risk of hypertension and coronary heart disease in the Chinese elderly population.[35] Although no studies have hitherto investigated the correlation between pickled vegetable intake and uterine tumors, a high-salt diet has been shown to promote tumor progression by triggering an immune response.[36-37]

Moreover, some species of mushrooms reportedly exhibit immunomodulatory activity, making them a promising candidate for drug replacement therapy for rheumatic diseases,[38] and garlic is a potential adjunctive treatment for rheumatic diseases.[39-40] Thus, according to the Salt-preserved vegetable-Nut Pattern, mushrooms and garlic may jointly play a protective role against rheumatic diseases. Interestingly, although nuts, mushrooms, seaweed, and garlic have been documented to be effective for blood pressure control[41] and yield many health benefits,[42-45] the Salt-preserved vegetable-Nut Pattern was found to increase the risk of hypertension in Chinese older adults in the presence of a high-salt diet of salty vegetables. This finding suggests that salt intake exerts the most significant influence on blood pressure and that its effect significantly outweighs the effect of other foods in regulating blood pressure.

The present study found that higher scores in the Vegetable-Fruit Pattern were associated with a decreased risk of heart disease among older adults. Consistent with the literature,[46] increased fruit and vegetable intake was associated with a reduced risk of cardiovascular disease. It is widely acknowledged that dietary fiber in fruit and vegetable intake may reduce cholesterol levels, blood pressure, inflammation, and platelet aggregation and improve vascular and immune function.[47]

In addition, this study found that as Fish-Meat Pattern scores increased, the risk of heart disease, stroke, or cardiovascular disease decreased, and the risk of rheumatic or rheumatoid disease increased in older adults. In this respect, studies have shown that red meat intake increases the risk of rheumatic disease,[48] while fish intake reduces the risk of cardiovascular disease.[49] Although meat intake is generally considered to increase the risk of cardiovascular disease, specific types of meat, such as lean and unprocessed red meat, do not increase the risk of cardiovascular disease.[50]

This study has several limitations that should be acknowledged. Firstly, the database questionnaire provided information on the frequency of food intake but did not include specific details regarding the categories and quantities of each food consumed. Secondly, given the cross-sectional observational nature of our study, it is susceptible to reverse causality and potential confounding factors, despite attempts to adjust for multiple confounders. Lastly, the reliance on self-reported questionnaire data introduces the possibility of bias in our findings, emphasizing the need for more research.

Conclusions

This study substantiated that there are four major dietary patterns in the Chinese elderly population, namely Egg-Milk Pattern, Salt-preserved vegetable-Nut Pattern, Vegetable-Fruit Pattern, and Fish-Meat Pattern. The recommended dietary patterns for common diseases in elderly patients vary greatly. Salt-preserved vegetable-nut pattern is recommended for rheumatic diseases, while vegetable-fruit and fish-meat patterns are recommended for heart disease. Patients with stroke or cardiovascular disease are recommended to adopt the fish-meat pattern. However, the same dietary pattern may have opposing effects on different diseases.

Accordingly, personalized dietary guidance should be implemented for elderly individuals based on their health conditions. The correlations between dietary patterns and diseases derived from this study may provide a basis for the prevention and individualized management of diseases in the elderly. However, the mechanisms underlying the interactions between nutrients in each dietary pattern remain unclear, emphasizing the need for future studies.

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Conflict of Interest
The authors declares no conflict of interest.

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Author Contribution

Tian Zheng and He Jingchun are the co-first authors of this article.