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Screening and Risk Factor Analysis of High-risk Groups for Stroke in Permanent Residents Over 40 Years Old in Dehui City

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Abstract: A cluster random sampling method was adopted to select 3,895 permanent residents aged 40 and above, and information was collected through questionnaires, physical examinations, and laboratory tests. It was concluded that the detection rate of stroke high-risk population of residents aged 40 and over in Dehui City was 43.80%, and the detection rate increased with age. There are certain differences in risk factor exposure between men and women. Relevant results show that the proportion of high-risk stroke population and high exposure level of risk factors among permanent residents aged 40 and above in Dehui City are high, and relevant departments should pay attention to this.

1. Introduction

Cerebrovascular diseases are all diseases that primarily involve the cerebral vasculature and are the leading cause of severe long-term disability and the second leading cause of death worldwide [1]. Stroke is the most common manifestation of cerebrovascular disease. A stroke occurs if the artery supplying the brain is occluded or ruptured. The types of stroke [2] are ischemic or embolic stroke caused by obstruction of the blood supply to the brain and hemorrhagic stroke caused by bleeding in or around the brain. Transient ischemic attack (TIA), also known as microstroke, is caused by temporary occlusion and is a serious warning sign of future stroke [3]. In the last 30 years, the prevalence of stroke in China has increased significantly, and China now has the highest number of current stroke cases in the world [4]; the incidence rate is also on a significant upward trend, contrary to the decreasing trend in developed countries [5]. For this reason, this project team screened permanent residents aged 40 years and above in Dehui City in March 2022 and March 2023 to identify key populations and priority areas for stroke intervention.

2. Subjects and Methods

2.1. Screening Sites and Subjects

Multi-stage whole-group random sampling was used. Screening sites were identified by the Jilin Provincial Health Administration based on the recommendations made by the base hospital (Jilin

Provincial People's Hospital) and required areas with reasonable regional distribution, good foundation for public health work, high motivation of medical personnel to participate, better health records of the regional population, and reasonable population age and gender structure. Among them, the community screening site for the victory community, the township screening site for the town of Songhua River.

Screening target inclusion criteria:

1) Age above 40 years (born before December 31, 1982, including the files of patients who died between January 1, 2021 and December 31, 2021);

2) Local permanent residents (those who have lived in the local area for six months or more);

3) Voluntary participation and signed informed consent form;

The total number of study subjects who finally met the inclusion criteria, had complete information and were included in the statistical analysis was 3895.

2.2. Survey Method

The "2022 Annual Community and Township Population Screening Form for Cardiovascular and Cerebrovascular Disease Risk Factors" was used to survey the current status of those who met the criteria in a face-to-face manner. Screening techniques and staff were trained by the base hospital in a level-by-level training approach, which included introduction to the screening program, on-site survey techniques and quality control of the sampled population, physical examination, laboratory tests and survey form filling techniques.

The survey included basic demographic information, questionnaire, physical examination, laboratory examination, electrocardiogram and cerebrovascular ultrasound and other data information.

2.3. Risk Factors and Determination Criteria for High-risk Groups

(1) Hypertension A history of hypertension (diagnosed in a secondary or higher hospital) or elevated blood pressure as measured by this screening.

(2) Atrial fibrillation or valvular heart disease previous medical history (diagnosed by a hospital of second level or higher) or the current ECG showed atrial fibrillation.

(3) Smoking Active smokers: those who have smoked for six months or more in their lifetime or cumulatively for six consecutive months.

Quitters: smokers who had stopped smoking at the time of the survey and persisted for more than 6 months.

(4) Dyslipidemia With previous medical history (diagnosed at a level II or higher hospital) or current on-site measurement, total cholesterol ≥ 6.22 mmol/L (240 mg/dl), triglycerides ≥ 2.3 mmol/L (200 mg/dl), HDL < 1.04 mmol/L (40 mg/dl), LDL ≥ 4.1 mmol/L (160 mg /(5) Diabetes mellitus.

(5) Diabetes mellitus A previous medical history (diagnosed in a secondary or higher hospital) or the current on-site measurement showed elevated blood pressure, random blood glucose ≥ 11 nmol/L or fasting blood glucose ≥ 7 nmol/L.

(6) Little physical activity Those who exercised ≥ 3 times per week, ≥ 30 minutes per exercise of moderate intensity and above, or engaged in moderate or heavy physical labor were considered to have regular physical activity. On the contrary, it is a lack of exercise. Moderate physical work refers to continuous hand and arm movements (e.g. sawing wood, etc.); arm and leg work (e.g. transport operations such as trucks, tractors or construction equipment); arm and trunk work (e.g. forging, wind tool operation, painting, intermittent lifting of moderately heavy loads, weeding, hoeing fields, picking fruits and vegetables, etc.). Heavy physical labor is the arm and trunk load

work (such as lifting heavy objects, shoveling, hammer forging, sawing and planning or chiseling hardwood, mowing, digging, etc.).

(7) Obesity BMI ≥ 28 is obese. [(BMI=weight (kg)/height2 (m2)].

(8) Family history of stroke Definite diagnosis at a hospital of second level or higher.

a. History of previous stroke.

Definite diagnosis in a secondary or higher hospital; CT report.

b. History of TIA.

Definite diagnosis in a secondary or higher hospital; CT report

High-risk group: People with three or more of the eight risk factors for stroke, including hypertension, dyslipidemia, diabetes, atrial fibrillation or valvular heart disease, smoking history, obesity, lack of exercise, family history of stroke, or transient ischemic attack, or previous stroke were assessed as high-risk group for stroke.

2.4. Statistical Analysis

The base hospital trained the screening information entry clerks, collected, organized and summarized the screening data information in a timely manner, and entered the data into the cerebrovascular disease big data platform. The collected and collated data were analyzed using SPSS 19.0 software, and their rates were calculated for categorical variables, and the rates were tested by χ^2-test or logistic regression analysis. The test level α= 0.050.

3. Results

3.1. Basic Information of the Survey Population

Of the 3895 people in this survey, 2005 (51.5%) were community population and 1890 (48.5%) were township population; 1649 (42.3%) were male and 2246 (57.7%) were female. The Kolmogorov Smirnov test for age showed that the Kolmogorov Smirnov Z was 3.989, p=0.000 <0.05, indicating that "age" does not obey normal distribution, i.e., non-normal distribution. For the non-normal distribution, the median was used to describe the concentration level and the interquartile spacing (P75P25) to describe the dispersion level. For the overall sample population, the median age of males was 65, and the interquartile range was 7156=15; for females, the median age was 63, and the interquartile range was 7056=14. The median age of males in the community sample population was 67, and the interquartile range was 7260=12; for females, the median age was 65, and the interquartile range was 7058=12. The median age of males in the township sample population was 62, and the interquartile range was 7058=12. The median age of men in the rural sample was 62, with an interquartile range of 6954=15; the median age of women was 60, with an interquartile range of 6953=16. See Tables 1.

3.2. Distribution of High-risk Groups for Stroke

Table 1: Demographic characteristics of the screening population and distribution of high-risk groups

Population characteristics	Number of screened individuals	Composition ratio	Number of people at high risk	High-risk rate	valueχ^2	p-value
Urban and rural					1.381	0.24
Community	2005	0.515	860	42.89%		
Township	1890	0.485	846	44.76%		
Gender					39.163	<0.001

Male	1649	0.423	818	49.61%		
Female	2246	0.577	888	39.54%		
Age group (years)					26.448	<0.001a
40~49	432	0.111	148	34.26%		
50~59	1099	0.282	455	41.40%		
60~69	1432	0.368	671	46.86%		
70~	932	0.239	432	46.35%		
Marital status					5.439	0.142
Married	3567	0.916	1548	43.40%		
Unmarried	23	0.006	14	60.87%		
Divorced/widowed	288	0.074	138	47.92%		
Other	17	0.004	6	35.29%		
Education level					10.046	0.018
Elementary school and below	1930	0.496	893	46.27%		
Junior high school	1281	0.329	537	41.92%		
High school or junior college	557	0.143	223	40.04%		
College or undergraduate and above	127	0.033	53	41.73%		
Occupational					2.602	0.857
Civil Servant	31	0.008	13	41.94%		
Professional and technical staff	90	0.023	41	45.56%		
Clerical and related personnel	113	0.029	44	38.94%		
Commercial/service personnel	292	0.075	136	46.58%		
Agriculture, forestry and fishery	2228	0.572	978	43.90%		
Transportation personnel	317	0.081	133	41.96%		
Other	824	0.212	361	43.81%		
My average annual income (million yuan)				6.323	0.097	
<0.5	1286	0.330	593	46.11%		
0.5~0.9	999	0.256	409	40.94%		
1.0~1.9	836	0.215	361	43.18%		
≥2	774	0.199	343	44.32%		
Total	3895	1	1706	43.80%		
Note: [a] indicates the use of trend χ^2 test						

A total of 1706 high-risk groups were screened, with a high-risk rate of 43.8%. The high-risk rate of stroke was 49.6% for men and 39.6% for women, with statistically significant differences between different genders (2=39.163, P<0.001); and increased with age (χ^2 trend=26.448, P<0.001); 42.9% and 44.8% for community and township, respectively, with no statistically significant differences between different regions (2=1.381, P > 0.050). Using logistic regression analysis, after adjusting for age, the stroke risk rate wasχ^{higher} in men than in women; after adjusting for sex, the stroke risk rate was highest in the group aged 50-60 years; after adjusting for sex and age, the stroke risk was lowest in $\chi^{the}{}_{secondary/high\ school}$ group; all these differences were statistically significant (P < 0.050). See Tables 2 and 3.

Table 2: Logistic regression coding and assignment table

Code	Variable name	Assignment
Y	High risk of stroke	No=0, Yes=1
X1	Gender	Female=0, Male=1
X2	Age group	40~49=1, 50~59=2, 60~69=3, 70~=4
X3	Education level	Elementary school and below=1, junior high school=2, secondary/high school=3, college/bachelor's degree and above=4

Table 3: Results of logistic regression analysis after adjusting for gender and age

Variables	B	Standard error	χ^2	P	OR	OR 95% CI	
						Lower	Upper
Sex	/	/	/	/	/	/	/
Male	/	/	/	/	/	/	/
Female	0.421	0.066	40.43	0.66	0.66	0.576	0.747
Age (years)	/	/	/	/	/	/	/
40~50	/	/	/	/	/	/	/
50~60	0.306	0.119	6.589	0.01	1.358	1.075	1.716
60~70	0.524	0.116	20.47	0	1.689	1.346	2.119
70~	0.457	0.122	14.04	0	1.579	1.243	2.006
Education level	/	/	/	/	/	/	/
Elementary school and below	/	/	/	/	/	/	/
Junior high school	0.177	0.074	5.716	0.017	0.838	0.725	0.969
Secondary/high school	0.311	0.1	9.758	0.002	0.733	0.603	0.891
College/bachelor and above	0.231	0.189	1.502	0.22	0.794	0.548	1.149

3.3. Distribution of Risk Factors among High-risk Groups for Stroke

Table 4: Exposure to risk factors among high-risk groups [n (%)]

Risk Factors	Total	%	Urban					Township					χ^2	P [c]
			Sub-total	Male	Fema-le	χ^2	P[a]	Sub-total	Male	Female	χ^2	P [b]		
	1706		860	367	493	/	/	846	451	395	/	/	/	/
Hypertension	1237	72.51	741	314	427	0.196	0.658	496	263	233	0.04	0.843	162.20	<0.001
			86.16%	85.56%	86.61%	/	/	58.63%	58.31%	58.99%	/	/	/	/
Dyslipidemia	1402	82.18	655	258	397	12.122	<0.001	747	386	361	6.87	0.009	42.87	<0.001
			76.16%	70.30%	80.53%	/	/	88.30%	85.59%	91.39%	/	/	/	/
Diabetes	808	47.36	324	132	192	2.016	0.156	484	236	248	9.41	0.002	65.30	<0.001
			37.67%	35.97%	38.95%	/	/	57.21%	52.33%	62.78%	/	/	/	/
History of Smoking	631	36.99	179	128	51	76.824	<0.001	452	315	137	104.63	<0.001	194.63	<0.001
			20.81%	34.88%	10.34%	/	/	53.43%	69.84%	34.68%	/	/	/	/
Obesity	483	28.31	366	156	210	0.001	0.979	117	49	68	7.13	0.008	173.42	<0.001
			42.56%	42.51%	42.60%	/	/	13.83%	10.86%	17.22%	/	/	/	/
Lack of exercise	1096	64.24	458	188	270	1.059	0.303	638	314	324	17.47	<0.001	91.15	<0.001
			53.26%	51.23%	54.77%	/	/	75.41%	69.62%	82.03%	/	/	/	/
Prior stroke	190	11.14	148	78	70	7.349	0.007	42	23	19	0.37	0.847	64.61	<0.001
			17.21%	21.25%	14.20%	/	/	4.96%	5.10%	4.81%	/	/	/	/
Prior TIA	7	0.41	6	3	3	0.133	1	1	0	1	1.14	0.467	3.50	0.135
			0.70%	0.82%	0.61%			0.12%	0.00%	0.25%	/	/	/	/
Atrial fibrillation	9	0.53	9	7	2	4.581	0.072	0	0	0	-	-	-	-
			1.05%	0.019074	0.004057	/	/	0	0	0	/	/	/	/
family history of stroke	237	13.89	107	40	67	1.399	0.237	130	77	53	2.16	0.141	3.05	0.081
			12.44%	10.90%	13.59%	/	/	15.37%	17.07%	13.42%	/	/	/	/

Note: [a] urban male vs female; [b] township male vs female; [c] urban vs township.

The top five risk factors exposure in the high-risk group for stroke were dyslipidemia (82.18%), hypertension (72.51%), physical inactivity (64.24%), diabetes mellitus (47.36%), and smoking history (36.99), in that order. Among community residents, the detection rates of smoking (Waldχ^2=76.824, P<0.001) and previous stroke (Waldχ^2=7.349, P<0.050) were higher in men than in women, and the proportion of dyslipidemia (Wald2=12.122, P<0.001) conditions was higher in women than in men. Among rural residents, the proportion of smoking was higher in men than in women, while the detection rates of risk factors such as dyslipidemia, diabetes, obesity and lack of exercise were higher in women than in men, and the differences were statistically significant (P < 0.050). Hypertension, obesity and previous stroke were higher in the community than in the township; dyslipidemia, diabetes, smoking and physical inactivityχ^{were} higher in the township than in the community; the differences in the distribution of the above risk factors for stroke between the community and the township were statistically significant (P < 0.050). See Table 4.

4. Recommendations

The detection rates of hypertension and dyslipidemia were very high in the high-risk group of stroke in Dehui city, both above 70%; and the lack of exercise was very significant in the community and township, with hypertension, dyslipidemia and lack of exercise occupying the top three risk factors in both the community and township. This shows that hypertension, dyslipidemia and physical inactivity are the most important risk factors for stroke in Dehui city, and it is necessary to further implement basic public health services and family doctor contracting services to increase the regular supervision and medication management of patients with hypertension and dyslipidemia. The prevention of stroke through effective control of blood pressure and lipids. Lack of exercise is not only an independent risk factor for stroke [6], but also causes hypertension, obesity, diabetes and other diseases, which are risk factors for stroke.

Among the risk factors in this study, smoking was higher in men than in women, both in urban and rural areas. Smoking is a major risk factor for stroke, with an estimated 15% of annual deaths due to stroke caused primarily by smoking [7]; smoking cessation reduces the risk of stroke, with the additional risk almost disappearing after 2 to 4 years of cessation [8]. Therefore, men need to pay more attention to tobacco control interventions during stroke interventions. The detection rates of risk factors such as hypertension, dyslipidemia, diabetes mellitus, obesity and physical inactivity are higher in both community and rural women than in men, suggesting that women should pay more attention to the control of metabolic diseases, pay attention to diet control and develop good lifestyle habits. Risk factors such as hypertension, obesity and previous stroke were higher in the community than in the township; while risk factors such as dyslipidemia, diabetes, smoking and physical inactivity were higher in the township than in the community. Therefore, cities should strengthen disease management of common chronic diseases, while townships should pay more attention to promoting healthy lifestyles and changing personal bad habits.

5. Conclusions

The project screened 3,895 community and township residents in Dehui and found that the detection rate of stroke among the resident population aged 40 years and above was 43.80%, suggesting that Dehui has a high risk rate of stroke in China and needs to strengthen its stroke prevention and treatment efforts. The top five risk factors in the high-risk group were dyslipidaemia (82.18%), hypertension (72.51%), lack of exercise (64.24%), diabetes (47.36%) and smoking history (36.99). The article makes various recommendations to address these conditions, focusing on improving one's lifestyle, diet and exercise habits.

The study provides a scientific and reliable basis for the comprehensive prevention and treatment of stroke in the Dehui area and provides a data base for regular follow-up and standardised

management of the screened out high-risk groups. The study also has some limitations. Firstly, some of the information was obtained through questioning, which may result in recall bias and discrepancies in the results. Secondly, due to the net outflow of population from the northeast region in recent years, there are more young people and men working outside the home, while older people and women are commonly left behind, resulting in some differences in the distribution of the study population and the standard population in Dehui, and further validation of the findings will be needed in future studies.

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