

Exploring the degree of nicotine dependence and willingness to quit smoking in Chinese smoking patients with stroke

A cross-sectional survey

Ling Li, BD^{a,*} , Haifeng Li, BD^b, Ying Zhang, BD^a, Chengyuan Zheng, BD^a, Houyun Xu, BD^a, Zizhen Cheng, MD^a

Abstract

Smoking is closely related to the occurrence of stroke. The degree of nicotine dependence and willingness to quit smoking are key factors that determine whether a smoker can successfully quit smoking. Few studies have been conducted on factors affecting the willingness to quit smoking among smokers who suffered from stroke.

Although the smoking rate has declined, it is still the main changeable risk factor for cerebrovascular diseases. We aimed to investigate the current status of nicotine dependence and willingness to quit smoking among patients who suffered from stroke. We also clarified factors that affect the willingness to quit smoking among stroke patients and provide evidence for quitting smoking.

Convenience sampling methods were used to conduct cross-sectional studies. A questionnaire survey was administered to 215 stroke patients who smoked. A general information questionnaire as well as patient smoking and cessation status questionnaire were used. Nicotine dependence test scale, smoking attitude factor score, and tobacco harm perception scale were applied for investigation. Logistic regression was used to analyze factors related to patients' willingness to quit smoking.

Statistically significant differences in willingness to quit smoking were found among stroke patients with different ages, household registration status, education levels, marital status, occupation, smoking attitude, and nicotine dependence ($P < .05$). About 34.4%, 39.1%, and 26.5% of smoking patients had low, moderate, and severe nicotine dependence, respectively. Logistic analysis showed that compared with other occupations, workers, retirees, farmers, and freelancers compared with other people (0.050, 0.081, 0.053, 0.048) had a negative impact on the willingness to quit smoking among stroke patients. Compared with positive attitudes, negative and neutral smoking attitudes (0.190, 0.048) had a negative impact on the willingness to quit smoking among stroke patients. Compared with high nicotine dependence, low and moderate nicotine dependence (4.628, 2.596) had a positive impact on willingness to quit smoking.

Smoking patients in neurology department are more willing to quit smoking (67.9%). Factors such as occupation, smoking attitude, and nicotine dependence should be considered when establishing smoking cessation interventions for stroke smokers.

Keywords: nicotine dependence, smoking, stroke, willingness to quit smoking

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^aLinyi City Center Blood Station, Shandong Province 146 Yimeng North Road, Lanshan District, Linyi City, Shandong, China, ^bLinshu County People's Hospital, Xiangyang Road, Linshu County, Linyi City, Shandong, China.

* Correspondence: Ling Li, Linyi City Center Blood Station, Shandong 276000, China (e-mail: lyxzlling@163.com).

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1. Introduction

Stroke, also known as cerebrovascular accident, is a group of sudden cerebrovascular diseases caused by abnormal cerebrovascular system and has the common characteristic of focal nerve function damage. The 2 types of stroke according to hemodynamic characteristics are ischemic (cerebral infarction and cerebral embolism) and hemorrhagic (cerebral hemorrhage and subarachnoid hemorrhage). Stroke has become the second leading cause of death worldwide. The disease is characterized by high rates of morbidity, recurrence, disability, and mortality as well as high economic burden. Stroke is the "number one killer of human health".^[1-4] With increasing incidence of chronic diseases, such as hypertension, diabetes, and hyperlipidemia, the exposure to stroke risk factors has increased every year in China and stroke has become the leading cause of death in China.^[5]

Smoking is closely related to the occurrence of stroke. Smoking can lead to atherosclerosis and arterial wall rupture, causing embolism and accelerating stroke. In addition, smoking can increase fibrinogen content, promote platelet aggregation, improve blood cell specific volume, slow down blood flow,

and thus accelerate thrombosis; smoking also blocks cerebral blood flow and causes stroke. Smoking can increase the risk of recurrence of stroke.^[6] Tobacco use increases the risk of death from many diseases, such as common cancer, ischemic heart disease, chronic obstructive pulmonary disease (COPD), and stroke. Given that smoking is so harmful, differences in the prevalence of smoking among the population translate into significant differences in disease morbidity and mortality.^[7] China has the largest number of smokers worldwide. In 2014, China consumed more than 40% of cigarettes worldwide, which is more than the sum of 29 cigarette-consuming countries.^[8] Although the prevalence of smoking has declined nationally, it remains a major variable risk factor for development and progression of most diseases.

Tobacco dependence is a chronic addictive disease. Once smokers quit smoking for a long time, they will have a series of withdrawal symptoms, such as irritability, irritability, insomnia, low mood, and inattention, which will lead to difficulties in quitting smoking.^[9] The degree of nicotine dependence is one of the key factors that determine whether a smoker can successfully quit smoking. Studies have shown that smokers have impulsiveness, poor self-control, and other personality characteristics, which make them more likely to become tobacco dependent under the stress of life events and environment.^[10] According to a report, the more severe the degree of nicotine dependence is, the more obvious the smoking behavior and the higher the frequency and amount of smoking will be.^[11] The risk of stroke decreases after 2 to 3 years of quitting smoking. After 5 years of smoking cessation, the risk of stroke shows a continuous decreasing trend.^[12,13]

In this study, patients who expressed their willingness to “quit smoking within 6 months” were defined as patients who were willing to quit smoking and had intention to quit smoking. This study aimed to understand the attitudes of stroke patients toward smoking and their perceptions of the dangers of tobacco, evaluate the level of nicotine dependence of patients and their willingness to quit, and identify factors that may influence the willingness to quit. Results are important to reduce the risk of stroke onset and recurrence and to develop scientifically sound interventions for patients.

2. Materials and methods

2.1. Design and sample

This study is a cross-sectional survey and selected 215 stroke patients who were admitted to the neurology department of a general hospital in Linyi City, Shandong Province, China from November 2020 to February 2021. The inclusion criteria include the following: age ≥ 18 years; all stroke smoking patients were confirmed by head MRI diffusion imaging at the time of diagnosis and treatment; a history of active smoking; and informed consent and voluntary participation. The exclusion criteria are as follows: patients who cannot communicate normally; and patients with other serious diseases (such as liver and kidney function, heart function, lung failure, or malignant tumors). The completion rate of the questionnaire is less than 95% to be eliminated.

The project was approved by the hospital's ethics committee. All participants were informed about the study and their written consents were obtained.

The sample size for the cross-sectional study was determined according to the Kendall sample size estimation method. The

sample size was 5 to 10 times the number of variables in the study. At the same time, in order to reduce the research error and pursue the stability of the research results, 20% sample size is increased to determine the sample size of the final investigation. The questionnaire involved in this study included a total of 17 items in the dimensions of the patient's general information and scales. The sample size was calculated as 10 times the number of variables, and the sample size was calculated as 204 cases. In this study, 230 questionnaires were finally distributed, and data with a completion rate of 95% or more and no obvious regular response pattern were retained, and 215 valid questionnaires were finally recovered, with a valid recovery rate of 93.5%.

2.2. Research tools

The questionnaire was designed by the researchers and included gender, age, registered permanent residence, ethnic group, educational level, marital status, occupation, monthly family income, and hospitalization complications.

The questionnaire on smoking and cessation status of patients was based on literature search and revised by clinical smoking cessation experts. The contents of the questionnaire include smoking status: smoking frequency, smoking years, smoking attitude, awareness of tobacco hazards, social environmental factors and nicotine dependence; and smoking cessation status: whether you have tried to quit smoking, the number of attempts to quit, reasons for quitting, methods of quitting, whether you have relapsed, reasons for relapse, and reasons for reluctance to try to quit.

The degree of nicotine dependence was assessed using the Fagerstrom Test for Nicotine Dependence,^[14] which is widely used at home and abroad. The Fagerstrom Test for Nicotine Dependence contains a total of 6 items, and the score range is 0 to 10 points: 0 to 3 points represent mild nicotine dependence; 4 to 6 points represent moderate nicotine dependence; 7 to 10 points represent severe nicotine dependence. High scores indicate smoking, and that the degree of nicotine dependence of the patient is more serious.

The smoking attitude was evaluated based on the Smoking Attitude Scale. The score is the total score of each sub-question and is divided into 3 quantiles from low to high, representing positive, neutral, and negative attitudes toward smoking, respectively. Tobacco hazard awareness score is the total score of each sub-question and is divided into 3 quantiles from low to high, representing low, medium, and high levels of hazard awareness.

2.3. Research method

Researchers were trained uniformly and the hospital's consent was obtained in advance. The entire investigation process strictly adopts the principles of voluntariness, anonymity, and informed consent. When the subject encountered a problem during the research process, the researcher gave an answer on the spot. The questionnaires were distributed uniformly and recovered on the spot, and the questionnaire filling time was 30 minutes.

2.4. Quality control

Quality control includes the following: checking and entering the questionnaire on the day of data collection and setting reasonable data boundaries to ensure that the entered data is accurate. Questionnaires with a missing value of more than 10% are

considered invalid questionnaires and were not entered to the data entry stage. The statistical method was strictly followed. Conditions were established to ensure that the original data were used and the data will not be tampered.

2.5. Statistical analyses

The data in this study were analyzed by SPSS 21.0 (IBM Corporation, Armonk, NY, USA). Measurement data conforming to the normal distribution are described by mean and standard deviation, and measurement data not conforming to the normal distribution are presented by median and interquartile range. Counting data are represented as frequency and percentage. Two groups of measurement data conforming to the normal distribution were compared by *t* test. Multiple groups of measurement data were compared by analysis of variance. Chi-square test was used for comparison of count data. Nonparametric test was used for non-normal distribution.

3. Results

3.1. Basic information

A total of 215 stroke patients with a history of smoking were included in this study, and the mean age is (55.17 ± 14.126) years. There are 198 males and 17 females; the household registration is mostly urban, accounting for 55.3%; ethnicity is Han, with 205 cases, accounting for 95.3%; 6 illiterate cases, 46 primary school, 84 junior high school, 50 technical secondary school, high school 50. Ten cases of junior college, 19 cases of bachelor's degree or above; married people accounting for 90.7%; family per capita monthly income is less than 5000 yuan in 60 cases, >5000 to 10,000 yuan in 128 cases, and >10,000 to 50,000 yuan 26 cases, 1 case > 50,000 yuan; 27 stroke patients with heart disease, 107 patients with hypertension, 42 patients with diabetes, and 50 patients with other diseases. The results are shown in Table 1.

3.2. Smoking status

Among the 215 patients, 186 patients smoked daily, accounting for 86.5%; the age of starting smoking was (19.11 ± 4.141) years old, and the average duration of smoking was (34.89 ± 14.284) years; 65.6% of the patients did not because of cigarette prices. Expensive and reduce smoking. 61.4% of patients noticed the warnings on the cigarette pack in the last month; 53.5% of patients can smoke at home without being restricted by family members, and only 11.2% of patients' families do not allow them to smoke in the room; 48.4% of patients are not subject to any restrictions on smoking in the workplace, and only 14.0% of patients are not allowed to smoke indoors; and 50.2% of patients are exposed to second-hand smoke for more than 15 minutes almost every day.

3.3. Quit smoking status

A total of 146 patients tried to quit smoking. Among them, 121 patients (82.9%) chose to quit smoking because smoking endangered their health, 80 patients (54.8%) chose to quit smoking because smoking aggravated their illness and unfavorable recovery, 69 patients (47.3%) chose to quit smoking because their doctors' advised quitting smoking, and 73 patients (50.0%) chose to quit smoking because their relatives opposed smoking.

Table 1

Basic information distribution of stroke smoking patients in neurology department of a General Hospital in Linyi city, Shandong Province.

Project	Classification	Frequency (n)	Percentage (%)
Gender	Male	198	92.1
	Female	17	7.9
Age	18~40	33	15.3
	41~65	131	60.9
	>65	51	23.7
Account type	Rural area	96	44.7
	Town	119	55.3
Nationality	Han nationality	205	95.3
	Other nationalities	10	4.7
Education level	Illiteracy	6	2.8
	primary school	46	21.4
	junior high school	84	39.1
	Technical secondary and high school	50	23.3
	Junior college	10	4.7
Marital status	Bachelor degree and above	19	8.8
	Unmarried	18	8.4
	Married	195	90.7
	Widowed	1	0.5
Occupational situation	Divorced	1	0.5
	Retirees	61	28.4
	Worker	35	16.3
	Farmer	45	20.9
	Civil servant	1	0.5
	Teacher	4	1.9
	Corporate personnel	27	12.6
	Freelancer	16	7.4
Family monthly income (yuan)	Other	26	12.1
	<5000	60	27.9
	5000-10,000	128	59.5
	>10,000-50,000	26	12.1
Inpatient diagnosis of comorbidities	>50,000	1	0.5
	With heart disease	27	12.6
	With hypertension	107	49.8
	With diabetes	42	19.5
	Combined with other diseases	50	23.3

Sixty-nine patients were unwilling to try to quit smoking. Among them, 43 patients (62.3%) believed that they could not quit smoking and were unwilling to try, and 29 patients (42.0%) believed that smoking had no adverse effects on the body and were unwilling to try.

A total of 138 patients (94.5%) chose to quit smoking by their own perseverance, only 9 patients (6.2%) chose to go to the smoking cessation clinic for help to quit smoking, only 7 patients (4.8%) chose the smoking cessation hotline to ask for help to quit smoking, 24 patients (16.4%) patients chose e-cigarettes to seek help to quit smoking, 14 cases (9.7%) used nicotine gum and nicotine patch to seek help to quit smoking.

A total of 121 patients (82.9%) relapsed after smoking cessation, of which 77 patients (82.9%) chose to relapse due to the onset of cigarette addiction, 76 patients (62.8%) chose to relapse due to the influence of other smokers around, and 40 patients (33.1%) patients chose to relapse due to tension, anxiety, and depression.

3.4. Degree of nicotine dependence

The nicotine dependence degree of 215 stroke patients who smoked was evaluated (Table 2). The judgment results of the

Table 2
FTND Dependency Assessment Scale for Stroke Smokers in neurology department of a General Hospital, Shandong Province [n(%)].

Investigate subject	Standard	N (percent)
How long does it take to smoke the first cigarette after waking up in the morning (min)	<6	92 (42.8%)
	6~30	55 (25.6%)
	31~60	24 (11.2%)
	>60	44 (20.5%)
In nonsmoking places (such as nonsmoking areas in shopping malls, buses, hospitals, etc), do you feel difficult because you cannot smoke?	Yes	109 (50.7%)
	No	106 (49.3%)
Which cigarette is the hardest to give up	First in the morning	85 (39.5%)
	Other time	130 (60.5%)
Do you smoke more in the first hour after waking up in the morning than at other times	Yes	96 (44.7%)
	No	119 (55.3%)
Do you still smoke when you spend most of your time in bed due to illness?	Yes	45 (20.9%)
	No	170 (79.1%)
How many cigarettes do you smoke per day (sticks)	≥31	32 (24.7%)
	21-30	37 (43.3%)
	11-20	93 (17.2%)
	≤10	53 (14.9%)

FTND = the Fagerstrom Test for Nicotine Dependence.

Farnese Nicotine Dependence Assessment Scale showed that 74 cases (34.4%) were mildly dependent on nicotine; 84 cases (39.1%) were moderately dependent on nicotine; 57 cases (26.5%) were severely dependent on nicotine. The results are shown in Table 3.

3.5. Smoking attitudes and perceptions of tobacco harm

The smoking attitude and awareness level of tobacco harm in 215 cases of smoking stroke patients were studied. A total of 127 (59.1%) patients had a negative attitude, 37 (17.2%) patients had a neutral attitude, and 51 (23.7%) patients had a positive attitude. Eighty-two patients (38.1%) had low-level knowledge of tobacco harm, 80 patients (37.2%) had low-level knowledge of tobacco harm, and 53 patients (24.7%) had high-level knowledge of tobacco harm.

3.6. Analysis of influencing factors of smoking cessation intention of stroke patients

The results of univariate analysis showed statistically significant differences in the willingness to quit smoking among stroke patients of different age, household registration, education level, marital status, occupation, smoking attitude, and nicotine dependence ($P < .05$). The results are shown in Table 4.

The willingness to quit smoking (0 = none, 1 = yes) was used as the dependent variable, and the statistically significant variables in the univariate analysis were used as independent variables. The variable assignment method is as follows. Sub-variables were set with reference to >65 years old, urban household registration,

bachelor degree and above, divorced, other occupations, positive attitudes, and high nicotine dependence. According to logistic regression analysis, the introduction level: 0.05, the elimination level: 0.10. The final results showed that occupation, smoking attitude, and nicotine dependence are the influencing factors of willingness to quit smoking. The results are shown in Table 5.

4. Discussion

This study investigated the current status of nicotine dependence and willingness to quit smoking among current smokers and clarified factors that affect the willingness to quit smoking to provide a theoretical basis for follow-up related research. Smoking is one of the risk factors for the worsening of stroke and premature death, and about one-third of the deaths of patients are related to smoking and secondhand smoke exposure.^[15] Smoking cessation has become an important factor that can be intervened for patients with cardiovascular and cerebrovascular diseases. Smoking cessation can reduce the risk of worsening events, and the benefits of smoking cessation will be reflected in a short time. However, the current success rate of smoking cessation is very unsatisfactory. The nicotine dependence and willingness to quit smoking among smokers with more diseases should be elucidated to develop more appropriate and detailed smoking cessation plans for smokers, reduce disease recurrence and morbidity rates, and improve patient health.

The smoking situation derived from this survey is reported in detail. The current stroke smokers are mostly male patients, accounting for 92.1% of the total number of people in this survey, while only 7.9% of women; most of them are older than 40 years old. The current smoking rate shows that the smoking rate among men is on the rise, and more married men use tobacco. This finding is consistent with other domestic survey results,^[16] suggesting that male smokers are still the key population for tobacco control. From a nationwide perspective, men are the main smokers, which may be related to country's cultural traditions and man's living habits and behavior. Tobacco smoke is also a common indoor pollutant, and 40% of children and 35% of female nonsmokers in the world are also exposed to second-hand smoke. Studies have shown that exposure to

Table 3
Fabrication of nicotine dependence in stroke smoking patients in neurology department of a General Hospital, Shandong Province [n (%)].

Nicotine dependence level	Number of people (percent)
Mild (0~3 points)	74 (34.4%)
Moderate (4~6 points)	84 (39.1%)
Severe (7~10 points)	57 (26.5%)

Table 4**Distribution of smoking cessation intention among stroke patients with different types in neurology department of a general Hospital in Linyi city, Shandong Province [n/(%)].**

Project	Classification	Willing to quit smoking	No desire to quit smoking	χ^2 value	P value
Gender	Male	133 (67.2)	65 (32.8)	0.621	.591
	Female	13 (76.5)	4 (23.5)		
Age	18~40	29 (87.9)	4 (12.1)	7.141	.028
	41~65	84 (64.1)	47 (35.9)		
	>65	33 (64.7)	18 (35.3)		
Account type	Rural area	74 (77.1)	22 (22.9)	6.702	.012
	Town	72 (60.5)	47 (39.5)		
Nationality	Han nationality	136 (66.3)	69 (33.7)	3.532	.060
	Other nationalities	10 (100.0)	0 (0.0)		
Education level	Illiteracy	4 (66.7)	2 (33.3)	17.771	.031
	Primary school	32 (69.6)	14 (30.4)		
	Junior high school	51 (60.7)	33 (39.3)		
	Technical secondary school, high school	32 (64.0)	18 (36.0)		
	Junior college	8 (100.0)	2 (0.0)		
	Bachelor degree and above	19 (76.5)	0 (76.5)		
Marital status	Unmarried	18 (100.0)	0 (0.0)	12.649	.003
	Married	126 (64.6)	69 (35.4)		
	Widowed	1 (100.0)	0 (0.0)		
	Divorced	1 (100.0)	0 (0.0)		
Occupational situation	Retirees	37 (60.7)	24 (39.3)	21.889	.001
	Worker	18 (51.4)	17 (48.6)		
	Farmer	31 (68.9)	14 (31.1)		
	Civil servant	0 (0.0)	1 (100.0)		
	Teacher	3 (76.0)	1 (25.0)		
	Corporate personnel	22 (81.5)	5 (18.5)		
	Freelancer	10 (62.5)	6 (37.5)		
	Other	25 (96.2)	1 (3.8)		
	Family monthly income (yuan)	<5000	42 (70.0)		
>5000-10,000	91 (71.1)	37 (28.9)			
>10,000-50,000	12 (46.2)	14 (53.8)			
>50,000	1 (100.0)	0 (0.0)			
Nicotine dependence	Low level	59 (79.7)	15 (20.3)	10.849	.005
	Moderate	57 (67.9)	27 (32.1)		
	Severe	30 (52.6)	27 (47.4)		
Smoking attitude	Negative attitude	77 (76.5)	50 (76.5)	10.983	.004
	Neutral attitude	25 (76.5)	12 (76.5)		
	Positive attitude	44 (76.5)	7 (76.5)		
Awareness level of tobacco harm	Low level	61 (74.4)	21 (25.6)	3.208	.197
	Moderate	49 (61.3)	31 (38.8)		
	Height	36 (67.9)	17 (32.1)		

nicotine in tobacco has obvious neurotoxicity to the fetus and is related to various adverse birth outcomes.^[17] The use of tobacco by parents or future parents will increase the risk of children smoking because their attitudes toward smoking are affected by their parents' behavior. More importantly, the smoking environment is a hazard to all family members because it increases the risk of acute respiratory disease and asthma in children as well as the risk of lung cancer, advanced asthma, and ischemic heart disease in adults.^[18,19] Therefore, controlling the male smoking population can further protect women and children from exposure to second-hand smoke. Scholars should focus on the prevention and control of the harms of smoking among males. Changing concepts, improving knowledge, trust, and practice, and increasing men's awareness of the harms of smoking are necessary for active prevention awareness.

This study shows that the occupation of farmers, workers, and retirees has a negative impact on the willingness of stroke patients to quit smoking. This finding may be related to the particularity of farmers' occupations. Farmers whose main source of income is

cultivated land have lower family incomes and lower economic levels than other occupations. It is related to the generally low education level of most farmers and workers, and the complexity of the people in contact at work. Moreover, in the data analysis, education level has no significant effect on the willingness to quit smoking, which may be related to the sample size of this study. However, according to previous studies, education level is correlated with smoking rate.^[20,21] The proportion of stroke patients with college degree or above and 40 years of age or older is relatively low, which usually means that the population has a low level of education. The occupations are mainly farmers and workers. The contact in life is more complicated, smoking is more common, and they are forced by life and social needs. Quitting smoking is not considered. Although most people know that smoking is harmful, they do not know the harm and the severity of the harm. In addition, factors such as age and occupation limit the patient's health awareness and fail to recognize the danger of smoking to stroke, leading to high nicotine dependence, high smoking rate, and difficulty in quitting smoking, thereby

Table 5**Logistic regression analysis of smoking cessation intention among stroke patients in neurology department of a General Hospital in Linyi, Shandong Province.**

Project	β value	SE value	Wald value	P value	OR (95% CL)
Occupation/other					
Retirees	-2.507	1.121	5.006	.025	0.081 (0.009–0.733)
Worker	-2.997	1.129	7.051	.008	0.050 (0.005–0.456)
Farmer	-2.930	1.172	6.251	.012	0.053 (0.005–0.531)
Freelancer	-3.028	1.234	6.025	.014	0.048 (0.004–0.543)
Smoking attitude/positive attitude					
Negative attitude	-1.659	0.508	10.659	.001	0.190 (0.070–0.515)
Neutral attitude	-1.511	0.616	6.015	.014	0.048 (0.004–0.543)
Nicotine dependence degree/severe					
Low level	1.532	0.461	11.061	.001	4.628 (1.876–11.416)
Moderate level	0.954	0.414	5.304	.021	2.596 (1.153–5.845)
Constant	3.291	1.231	7.152	.007	26.882 (—)

increasing the risk of stroke and recurrence. Therefore, promoting “smoking is harmful to health” for this group of people is insufficient. Health education methods such as pictures or television and media advertisements can be used to show the harm of smoking more vividly. It is also easier to be accepted by patients with low-level education, raising the health awareness of people in various occupational fields. Correcting their incorrect smoking cognition can help smokers with stroke increase their motivation to quit smoking, thereby reducing the degree of nicotine dependence, helping to quit smoking successfully, and reducing disease incidence and recurrence rate.

The degree of nicotine dependence is an important risk factor for smoking and the willingness to quit smoking in stroke patients. The willingness to quit smoking of patients with low nicotine dependence was 4.628 times that of patients with severe nicotine dependence. The willingness to quit smoking of patients with moderate nicotine dependence was 2.596 times that of patients with severe nicotine dependence. The lower the degree of dependence is, the stronger the willingness of stroke smokers to quit smoking will be. Nicotine can cause the release of neurotransmitters, such as dopamine and acetylcholine, which promote pleasure in the nucleus accumbens.^[22] Some smokers have limited knowledge about the mechanism of nicotine addiction and believe that tobacco can improve mood. The more severe the degree of nicotine dependence is, the more obvious their smoking addiction behavior and higher the smoking frequency and amount will be,^[23] which increases the risk of stroke and becomes an important risk factor. The survey found that only 47.3% of people chose to quit smoking because of the doctor’s advice, and 62.3% of people still said they could not quit smoking and were unwilling to try. About 94.5% of people quit smoking by their own perseverance, but the persistence time was short and short. Relapses occurred. Only 9 people went to the smoking cessation clinic to seek help for smoking cessation. Most of the patients were unable to cope with the relapse due to the onset of smoking cessation and insufficient sources of smoking cessation knowledge and assistance. Previous studies showed that the higher the nicotine dependence of smokers is, the more resistant the smokers will be to tobacco control interventions will be, and the less likely they will be to quit smoking.^[20,24] Therefore, health education should be carried out for smokers of light to moderate dependence, and it is necessary to clarify the mechanism of nicotine addiction and its harm to better reduce the hedonic component, thereby reducing their

addiction. For people who are highly dependent on nicotine, they should improve their ability to deal with negative emotions and learn to refuse cigarette delivery and smoking in social situations to improve their self-efficacy and learn to use correct emotional management methods to avoid tobacco use as a way to increase positive emotions and reduce negative emotions.

The study found that 94.5% of people quit smoking by their own perseverance, only 6.2% of patients would choose to go to a smoking cessation clinic for help to quit smoking, 9.7% of patients had used alternative methods to quit smoking, such as nicotine gum, nicotine patches, etc, and only 16.4% of patients will choose e-cigarettes as an alternative to smoking cessation. Possible reasons may be related to smoking cessation methods and economic ability available to them. Patients cannot obtain better alternatives due to insufficient sources of smoking cessation knowledge and help, leading to relapse.^[25] Successful smoking cessation usually requires 2 conditions, namely, the combined effect of intrinsic motivation to quit smoking and external assistance in smoking cessation interventions. In the absence of external assistance interventions, smoking cessation is difficult and the success rate is low. The natural quit rate of the general population in China is less than 5%. E-cigarettes are a new type of tobacco product that can emit aerosols, nicotine, and toxic gases containing small and ultra-fine examples, which will increase the risk of cardiovascular and pulmonary diseases; as such, they are not recommended as an alternative treatment. Over the years, domestic and foreign social and health personnel have conducted extensive research and useful attempts on smoking cessation intervention models to increase the confidence of quitters, help guide patients with difficulties, such as withdrawal symptoms, and improve the success rate of smoking cessation. Therefore, health workers should pay attention to patients’ withdrawal symptoms, adopt personalized coping plans to help patients adopt the correct way to quit smoking, actively cope with the discomforts that occur during smoking cessation, and increase the chances of successful smoking cessation.

This study evaluated the smoking attitude and awareness of tobacco harm in 215 stroke patients, and found that 59.1% of patients had negative attitudes, and only 24.7% of patients had high-level awareness of tobacco harm. Possible reasons are related to the incomplete understanding of the factors affecting the disease, and that smoking cannot have a great impact on one’s own diseases. Therefore, we should strengthen disease knowledge training and popularize risk factors for the general public, and the

smoke-free environment during hospitalization can also help to change smoking habits. These can enable patients to receive disease treatment and understand disease knowledge during hospitalization, so that they can successfully quit smoking and the best opportunity to develop a healthy lifestyle.

Studies have confirmed that quitting smoking for 2 to 3 years will reduce the risk of stroke; the risk of stroke will continue to decrease 5 years after quitting smoking.^[26] Therefore, based on this theory and the above factors, the following smoking cessation interventions should be given to the population to prevent the onset and recurrence of stroke. For people at high risk of stroke, the risk of smoking should be explained in time through the bulletin board and health promotion channels to reduce disease incidence and recurrence rate. For patients with confirmed stroke, medical staff should explain the relationship between smoking and stroke in a reasonable way according to the patient's education level, strengthen their risk awareness, and enhance their motivation to quit smoking. According to interventions for smoking cessation phased in patients' disease development and mental status, increasing the exposure rate of related knowledge and improving their cognition and willingness to quit smoking should be conducted. Medical staff should strengthen their spouse's knowledge while educating patients on health; enlist the support of spouses to realize the dangers of smoking and encourage and supervise patients to quit smoking. For patients with a high degree of nicotine dependence, simply giving compliance and motivation intervention cannot control their withdrawal symptoms during quitting. At that time, small doses of nontobacco, reliable and safe nicotine preparations can be given to implement nicotine replacement therapy to gradually reduce withdrawal symptoms, so as to overcome the smoking habit.^[27,28] In addition, other reports indicate that smoking has no significant correlation with recurrence of stroke.^[29] However, many of the damages caused by smoking can be avoided or reduced by quitting smoking.^[30,31] Therefore, smoking cessation intervention is imperative.

There are some limitations to consider in the current study. First of all, the limitations of this study stemmed from the single-center design and the small sample size, which limited the generality. Secondly, this study did not consider the influence of the surrounding environment of stroke patients on their intention to quit smoking. Therefore, follow-up studies should consider the limitations of these 2 points, conduct multi-center investigations, and improve the factors that may affect patients' willingness to quit smoking.

5. Conclusion

In this study, the convenience sampling method was used to investigate the nicotine dependence and cessation intention of stroke patients who smoked in the department of neurology of a general hospital in Linyi city, Shandong Province. Nicotine dependence and willingness to quit smoking were described in detail, and willingness to quit smoking was discussed. The main influencing factors and relevant suggestions are put forward. This study enriched the factors related to nicotine dependence and cessation intention of stroke patients in Linyi city, Shandong Province. The results provide a theoretical basis for stroke patients to formulate smoking control strategies, and help to create "smoke-free patients".

Author contributions

Conceptualization: Haifeng Li, Zizhen Cheng.

Data curation: Ling Li, Haifeng Li, Ying Zhang.

Formal analysis: Chenyuan Zheng.

Investigation: Ling Li, Ying Zhang, Chenyuan Zheng, Houyun Xu, Zizhen Cheng.

Methodology: Ling Li, Houyun Xu.

Resources: Haifeng Li.

Supervision: Haifeng Li, Zizhen Cheng.

Writing – original draft: Ling Li, Haifeng Li, Ying Zhang.

Writing – review & editing: Ling Li.

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