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Prevalence and influencing factors of fear of disease progression in stroke in China: a systematic review and meta-analysis

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ABSTRACT

Objectives: To systematically review the incidence and influencing factors of fear of disease progression (FoP) in patients with stroke in China, and to provide references for early prevention and intervention.

Design: Systematic review and meta-analysis of observational clinical studies.

Setting and Participants: Adults with stroke.

Methods: CNKI, Wanfang Data, VIP, CBM, Web of Science, PubMed, Cochrane Library, and Embase databases were searched for literature on the incidence and/or influencing factors of FoP in stroke patients. The search time frame extended from the establishment of the databases to March 2024. Two researchers independently screened the literature, extracted data, and evaluated the quality of the literature. Stata 17.0 software was used for meta-analysis.

Results: A total of 20 studies involving 7,156 patients were included. The meta-analysis results showed that the incidence of FoP in Chinese stroke patients was 56% (95% CI = 45%-66%). Subgroup analysis revealed that the incidence of FoP in the <60 years group (53%, 95% CI = 40%-66%) was higher than that in the ⩾ 60 years group (43%, 95% CI = 40%-46%). The incidence was highest in East China (70%, 95% CI = 56%-83%), followed by Central China (55%, 95% CI = 36%-73%) and North China (43%, 95% CI = 38%-47%). The incidence of FoP in hemorrhagic stroke (72%, 95% CI = 49%-95%) was higher than that in ischemic stroke (45%, 95% CI = 27%-64%). The incidence of FoP after 2020 (59%, 95% CI = 48%-70%) was higher than that before 2020 (40%, 95% CI = 32%-47%). The main influencing factors of FoP in Chinese stroke patients included age (OR = 0.94, 95% CI = 0.92-0.97, P < 0.05), education level (OR = 0.71, 95% CI = 0.67-0.76, P < 0.05), economic income (OR = 0.74, 95% CI = 0.69-0.78, P < 0.05), body mass index (OR = 1.22, 95% CI = 1.04-1.43, P < 0.05), social support (OR = 0.75, 95% CI = 0.63-0.90, P < 0.05), illness perception (OR = 1.41, 95% CI = 1.37-1.45, P < 0.05), and family cohesion (OR = 0.80, 95% CI = 0.67-0.96, P < 0.05).

Conclusions and implications: The incidence of FoP in Chinese stroke patients is high, at 56%. The main influencing factors of FoP in these patients include age, education level, economic income, body mass index, social support, illness perception, and family cohesion. In clinical practice, attention should be given to the psychological status of stroke patients, with an emphasis

on the assessment and screening of FoP. Targeted intervention measures should be implemented to address these influencing factors.

PROSPERO registration number: CRD42024500637

Strengths and limitations of this study:

⇒ This research through the meta analysis to explore the incidence of cerebral apoplexy patients FoP China and its influence factors, is for the purpose of early identification of high-risk patients for clinical medical personnel, to develop targeted individualized intervention programme provides evidence-based guidelines.

⇒ The literature included in this study were all cross-sectional studies, which may involve selection, implementation and measurement bias, leading to inter-study heterogeneity.

⇒ Due to the limited number included in the study, some factors affecting only consider the 2 study, may affect the reliability of the results.

Key words: stroke; fear of disease progression, incidence rate, the influencing factors, met a-analysis

INTRODUCTION

Stroke is currently the second leading cause of death globally and the leading cause of adult death and disability in China. By 2020, there were 17.8 million stroke patients in China over the age of 40[1-2], and the five-year recurrence rate in this population is as high as 41%[3]. Additionally, 70% to 80% of these patients will experience residual disabilities after treatment[4]. Stroke patients often suffer from negative emotions such as anxiety and depression due to the long-term and repeated impacts of the disease on their body and mind. Furthermore, patients may experience fear due to a lack of understanding of the disease and uncertainty about its treatment and prognosis[5]. Fear of Progression (FoP) is the fear patients experience concerning the disease's consequences or recurrence[6]. Long-term and/or excessive fear not only reduces the treatment compliance of stroke patients, hinders them from adopting healthy behaviors, and delays the rehabilitation process, but also increases their psychological distress and severely affects their quality of life[7-8]. Therefore, understanding the incidence and influencing factors of FoP in stroke patients in China is crucial for early identification and management of their fears. Recent research on the incidence and influencing factors of FoP in Chinese stroke patients is relatively sparse and lacks a unified conclusion. Thus, this study uses meta-analysis to explore the incidence and influencing factors of FoP in Chinese stroke patients, aiming to provide evidence-based guidance for clinical staff to identify high-risk patients early and develop targeted, individualized intervention programs.

METHODS

Database and search strategies

Computer retrieval of data was conducted using CNKI, Wangfang database, VIP, CBM, Web of Science, PubMed, the Cochrane Library, and Embase—eight major databases. The search targeted

literature on the incidence of FoP in stroke patients and/or related influencing factors, with a retrieval time limit up to March 2024. A combination of medical subject heading terms and free text words was used: "stroke", "apoplexy", "brain embolism", "brain hemorrhage", "cerebrovascular", "accident", "anxiet*", "worr*", "afraid", "fear*", "concern", "relapse", "recur*", "progress*", "return", "incidence", "occurrence", "influence", "factor*", and "relevant factor*". Additionally, references within the included literature were tracked to enhance recall. The search strategy was independently conducted by two experienced investigators (ZY and CC) in information retrieval. Complete details of the search strategy are available in the online supplemental table 1.

Protocol and registration

The review protocol is registered with PROSPERO (CRD42024500637).

Inclusion and exclusion criteria

In this review, the inclusion criteria are as follows: (1) Studies involving stroke patients aged 18 years or older; (2) Cross-sectional studies; (3) Outcome indicators for the incidence of FoP in stroke patients and/or influencing factors, with extractable research data presented as OR and 95% CI; (4) Use of the Fear of Progression Questionnaire-Short Form (FoP-Q-SF) as the research instrument. The exclusion criteria were as follows: (1) Types of literature such as conference abstracts, reviews, systematic reviews, case reports, etc.; (2) Literature with incomplete data or inaccessible full texts; (3) Low-quality literature; (4) Literature with repeated publication or data reuse; (5) Documents available in both Chinese and English.

Data extraction and synthesis

Two researchers (MW and YY) independently identified relevant literature by reviewing the titles, abstracts, and full texts of the retrieved studies. Initially, they read the titles and abstracts to exclude obviously irrelevant literature. Then, they conducted a second screening by reading the full texts to determine the final included literature and extract relevant data. Any disagreements were resolved through discussion and consultation with a third investigator. The extracted data primarily included the first author, year of publication, study area, age, total sample size, incidence of FoP, influencing factors, etc. Two researchers independently completed data extraction, and all researchers subsequently reviewed the data for accuracy.

Quality assessment

The quality of the included literature was independently evaluated by two investigators (M W and YY) using the evaluation criteria recommended by the US Agency for Healthcare Research and Quality (AHRQ)[9]. The criteria include 11 items, with 1 point assigned for e ach item answered as "yes," "no," or "unclear." The total score ranges from 0 to 11 point s, categorizing studies as low quality (0-3 points), medium quality (4-7 points), or high qu ality (8-11 points). Any discrepancies between two investigators were resolved by consultin g a third reviewer (LX).

Statistical analysis

Using Stata 17.0 software, a meta-analysis was conducted to determine the incidence and

influencing factors of FoP in stroke patients. I2 was used to test the heterogeneity of the included literature. If I2 < 50% and P ⩾ 0.1, a fixed effect model was used for analysis; otherwise, a random effects model was adopted. Subgroup analysis and sensitivity analysis were performed to further investigate the source of heterogeneity. Subgroup analysis categories included average age, study area, types of stroke, and year of publication. Sensitivity analyses assessed the stability of the studies by excluding each study one by one. Egger's test and Begg's test were used to evaluate publication bias, with P < 0.05 considered statistically significant. However, a funnel plot was not used to assess the presence of publication bias because the available literature pertaining to each individual risk factor fell below a threshold of 10, rendering the data too fragmented for meaningful comparisons.

Patient and public involvement

None.

RESULTS

Literature search

A total of 994 records were retrieved from the databases: 152 from PubMed, 150 from the Cochrane Library, 173 from CNKI, 139 from Web of Science, 127 from CBM, 63 from VIP, 50 from WanFang, 140 from Embase, and none from additional records identified through other sources. Subsequently, 153 duplicate studies were excluded. A total of 787 articles were excluded following preliminary screening based on titles and abstracts. Following a re-screening of the full texts, 34 articles were excluded, and 20 articles were ultimately included in the meta-analysis[10-29]. The PRISMA flow diagram illustrating the search strategy and study selection is depicted in online supplemental figure 1.

Characteristics and quality of the included studies

A total of 20 articles were included in this study[10-29], all of which were in Chinese. The study involved 156 patients with cerebral apoplexy, among whom 3,054 cases of FoP were reported, with an incidence rate ranging from 32.4% to 87.05%. The study covered nine provinces in China: Shanxi, Shandong, Tianjin, Hainan, Sichuan, Henan, Jilin, Hebei, and Guangdong. The average age of the patients ranged from 27.45 to 69.42 years. A total of 38 factors influencing FoP in patients with cerebral apoplexy were identified in China. The results of the literature quality evaluation indicated that 15 articles[11,12,14,16-24,27-29] were of medium quality, while 5 articles[10,13,15,25,26] were of high quality. The complete details of the characteristics and quality of the included studies are available in table 1.

Table 1 Characteristics and evaluated quality of the included studies

the first author	The year of publication (year)	Research area	Stroke type	age (year)	average age (year)	Total sample size	The number of cases	incidence (%)	influencing factor	estimation of quality
Li et al, 2024[10]	2024	Shanxi	And hemorrhagic and ischemic stroke	18～59	48.85±6.34	337	171	50.74	—	8
Song et al, 2023[11]	2023	Shandong	And hemorrhagic and ischemic stroke	18～79	—	437	355	81.24	1、4、8、9	6
Zhang et al, 2023[12]	2023	Tianjin	And hemorrhagic and ischemic stroke	≥18	59.59±7.48	408	176	40.6	—	7
Gu et al, 2023[13]	2023	Hainan	And hemorrhagic and ischemic stroke	≥60	69.42±4.37	223	—	—	1、7、8、10、13	8
Huang et al, 2023[14]	2023	Sichuan	cerebral arterial thrombosis	≥18	63.76± 11.26	314	—	—	1、6、11、12、14、15、22	7
Liu et al, 2023[15]	2023	Shandong	cerebral arterial thrombosis	—	—	160	54	33.75	5、7、16、17、18、19	8
Wang et al, 2023[16]	2023	Shandong	hemorrhagic apoplexy	≥18	—	292	247	82.33	—	6
Qi et al, 2023[17]	2023	Henan	cerebral arterial thrombosis	18～60	—	300	127	42.3	1、5、18、20、21	6
Wei et al, 2023[18]	2023	Tianjin	And hemorrhagic and ischemic stroke	≥18	65.84± 12.03	425	187	44	3、6、8、22、23、24、25、26	7
Mei et al, 2023[19]	2023	Jilin	cerebral arterial thrombosis	≥18	—	276	—	—	5、7、8	6
Zhang et al, 2022[20]	2022	Hebei	And hemorrhagic and ischemic stroke	≥18	—	335	143	42.7	1、2、6、7、10、11、15、27、28	7
Sun et al, 2022[21]	2022	Shandong	hemorrhagic apoplexy	18～69	—	170	148	87.05	—	7
Yun et al, 2022[22]	2022	Henan	And hemorrhagic and ischemic stroke	≥18	—	192	94	48.95	1、29	7
Liu et al, 2022[23]	2022	Sichuan	And hemorrhagic and ischemic stroke	—	—	448	233	52	1、8、27、30、31、32、33、34	7
Deng et al, 2022[24]	2022	Guangdong	And hemorrhagic and ischemic stroke	20～35	27.45±1.20	876	—	—	3、7、17、21、25、35、36	6
Yi et al, 2022[25]	2022	Henan	cerebral arterial thrombosis	24～59	51.31±6.67	218	158	72.5	22、25、31、37	8
Bao et al, 2021[26]	2021	Shandong	And hemorrhagic and ischemic stroke	≥60	—	584	498	85.27	1、4、8、10、22	8

Cui et al, 2020[27]	2020	Hebei	cerebral arterial thrombosis	18～80	—	358	116	32.4	1、2、3、8、16、17、18	7
Wang et al, 2020[28]	2020	Shandong	hemorrhagic apoplexy	⩾18	47.97±13.76	220	99	45	4、15、38	6
Liu et al, 2021[29]	2020	Tianjin	And hemorrhagic and ischemic stroke	⩾18	64.26±9.75	583	248	42.5	—	7

Note: 1 is age; 2 was gender; 3 family history; 4 for the course; 5: education level; 6 for working conditions; 7 for the economic income; 8 for disease recurrence rate; 9, ADL; 10 is Barthel index; 11 for body mass index; 12 were marital status; 13 was self-efficacy; 14 for reproductive condition; 15 for social support; 16 was MRS Score; 17 for family care; 18 for understanding social support; 19: illness uncertainty; 20 was Eysenck personality type; 21 with underlying diseases; 22 for illness perception; 23 for health literacy; 24 for family resilience; 25 for medical burden; 26 for stroke type; 27 for family intimacy; 28 for nerve function defect degree; 29 for multiple dimensions of fatigue; 30 were the main caregivers; 31 for living conditions; 32 cases visited hospital within 6 hours; 33 as the disease shame; 34 were self-perceived burden; 35 for SAS scores; 36 was SDS score; 37 were coping style; 38 HADS scores; - Indicates that there is no such content.

Meta-analysis of the incidence of FoP in Chinese stroke patients

Among the included 20 articles[10-29], 16 articles[10-12,15-18,20-23,25-29]reported the incidence of FoP in patients with stroke. There was significant heterogeneity among the studies (I^2=98.7%, P < 0.001), so the random effect model was used for Meta-analysis. The results showed that the incidence of FoP in Chinese stroke patients was 56% (95%CI= 45%-66%). The forest plot of FoP incidence in Chinese stroke patients is shown in Figure 2.

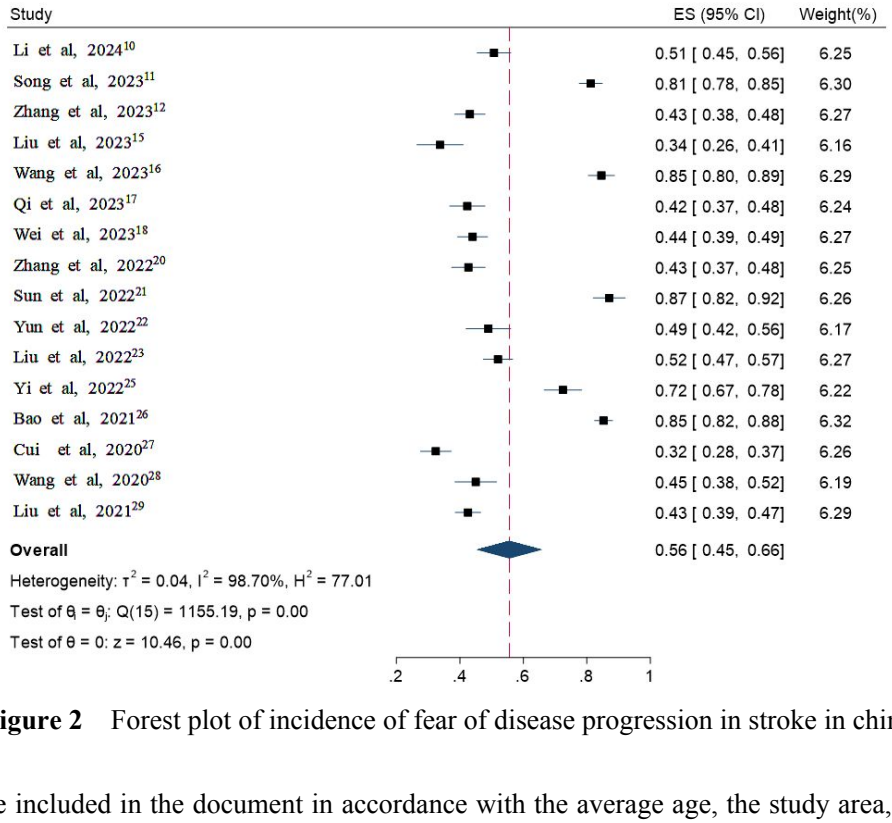

Figure 2 Forest plot of incidence of fear of disease progression in stroke in china

Will be included in the document in accordance with the average age, the study area, the types of cerebral apoplexy, year of publication on subgroup analysis, the results showed: (1) with an

average age group, the average age of < 60 years old group and 60 or higher rate of 53% (95% CI = 40% ~ 66%), 43% (95% CI = 40% ~ 46%); (2) The incidence in North China, East China and central China was 43% (95%CI= 38%-47%), 70% (95%CI= 56%-83%) and 55% (95%CI= 36%-73%), respectively. (3) The incidence of FoP in ischemic and hemorrhagic stroke was 45% (95%CI= 27%-64%) and 72% (95%CI= 49%-95%), respectively. (4) Grouped by year of publication, the incidence of FoP before 2020 and after 2020 was 40% (95%CI= 32%-47%) and 59% (95%CI= 48%-70%), respectively. The subgroup analysis of the incidence of FoP in Chinese stroke patients is shown in Table 3.

Table 3 Subgroup analysis of incidence of fear of disease progression in stroke in china

subunit	The number of research (a piece of writing)	Occurrence rate (95%CI)（%）	Effect model	Heterogeneity test	
				P	I^2 (%)
average age					
＜60 years old	4[10,12,25,28]	0.53（0.40~0.66）	random	<0.001	95.27
⩾60 years old	2[18,29]	0.43（0.40~0.46）	fixed	0.64	0
Research area					
North China	6[10,12,18,20,27,29]	0.43（0.38~0.47）	random	<0.001	80.96
East China	6[11,15-16,21,26,28]	0.70（0.56~0.83）	random	<0.001	98.25
Central China	3[17,22,25]	0.55（0.36~0.73）	random	<0.001	96.42
Stroke type					
ischemic	4[15,17,25,27]	0.45（0.27~0.64）	random	<0.001	97.46
hemorrhagic	3[16,21,28]	0.72（0.49~0.95）	random	<0.001	98.32
Year of publication					
2020 and before	3[27-29]	0.40（0.32~0.47）	random	<0.001	84.76
After 2020	13[10-12,15-18,20-23,25-26]	0.59（0.48~0.70）	random	<0.001	98.61

Meta-analysis of influencing factors of FoP in Chinese stroke patients

In this study, the influencing factors of FoP were extracted from 15 articles [11,13-15,17-20,22-28], and the studies with ⩾2 influencing factors were combined. Meta analysis results showed that age, cultural level, income, body mass index, perception of social support, disease, and the family intimate degree is the main factors affecting China's FoP patients with cerebral apoplexy, statistically significant difference (P < 0.05); Among them, age, education level, economic income, social support, and family cohesion were protective factors, as shown in Table 4.

Table 4 Meta-analysis of influencing factors of fear of disease progression in stroke

influencing factor	Included literature (part)	Meta analytic result		Effect model	Results of the heterogeneity test	
		OR （95%CI）	P		P	I^2 (%)
age (year)	9[11,13-14,17,20,22-23,26-27]	0.94 (0.92~0.97)	<0.001	fixed	0.07	44.8
course of disease	3[11,26,28]	0.43 (0.11~1.64)	0.22	stochastic	<0.001	91.3

economic income	3[13,19-20]	0.74 (0.69~0.78)	<0.001	fixed	0.14	49.7
number of disease recurrences	7[11,13,18-19,23,26-27]	1.12 (0.89~1.41)	0.34	stochastic	0.001	73.1
barthel index	2[13,26]	0.76 (0.52~1.11)	0.15	fixed	0.67	0
family history	2[24,27]	1.23 (0.99~1.54)	0.07	fixed	0.87	0
body mass index	2[14,20]	1.22 (1.04~1.43)	0.02	fixed	0.90	0
underlying diseases	2[17,24]	1.32 (0.98~1.79)	0.07	fixed	0.83	0
social support	3[14,20,28]	0.75 (0.63~0.90)	0.002	stochastic	0.002	84.0
disease perception	4[14,18,25-26]	1.41 (1.37~1.45)	<0.001	fixed	0.95	0
family intimacy	2[20,23]	0.80 (0.67~0.96)	0.01	stochastic	0.002	89.0
degree of education	2[17,19]	0.71 (0.67~0.76)	<0.001	fixed	0.24	28.2

Sensitivity analysis

Adopt the method of eliminating one by a single research on FoP incidence, sensitivity analysis results show that the amount of total consolidation effect is 0.56, did not change obviously, on both sides of all studies on the uniform distribution, low sensitivity, prompt Meta analysis result is stable and reliable, as shown in figure 3.

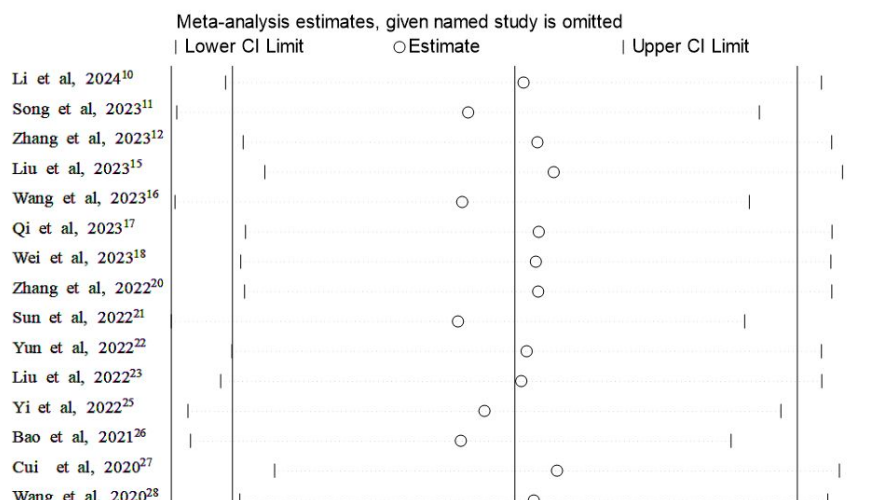

Figure 3 Sensitivity analysis of incidence of fear of disease progression in stroke in china

Test of publication bias

Using Egger 's inspection and Begg' s inspection respectively to evaluate publication bias incidence FoP research, Egger 's inspection (t = 2.13, P = 0.0517), Begg' s inspection (Z = 0.86, P = 0.4440) indicate no significant publication bias. Involved in each of the seven factors of the number included in the study, not for publication bias.

DISCUSSION

A total of 16 studies on the incidence of FoP in Chinese stroke patients were included in this study. Meta-analysis results showed that the incidence of FoP in stroke patients in China was 56% (95% CI = 45%-66%), which is considered high and consistent with the research results of Ellen Townend et al. (56%)[30]. The results of the subgroup analysis showed that: (1) The incidence of FoP in stroke patients aged <60 years (53%) was higher than that in patients aged ⩾60 years (43%). Studies, such as those by Easy to Dream[25], suggest that the degree of FoP is more severe in middle-aged and young stroke patients, which aligns with this research. This may be due to the greater family burden and social responsibility, longer life expectancy, vulnerability to disability, and heavier economic burden faced by younger patients, leading to increased psychological distress and fear of relapse[31-33]. (2) The incidence of FoP in East China (70%) was higher than that in Central China (55%) and North China (43%), which may be attributed to differences in social and living habits, cultural background, and economic and medical development levels among different regions. (3) For different types of stroke, the incidence of FoP in hemorrhagic stroke patients (72%) was significantly higher than that in ischemic stroke patients (45%), consistent with the findings of Wei Lirong[18]. This may be because the overall prognosis, sequelae, morbidity, and mortality are higher in hemorrhagic stroke patients, leading to lower quality of life and increased psychological distress[34-35]. (4) The incidence of FoP after 2020 (59%) was higher than before 2020 (40%), which could be related to the faster pace of modern life and greater mental stress.

Social and demographic factors are significant categories of influencing factors for FoP in stroke patients in China, including age, education level, economic income, and body mass index (BMI). (1) Age: The results of this study showed that age was a protective factor for FoP in stroke patients. This may be because elderly patients usually have rich life experience and most are in the stage of retirement and home care, which grants them stronger psychological tolerance to disease and lower fear of disease progression[36]. (2) Education level: The study indicates that a higher level of education is a protective factor for FoP in stroke patients. This is likely because patients with higher education levels have a stronger ability to comprehend disease-related information. After illness, they can independently acquire disease information through books, the internet, and other means, and can adopt more effective coping strategies when facing symptoms, thus avoiding excessive fear[37]. (3) Economic income: The results of this study showed that economic income was a protective factor for FoP in stroke patients. Stroke has a high morbidity rate, and most patients require long rehabilitation treatment cycles and significant economic support. Patients with low family income have limited medical expenditure, making it difficult to cope with sudden illness and its associated burdens, leading to poor psychological status and more serious fear of the disease[38]. (4) BMI: This study suggests that BMI is positively correlated with FoP in stroke patients. Patients with a higher BMI often have insufficient disease cognition or self-management ability[39], leading to a lack of confidence in self-control and management after the onset of the disease. Additionally, overweight and obesity can result in various abnormal health indicators, increasing the risk of stroke recurrence and aggravating patients' fear of disease progression. Therefore, clinical medical staff should focus on young patients, those with low education levels,

low family income, and high BMI. Strengthening the assessment and screening of FoP in these patients, providing predictive nursing care, and offering personalized health education and psychological guidance according to patients' conditions can help improve their confidence in coping with the disease and reduce their fear of disease progression.

Disease-related factors, including illness perception, are a type of influencing factors of FoP in Chinese stroke patients. Illness perception refers to the process by which patients use previous knowledge and experience of the disease to analyze and explain current symptoms or disease, representing the patient's understanding, recognition, and emotional response to the disease [40]. This research shows that disease awareness and FoP in stroke patients are positively correlated, meaning the more negative the illness perception, the more severe the FoP. The reason may be that patients with high levels of negative illness perception lack correct understanding of disease-related knowledge and treatment, believe they cannot control disease progression, and this sense of losing control over their health contributes to the fear of the disease. Therefore, clinical medical staff should identify patients with high levels of negative illness perception as soon as possible and use acceptance and commitment therapy and cognitive behavioral therapy to intervene cognitively, correct misconceptions, establish accurate illness perception, and enhance patients' confidence in managing the disease to reduce their fear of disease progression.

Social psychological factors, including social support and family cohesion, are major influencing factors for FoP in Chinese stroke patients. (1) Social support: This study showed that social support was a protective factor for FoP in stroke patients. The occurrence of stroke is a negative stress event for patients. During treatment and rehabilitation, patients are very eager to receive help and support from family, friends, and other sources. High levels of social support can provide patients with more favorable social resources and emotional care, alleviating their fear to some extent and helping them face life with optimism[41-42]. Conversely, low levels of social support can lead to pessimism in patients, which can exacerbate their fear of the disease and its progression. (2) Family intimacy: Family intimacy refers to the closeness, trust, understanding, and support between family members. This study shows that family intimacy is a protective factor for FoP in stroke patients. Good family cohesion can provide adequate emotional support, help buffer the discomfort caused by stressful events, and encourage positive coping mechanisms, thus reducing psychological pressure and the fear of disease progression[43]. Therefore, clinical medical staff should actively mobilize patients' social support systems, encourage them to express their ideas, and seek support from various sources. In addition, caregivers should be encouraged to strengthen communication and care, improve family relationships and positive interactions, jointly cope with the challenges of the disease, and reduce patients' fear of disease progression.

This study has certain limitations: (1) This research relies on cross-sectional studies, which may involve selection, implementation, and measurement biases, leading to heterogeneity between studies; (2) Due to the limited number of included studies, only two studies were considered for some influencing factors, which may affect the reliability of the results. Furthermore, some influencing factors were analyzed based on only a single study in the meta-analysis; (3) Sensitivity analysis and publication bias tests were not performed due to the limited number of included studies on influencing factors, and publication bias may exist. It is suggested that high-quality, large-sample, and multi-center studies be conducted in the future to further verify and supplement these findings.

CONCLUSIONS

In conclusion, the incidence of FoP in Chinese stroke patients is 56%, indicating a high prevalence. Age, education level, economic income, body mass index, social support, illness perception, and family cohesion are the main influencing factors of FoP in Chinese stroke patients. Clinical attention should be paid to the evaluation and screening of FoP in stroke patients, with a focus on key groups such as those with young age, low education level, low family income, high body mass index, and low social support. This approach will maximize the supportive role of family and society and reduce negative illness perceptions. Individualized health education and psychological guidance should be tailored to different groups, which is crucial for reducing the occurrence of FoP and improving patients' quality of life.

Author Contributions ZY and CC contributed equally. Concept and design: ZY and CC; Literature retrieval, study selection: ZY and CC; Data extraction and collection: MW and YY; Analysis and interpretation of data: ZY and MW; Supervision and validation: LX; Drafting of the original manuscript: ZY and CC. All authors have approved the final draft of the manuscript.

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Supplementary Table 1.

Search strategy used in Cochrane Library, Web of Science, Embase, PubMed, CBM, CNKI, Wanfang Data and VIP.

Search strategy used in Cochrane Library database.

1	MeSH descriptor: [Stroke] explode all trees
2	(stroke):ti,ab,kw OR (strokes):ti,ab,kw OR (apoplexy):ti,ab,kw OR (CVA):ti,ab,kw OR (cerebrovascular accident):ti,ab,kw
3	(poststroke):ti,ab,kw OR (cerebral infarction):ti,ab,kw OR (brain embolism):ti,ab,kw OR (brain hemorrhage):ti,ab,kw
4	#1 OR #2 OR #3
5	(anxiet*):ti,ab,kw OR (worr*):ti,ab,kw OR (afraid):ti,ab,kw OR (fear*):ti,ab,kw OR (concern):ti,ab,kw
6	(relapse):ti,ab,kw OR (recur*):ti,ab,kw OR (progress*):ti,ab,kw OR (return):ti,ab,kw
7	#4 AND #5 AND #6

Search strategy used in Web of Science database.

1	#1 TS=("stroke" OR "strokes" OR "apoplexy" OR "CVA" OR "cerebrovascular accident" OR "poststroke" OR "cerebral infarction" OR "brain embolism") #2 TS=("anxiet*" OR "worr*" OR "afraid" OR "fear*" OR "concern" OR "uncertainty") #3 TI=("relapse" OR "recur*" OR "progress*" OR "return") #4 #1 and #2 and #3

Search strategy used in EMBASE database.

1	'stroke'/exp
2	stroke:ab,ti OR strokes:ab,ti OR apoplexy:ab,ti OR 'CVA':ab,ti OR 'cerebrovascular accident':ab,ti OR poststroke:ab,ti OR 'cerebral infarction':ab,ti OR 'brain embolism':ab,ti OR 'brain hemorrhage':ab,ti
3	#1 OR #2
4	anxiet*:ab,ti OR worr*:ab,ti OR afraid:ab,ti OR fear*:ab,ti OR concern:ab,ti OR uncertainty:ab,ti
5	relapse:ab,ti OR recur*:ab,ti OR progress*:ab,ti OR return:ab,ti
6	'risk factor':ab,ti OR 'Risk factors':ab,ti OR factor:ab,ti OR 'influencing factor':ab,ti OR 'relevant factor':ab,ti OR 'contributing factor':ab,ti OR etiology:ab,ti OR 'disease rate':ab,ti OR prevalence:ab,ti
7	#3 AND #4 AND #5 AND #6

Search strategy used in Pubmed database.

1	"Stroke"[MeSH] OR "strokes"[Title/Abstract] OR "apoplexy"[Title/Abstract] OR "cerebrovascular accident"[Title/Abstract] OR "poststroke"[Title/Abstract] OR "cerebral infarction"[Title/Abstract] OR "brain embolism"[Title/Abstract] OR "brain hemorrhage"[Title/Abstract]
2	"anxiet*"[Title/Abstract] OR "worr*"[Title/Abstract] OR "afraid"[Title/Abstract] OR "fear*"[Title/Abstract] OR "concern"[Title/Abstract] OR "uncertainty"[Title/Abstract]
3	"relapse"[Title/Abstract] OR "recur*"[Title/Abstract] OR "progress*"[Title/Abstract] OR "return"[Title/Abstract]
4	"Incidence"[MeSH] OR "Prevalence"[MeSH] OR "frequency"[Title/Abstract] OR "occurrence"[Title/Abstract] OR "incidences"[Title/Abstract] OR "influence factor*"[Title/Abstract] OR "risk factor*"[Title/Abstract] OR "associated factor*"[Title/Abstract] OR "relevant factor*"[Title/Abstract]
5	#1 AND #2 AND #3 AND #4

Search strategy used in CBM database.

1	"Stroke"[MeSH] OR "strokes"[Title/Abstract] OR "apoplexy"[Title/Abstract] OR "cerebrovascular accident"[Title/Abstract] OR "poststroke"[Title/Abstract] OR "cerebral infarction"[Title/Abstract] OR "brain embolism"[Title/Abstract] OR "brain hemorrhage"[Title/Abstract]
2	"anxiet*"[Title/Abstract] OR "worr*"[Title/Abstract] OR "afraid"[Title/Abstract] OR "fear*"[Title/Abstract] OR "concern"[Title/Abstract] OR "uncertainty"[Title/Abstract]
3	"relapse"[Title/Abstract] OR "recur*"[Title/Abstract] OR "progress*"[Title/Abstract] OR "return"[Title/Abstract]
4	"Incidence"[MeSH] OR "Prevalence"[MeSH] OR "frequency"[Title/Abstract] OR "occurrence"[Title/Abstract] OR "incidences"[Title/Abstract] OR "influence factor*"[Title/Abstract] OR "risk factor*"[Title/Abstract] OR "associated factor*"[Title/Abstract] OR "relevant factor*"[Title/Abstract]
5	#1 AND #2 AND #3 AND #4

Search strategy used in CNKI database.

1	(主题: 中风) OR (主题: 脑卒中) OR (主题: 卒中) OR (主题: 脑梗死) OR 主题: 脑栓塞) OR (主题: 脑缺血) OR (主题: 脑血管意外) OR (主题: 脑血管病) OR (主题: 脑出血) OR (主题: 脑梗) AND (主题: 恐惧) OR (主题: 担忧) OR (主题: 不确定感) OR (主题: 担心)OR (主题: 害怕) AND (主题: 复发) OR (主题: 进展)

Search strategy used in Wanfang database.

1	主题：（中风 OR 脑卒中 OR 卒中 OR 脑梗死 OR 脑梗塞 OR 脑缺血 OR 脑血管意外 OR 脑血管病 OR 脑出血 OR 脑溢血 OR 脑梗 OR 脑血栓 OR 脑栓塞 OR 缺血性脑病）AND 主题：（恐惧 OR 担忧 OR 不确定感 OR 担心 OR 害怕）AND 主题：（复发 OR 进展）

Search strategy used in VIP database.

1	题名或关键词=中风 OR 脑卒中 OR 卒中 OR 脑梗死 OR 脑梗塞 OR 脑缺血 OR 脑血管意外 OR 脑血管病 OR 脑出血 OR 脑溢血 OR 脑梗 OR 脑血栓 OR 脑栓塞 OR 缺血性脑病 AND 题名或关键词=恐惧 OR 担忧 OR 不确定感 OR 担心 OR 害怕 AND 题名或关键词=复发 OR 进展

Supplementary Figure 1

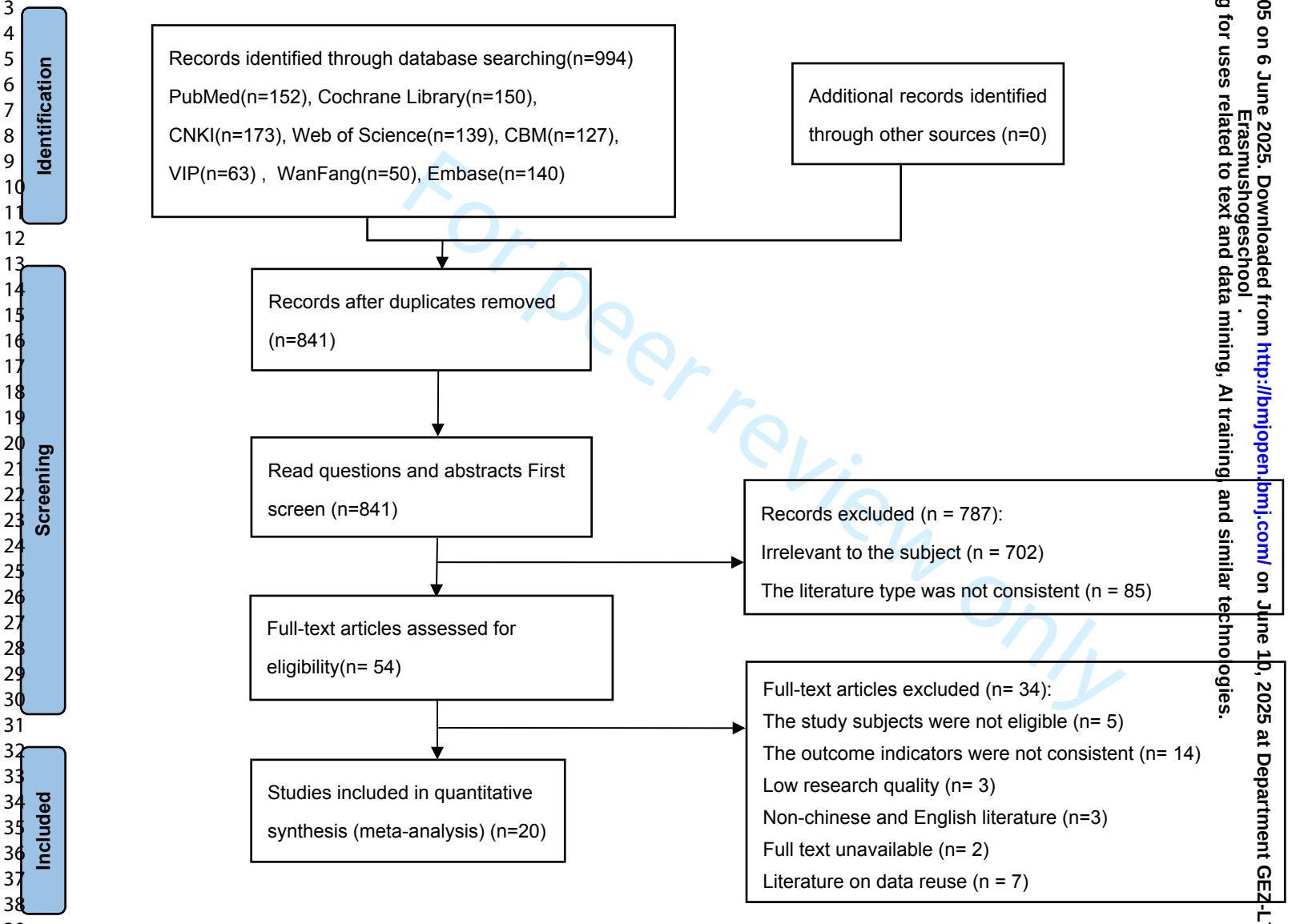

Figure 1 Flow diagram of study selection in the meta-analysis. FoP, fear of disease progression.

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Prevalence and Factors Influencing Fear of Disease Progression in Stroke Patients: A Systematic Review and Meta-Analysis with a Focus on China

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ABSTRACT

Objectives: To systematically estimate the prevalence and influencing factors of fear of disease progression (FoP) in stroke patients, with a focus on China.

Design: Systematic review and meta-analysis of observational clinical studies.

Data Sources: Eight databases (CNKI, Wanfang, VIP, CBM, Web of Science, PubMed, Cochrane Library, Embase) were searched from inception to March 2024, supplemented by manual reference screening.

Eligibility criteria: Cross-sectional studies reporting FoP incidence or influencing factors in Chinese stroke patients using the FoP-Q-SF scale were included.

Data extraction and synthesis: Two reviewers independently screened studies, extracted data, and assessed quality using the Agency for Healthcare Research and Quality (AHRQ) tool. Stata 17.0 software was used for meta-analysis.

Results: A total of 20 studies involving 7,156 patients were included. The pooled incidence of FoP in Chinese stroke patients was 56% (95% CI = 45%-66%), derived from a random-effects model despite significant between-study heterogeneity (I^2 = 98.7%), with subgroup analyses (age, region, stroke type) and sensitivity tests confirming result robustness. Subgroup analysis revealed that the incidence of FoP in the <60 years group (53%, 95% CI = 40%-66%) was higher than that in the ⩾60 years group (43%, 95% CI = 40%-46%). The incidence was highest in East China (70%, 95% CI = 56%-83%), followed by Central China (55%, 95% CI = 36%-73%) and North China (43%, 95% CI = 38%-47%). The incidence of FoP in hemorrhagic stroke (72%, 95% CI = 49%-95%) was higher than that in ischemic stroke (45%, 95% CI = 27%-64%). The incidence of FoP after 2020 (59%, 95% CI = 48%-70%) was higher than that before 2020 (40%, 95% CI = 32%-47%). The main influencing factors of FoP in Chinese stroke patients included age (OR = 0.94, 95% CI = 0.92-0.97, P < 0.05), education level (OR = 0.71, 95% CI = 0.67-0.76, P < 0.05), economic income (OR = 0.74, 95% CI = 0.69-0.78, P < 0.05), body mass index (OR = 1.22, 95% CI = 1.04-1.43, P < 0.05), social support (OR = 0.75, 95% CI = 0.63-0.90, P < 0.05), illness perception (OR = 1.41, 95% CI = 1.37-1.45, P < 0.05), and family intimate (OR = 0.80, 95% CI =

0.67-0.96, P < 0.05).

Conclusion: The incidence of FoP in Chinese stroke patients is high (56%), influenced by age, education level, economic income, body mass index, social support, illness perception, and family intimate. Clinical staff should prioritize psychological screening for FoP and implement targeted interventions, such as cognitive-behavioural therapy for negative illness perception, social support programs for low-income patients, and family-centred education for younger patients.

PROSPERO registration number: CRD42024500637

Strengths and limitations of this study:

⇒ The meta-analysis followed PRISMA guidelines with a comprehensive search across 8 databases and manual reference tracking, minimising selection bias.

⇒ Two independent reviewers conducted study screening, data extraction, and quality asses sment using the AHRQ tool, enhancing methodological rigour.

⇒ Subgroup analyses and sensitivity tests were performed to address heterogeneity.

⇒ The small number of studies (n=20) limited subgroup analyses for some influencing fac tors, reducing statistical power.

⇒ Non-Chinese studies were excluded, potentially omitting unpublished data and limiting generalizability to non-Chinese populations.

Key words: stroke; fear of disease progression, incidence rate, the influencing factors, met a-analysis

INTRODUCTION

Stroke is currently the second leading cause of death globally and the leading cause of adult death and disability in China. By 2020, there were 17.8 million stroke patients in China over the age of 40[1-2], and the five-year recurrence rate in this population is as high as 41%[3]. Additionally, 70% to 80% of these patients will experience residual disabilities after treatment[4]. Stroke patients often suffer from negative emotions such as anxiety and depression due to the long-term and repeated impacts of the disease on their body and mind. Furthermore, patients may experience fear due to a lack of understanding of the disease and uncertainty about its treatment and prognosis[5]. Fear of Progression (FoP) is the fear patients experience concerning the disease's consequences or recurrence[6], extends beyond transient psychological distress to critically impair treatment adherence, health behaviors, and rehabilitation outcomes[7-8]. Therefore, understanding the incidence and influencing factors of FoP in stroke patients is crucial for early identification and management of their fears.

Emerging evidence highlights the global prevalence and clinical significance of FoP in stroke populations. A UK qualitative study revealed 56% of stroke survivors experience clinically significant FoP, primarily driven by uncertainty about functional recovery and social role disruption[9]. Crowe et al.[10] further demonstrated that stroke's sudden onset and chronicity foster profound self-worth loss and persistent fear of recurrence, severely compromising quality of life. Consistent with these findings, a Korean survey of 180 ischemic stroke patients[11] identified elevated FoP levels associated with inadequate disease knowledge and maladaptive health behaviors (e.g., poor dietary habits, exercise avoidance, and medication nonadherence).

Despite these insights, critical gaps persist in understanding FoP among Chinese stroke

patients. Current research predominantly focuses on Western and other Asian populations, with limited investigation into China's unique sociocultural context where family-centered care models and stigma surrounding chronic illness may amplify FoP[12-13]. No consensus exists regarding FoP incidence or modifiable risk factors in this population, hindering the development of culturally adapted interventions. Thus, this study uses meta-analysis to explore the incidence and influencing factors of FoP in Chinese stroke patients, aiming to provide evidence-based guidance for clinical staff to identify high-risk patients early and develop targeted, individualized intervention programs.

METHODS

Database and search strategies

Computer retrieval of data was conducted using CNKI, Wangfang database, VIP, CBM, Web of Science, PubMed, the Cochrane Library, and Embase—eight major databases. The search targeted literature on the incidence of FoP in stroke patients and/or related influencing factors, with a retrieval time limit up to March 2024. A combination of medical subject heading terms and free text words was used: "stroke", "apoplexy", "brain embolism", "brain hemorrhage", "cerebrovascular", "accident", "anxiet*", "worr*", "afraid", "fear*", "concern", "relapse", "recur*", "progress*", "return", "incidence", "occurrence", "influence", "factor*", and "relevant factor*". Additionally, references within the included literature were tracked to enhance recall. The search strategy was independently conducted by two experienced investigators (ZY and CC) in information retrieval. Complete details of the search strategy are available in the online supplemental table 1.

Protocol and registration

The review protocol is registered with PROSPERO (CRD42024500637).

Inclusion and exclusion criteria

In this review, the inclusion criteria are as follows: (1) Studies involving stroke patients aged 18 years or older; (2) Cross-sectional studies; (3) Outcome indicators for the incidence of FoP in stroke patients and/or influencing factors, with extractable research data presented as OR and 95% CI; (4) Use of the Fear of Progression Questionnaire-Short Form (FoP-Q-SF) as the research instrument. The exclusion criteria were as follows: (1) Types of literature such as conference abstracts, reviews, systematic reviews, case reports, etc.; (2) Literature with incomplete data or inaccessible full texts; (3) Studies classified as low quality (score 0-3 points based on the US Agency for Healthcare Research and Quality [AHRQ][14] criteria); (4) Literature with repeated publication or data reuse; (5) Documents available in both Chinese and English.

Data extraction and synthesis

Two researchers (MW and YY) independently identified relevant literature by reviewing the titles, abstracts, and full texts of the retrieved studies. Initially, they read the titles and abstracts to exclude obviously irrelevant literature. Then, they conducted a second screening by reading the

full texts to determine the final included literature and extract relevant data. Any disagreements were resolved through discussion and consultation with a third investigator. The extracted data primarily included the first author, year of publication, study area, age, total sample size, incidence of FoP, influencing factors, etc. Two researchers independently completed data extraction, and all researchers subsequently reviewed the data for accuracy.

Quality assessment

The quality of the included literature was independently evaluated by two investigators (M W and YY) using the evaluation criteria recommended by AHRQ[14]. The criteria include 1 1 items, with 1 point assigned for each item answered as "yes," "no," or "unclear." The t otal score ranges from 0 to 11 points, categorizing studies as low quality (0-3 points), me dium quality (4-7 points), or high quality (8-11 points). Any discrepancies between two in vestigators were resolved by consulting a third reviewer (LX).

Statistical analysis

Using Stata 17.0 software, a meta-analysis was conducted to determine the incidence and influencing factors of FoP in stroke patients. I2 was used to test the heterogeneity of the included literature. If $I^2 < 50\%$ and $P \geqslant 0.1$, a fixed effect model was used for analysis; otherwise, a random effects model was adopted. To further explore sources of heterogeneity, meta-regression analysis was conducted using covariates such as publication years, research area, and stroke type. Subgroup analysis and sensitivity analysis were performed to further investigate the source of heterogeneity. Subgroup analysis categories included average age, study area, types of stroke, and year of publication. Sensitivity analyses assessed the stability of the studies by excluding each study one by one. Egger's test and Begg's test were used to evaluate publication bias, with $P < 0.05$ considered statistically significant. However, a funnel plot was not used to assess the presence of publication bias because the available literature pertaining to each individual risk factor fell below a threshold of 10, rendering the data too fragmented for meaningful comparisons.

Patient and public involvement

None.

RESULTS

Literature search

A total of 994 records were retrieved from the databases: 152 from PubMed, 150 from th e Cochrane Library, 173 from CNKI, 139 from Web of Science, 127 from CBM, 63 from VIP, 50 from WanFang, 140 from Embase, and none from additional records identified t hrough other sources. Subsequently, 153 duplicate studies were excluded. A total of 787 a rticles were excluded following preliminary screening based on titles and abstracts. Followi ng a re-screening of the full texts, 34 articles were excluded, and 20 articles were ultimat ely included in the meta-analysis[15-34]. The PRISMA flow diagram illustrating the search str ategy and study selection is depicted in online supplemental figure 1.

Characteristics and quality of the included studies

A total of 20 articles were included in this study[15-34], all of which were in Chinese. The study involved 156 patients with cerebral apoplexy, among whom 3,054 cases of FoP were reported, with an incidence rate ranging from 32.4% to 87.05%. The study covered nine provinces in China: Shanxi, Shandong, Tianjin, Hainan, Sichuan, Henan, Jilin, Hebei, and Guangdong. The average age of the patients ranged from 27.45 to 69.42 years. A total of 38 factors influencing FoP in patients with cerebral apoplexy were identified in China. The results of the literature quality evaluation indicated that 15 articles[16,17,19,21-29,32-34] were of medium quality, while 5 articles[15,18,20,30,31] were of high quality. The complete details of the characteristics and quality of the included studies are available in table 1.

Table 1 Characteristics and evaluated quality of the included studies

the first author	Research area	Stroke type	age (year)	Total sample size	The number of cases	incidence (%)	influencing factor	estimation of quality
Li et al, 2024[15]	Shanxi	And hemorrhagic and ischemic stroke	18～59	337	171	50.74	—	H
Song et al, 2023[16]	Shandong	And hemorrhagic and ischemic stroke	18～79	437	355	81.24	1、4、8、9	M
Zhang et al, 2023[17]	Tianjin	And hemorrhagic and ischemic stroke	⩾18	408	176	40.6	—	M
Gu et al, 2023[18]	Hainan	And hemorrhagic and ischemic stroke	⩾60	223	—	—	1、7、8、10、13	H
Huang et al, 2023[19]	Sichuan	cerebral arterial thrombosis	⩾18	314	—	—	1、6、11、12、14、15、22	M
Liu et al, 2023[20]	Shandong	cerebral arterial thrombosis	—	160	54	33.75	5、7、16、17、18、19	H
Wang et al, 2023[21]	Shandong	hemorrhagic apoplexy	⩾18	292	247	82.33	—	M
Qi et al, 2023[22]	Henan	cerebral arterial thrombosis	18～60	300	127	42.3	1、5、18、20、21	M
Wei et al, 2023[23]	Tianjin	And hemorrhagic and ischemic stroke	⩾18	425	187	44	3、6、8、22、23、24、25、26	M
Mei et al, 2023[24]	Jilin	cerebral arterial thrombosis	⩾18	276	—	—	5、7、8	M
Zhang et al, 2022[25]	Hebei	And hemorrhagic and ischemic stroke	⩾18	335	143	42.7	1、2、6、7、10、11、15、27、28	M
Sun et al, 2022[26]	Shandong	hemorrhagic apoplexy	18～69	170	148	87.05	—	M

Yun et al, 2022[27]	Henan	And hemorrhagic and ischemic stroke	⩾18	192	94	48.95	1、29	M
Liu et al, 2022[28]	Sichuan	And hemorrhagic and ischemic stroke	—	448	233	52	1、8、27、30、31、32、33、34	M
Deng et al, 2022[29]	Guangdong	And hemorrhagic and ischemic stroke	20～35	876	—	—	3、7、17、21、25、35、36	M
Yi et al, 2022[30]	Henan	cerebral arterial thrombosis	24～59	218	158	72.5	22、25、31、37	H
Bao et al, 2021[31]	Shandong	And hemorrhagic and ischemic stroke	⩾60	584	498	85.27	1、4、8、10、22	H
Cui et al, 2020[32]	Hebei	cerebral arterial thrombosis	18～80	358	116	32.4	1、2、3、8、16、17、18	M
Wang et al, 2020[33]	Shandong	hemorrhagic apoplexy	⩾18	220	99	45	4、15、38	M
Liu et al, 2021[34]	Tianjin	And hemorrhagic and ischemic stroke	⩾18	583	248	42.5	—	M

Note: 1 is age; 2 was gender; 3 family history; 4 for the course; 5: education level; 6 for working conditions; 7 for the economic income; 8 for disease recurrence rate; 9, ADL; 10 is Barthel index; 11 for body mass index; 12 were marital status; 13 was self-efficacy; 14 for reproductive condition; 15 for social support; 16 was MRS Score; 17 for family care; 18 for understanding social support; 19: illness uncertainty; 20 was Eysenck personality type; 21 with underlying diseases; 22 for illness perception; 23 for health literacy; 24 for family resilience; 25 for medical burden; 26 for stroke type; 27 for family intimacy; 28 for nerve function defect degree; 29 for multiple dimensions of fatigue; 30 were the main caregivers; 31 for living conditions; 32 cases visited hospital within 6 hours; 33 as the disease shame; 34 were self-perceived burden; 35 for SAS scores; 36 was SDS score; 37 were coping style; 38 HADS scores; - Indicates that there is no such content.

Meta-analysis of the incidence of FoP in Chinese stroke patients

Among the included 20 articles[15-34], 16 articles[15-17,20-23,25-28,30-34]reported the incidence of FoP in patients with stroke. There was significant heterogeneity among the studies (I^2=98.7%, P < 0.001), so the random effect model was used for Meta-analysis. The results showed that the incidence of FoP in Chinese stroke patients was 56% (95%CI= 45%-66%). The forest plot of FoP incidence in Chinese stroke patients is shown in Figure 1.

Will be included in the document in accordance with the study area, the types of cerebral apoplexy, year of publication on subgroup analysis, the results showed: (1) The incidence in North China, East China and central China was 43% (95%CI= 38%-47%), 70% (95%CI= 56%-83%) and 55% (95%CI= 36%-73%), respectively. (2) The incidence of FoP in ischemic and hemorrhagic stroke was 45% (95%CI= 27%-64%) and 72% (95%CI= 49%-95%), respectively. (3) Grouped by year of publication, the incidence of FoP before 2020 and after 2020 was 40% (95%CI= 32%-47%) and 59% (95%CI= 48%-70%), respectively. The subgroup analysis of the incidence of FoP in Chinese stroke patients is shown in Table 2. To explore potential sources of heterogeneity, we performed meta-regression analyses using publication years, research area, and

stroke type as covariates. Publication years (B = 0.28, 95% CI = 0.12-0.61, p = 0.004) and research area (B = 0.41, 95% CI = 0.26-0.65, p = 0.001) were statistically significant predictors of FoP incidence, indicating that more recent studies and studies from specific regions reported higher FoP rates. Stroke type (B = 0.30, 95% CI = 0.08-1.13, p = 0.065) showed a marginal association but did not reach statistical significance. Meta-regression results are presented in Table 3.

Table 2 Subgroup analysis of incidence of fear of disease progression in stroke in china

subunit	The number of research (a piece of writing)	Occurrence rate (95%CI)（%）	Effect model	Heterogeneity test	
				P	I^2 (%)
Research area					
North China	6[15,17,23,25,32,34]	0.43（0.38~0.47）	random	<0.001	80.96
East China	6[16,20-21,26,31,33]	0.70（0.56~0.83）	random	<0.001	98.25
Central China	3[22,27,30]	0.55（0.36~0.73）	random	<0.001	96.42
Stroke type					
ischemic	4[20,22,30,32]	0.45（0.27~0.64）	random	<0.001	97.46
hemorrhagic	3[21,26,33]	0.72（0.49~0.95）	random	<0.001	98.32
Year of publication					
2020 and before	3[32-34]	0.40（0.32~0.47）	random	<0.001	84.76
After 2020	13[15-17,20-23,25-28,30-31]	0.59（0.48~0.70）	random	<0.001	98.61

Table 3 Meta-regression analysis of incidence of fear of disease progression in stroke

Covariates	B	SE	I^2 (%)	P value	95%CI
Publication years	0.28	0.10	97.71	0.004	[0.12, 0.61]
Research area	0.41	0.09	98.23	0.001	[0.26, 0.65]
Stroke type	0.30	0.14	97.96	0.065	[0.08, 1.13]

Meta-analysis of influencing factors of FoP in Chinese stroke patients

In this study, the influencing factors of FoP were extracted from 15 articles [16,18-20,22-25,27-33], and the studies with ⩾2 influencing factors were combined. Meta analysis results showed that age, education level, income, body mass index, perception of social support, illness perception, and the family intimacy degree is the main factors affecting China's FoP patients with cerebral apoplexy, statistically significant difference (P < 0.05); Among them, age, education level, economic income, social support, and family intimacy were protective factors, as shown in Table 4.

Table 4 Meta-analysis of influencing factors of fear of disease progression in stroke

influencing factor	Included literature (part)	Meta analytic result		Effect model	Results of the heterogeneity test	
		OR （95%CI）	P		P	I^2 (%)
age (year)	9[16,18-19,22,25,27-28,31-32]	0.94 (0.92~0.97)	<0.001	fixed	0.07	44.8
course of disease	3[16,31,33]	0.43 (0.11~1.64)	0.22	stochastic	<0.001	91.3

economic income	3[18,24-25]	0.74 (0.69~0.78)	<0.001	fixed	0.14	49.7
number of disease recurrences	7[16,18,23-24,28,31-32]	1.12 (0.89~1.41)	0.34	stochastic	0.001	73.1
barthel index	2[18,31]	0.76 (0.52~1.11)	0.15	fixed	0.67	0
family history	2[29,32]	1.23 (0.99~1.54)	0.07	fixed	0.87	0
body mass index	2[19,25]	1.22 (1.04~1.43)	0.02	fixed	0.90	0
underlying diseases	2[22,29]	1.32 (0.98~1.79)	0.07	fixed	0.83	0
social support	3[19,25,33]	0.75 (0.63~0.90)	0.002	stochastic	0.002	84.0
illness perception	4[19,23,30-31]	1.41 (1.37~1.45)	<0.001	fixed	0.95	0
family intimacy	2[25,28]	0.80 (0.67~0.96)	0.01	stochastic	0.002	89.0
education level	2[22,24]	0.71 (0.67~0.76)	<0.001	fixed	0.24	28.2

Sensitivity analysis

Adopt the method of eliminating one by a single research on FoP incidence, sensitivity analysis results show that the amount of total consolidation effect is 0.56, did not change obviously, on both sides of all studies on the uniform distribution, low sensitivity, prompt Meta analysis result is stable and reliable, as shown in figure 2.

Test of publication bias

Using Egger 's inspection and Begg' s inspection respectively to evaluate publication bias incidence FoP research, Egger 's inspection (t = 2.13, P = 0.0517), Begg' s inspection (Z = 0.86, P = 0.4440) indicate no significant publication bias. Despite mild asymmetry in the funnel plot (Supplementary Figure 2), this pattern is likely attributable to high between-study heterogeneity (I^2 = 98.7%) rather than selective publication. Sensitivity analyses further confirmed the robustness of our findings, as the pooled incidence estimate remained stable when individual studies were sequentially excluded. Involved in each of the seven factors of the number included in the study, not for publication bias.

DISCUSSION

A total of 16 studies on the incidence of FoP in Chinese stroke patients were included in this study. Meta-analysis results showed that the incidence of FoP in stroke patients in China was 56% (95% CI = 45%-66%), which is considered high and consistent with the research results of Ellen Townend et al. (56%)[9]. The significant heterogeneity among the included studies, with an I^2 of 98.7% as shown in the meta-analysis of FoP incidence in Chinese stroke patients, poses a challenge to the validity of our results. This high degree of heterogeneity can be attributed to multiple factors. Firstly, the studies were conducted in different regions, such as North China, East China, and Central China, where there are differences in social and living habits, cultural background, and economic and medical development levels. These regional disparities may lead to variations in the reporting of FoP rates. Secondly, different types of stroke (hemorrhagic and ischemic) have distinct prognoses, sequelae, morbidity, and mortality, which can influence patients' psychological states and thus the incidence of FoP. Additionally, the studies were carried out in different time periods, and changes in social environment, such as the faster pace of modern

life after 2020, may have affected patients' mental stress levels and the reporting of FoP. Such diverse influencing factors contribute to the disparate values reported in the included studies and may introduce bias into our overall analysis. Therefore, when interpreting our results, it is crucial to consider the impact of this heterogeneity.

Meta-regression analyses further identified publication years ($p = 0.004$) and research area ($p = 0.001$) as significant predictors of heterogeneity, suggesting that more recent studies and studies from specific regions reported higher FoP rates. The results of the subgroup analysis showed that: (1) The incidence of FoP in East China (70%) was higher than that in Central China (55%) and North China (43%). This regional disparity may be driven by variations in healthcare accessibility and socioeconomic stressors. For instance, East China's rapid urbanization and competitive work environments may exacerbate psychological distress despite better medical infrastructure[35], whereas limited mental health resources in rural Central and North China could delay FoP diagnosis and intervention[36]. (2) For different types of stroke, the incidence of FoP in hemorrhagic stroke patients (72%) was significantly higher than that in ischemic stroke patients (45%), consistent with the findings of Wei Lirong[23]. This may be because the overall prognosis, sequelae, morbidity, and mortality are higher in hemorrhagic stroke patients, leading to lower quality of life and increased psychological distress[37-38]. (3) The incidence of FoP after 2020 (59%) was higher than before 2020 (40%), which could be related to the faster pace of modern life and greater mental stress.

Social and demographic factors are significant categories of influencing factors for FoP in stroke patients in China, including age, education level, economic income, and body mass index (BMI). (1) Age: The results of this study showed that age was a protective factor for FoP in stroke patients. This may be because elderly patients usually have rich life experience and most are in the stage of retirement and home care, which grants them stronger psychological tolerance to disease and lower fear of disease progression[39]. (2) Education level: The study indicates that a higher level of education is a protective factor for FoP in stroke patients. This is likely because patients with higher education levels have a stronger ability to comprehend disease-related information. After illness, they can independently acquire disease information through books, the internet, and other means, and can adopt more effective coping strategies when facing symptoms, thus avoiding excessive fear[40]. (3) Economic income: The results of this study showed that economic income was a protective factor for FoP in stroke patients. Stroke has a high morbidity rate, and most patients require long rehabilitation treatment cycles and significant economic support. Patients with low family income have limited medical expenditure, making it difficult to cope with sudden illness and its associated burdens, leading to poor psychological status and more serious fear of the disease[41]. (4) BMI: This study suggests that BMI is positively correlated with FoP in stroke patients. Patients with a higher BMI often have insufficient disease cognition or self-management ability[42], leading to a lack of confidence in self-control and management after the onset of the disease. Additionally, overweight and obesity can result in various abnormal health indicators, increasing the risk of stroke recurrence and aggravating patients' fear of disease progression. Although statistically significant (OR=1.22), the modest effect size indicates BMI should be interpreted cautiously as a predictor of FoP, and clinical interventions should prioritize stronger risk factors. Therefore, clinical medical staff should focus on young patients, those with low education levels, low family income, and high BMI. Strengthening the assessment and screening of FoP in these patients, providing predictive nursing care, and offering personalized health

education and psychological guidance according to patients' conditions can help improve their confidence in coping with the disease and reduce their fear of disease progression.

Disease-related factors, including illness perception, are a type of influencing factors of FoP in Chinese stroke patients. Illness perception refers to the process by which patients use previous knowledge and experience of the disease to analyze and explain current symptoms or disease, representing the patient's understanding, recognition, and emotional response to the disease[43]. This research shows that disease awareness and FoP in stroke patients are positively correlated, meaning the more negative the illness perception, the more severe the FoP. The reason may be that patients with high levels of negative illness perception lack correct understanding of disease-related knowledge and treatment, believe they cannot control disease progression, and this sense of losing control over their health contributes to the fear of the disease. Therefore, clinical medical staff should identify patients with high levels of negative illness perception as soon as possible and use acceptance and commitment therapy and cognitive behavioral therapy to intervene cognitively, correct misconceptions, establish accurate illness perception, and enhance patients' confidence in managing the disease to reduce their fear of disease progression.

Social psychological factors, including social support and family intimate, are major influencing factors for FoP in Chinese stroke patients. (1) Social support: This study showed that social support was a protective factor for FoP in stroke patients. The occurrence of stroke is a negative stress event for patients. During treatment and rehabilitation, patients are very eager to receive help and support from family, friends, and other sources. High levels of social support can provide patients with more favorable social resources and emotional care, alleviating their fear to some extent and helping them face life with optimism[44-45]. Conversely, low levels of social support can lead to pessimism in patients, which can exacerbate their fear of the disease and its progression. (2) Family intimacy: Family intimacy refers to the closeness, trust, understanding, and support between family members. This study shows that family intimacy is a protective factor for FoP in stroke patients. Good family intimate can provide adequate emotional support, help buffer the discomfort caused by stressful events, and encourage positive coping mechanisms, thus reducing psychological pressure and the fear of disease progression[46]. Therefore, clinical medical staff should actively mobilize patients' social support systems, encourage them to express their ideas, and seek support from various sources. In addition, caregivers should be encouraged to strengthen communication and care, improve family relationships and positive interactions, jointly cope with the challenges of the disease, and reduce patients' fear of disease progression.

Based on current clinical evidence, psychological interventions such as cognitive behavioral therapy[47] and mindfulness-based approaches[48] have demonstrated efficacy in reducing fear of progression in stroke patients. These interventions should be implemented within a multidisciplinary rehabilitation framework, with particular attention to cultural adaptation in the Chinese healthcare context.

This study has certain limitations: (1) The cross-sectional study design prevents causal inference between identified factors and FoP development; (2) The absence of validation data for populations outside China limits generalizability to other ethnic/healthcare contexts; (3) Limited included studies for some influencing factors (e.g., only two studies analyzing specific variables); (4) Despite Egger's and Begg's tests indicating no significant publication bias initially, the funnel plot exhibits a notable offset. This suggests these tests might not have fully detected the publication bias in our study, highlighting a limitation in our analysis. To address the current

limitations, future studies should: (1) conduct longitudinal designs to establish causal relationships, (2) validate findings in multinational populations, and (3) incorporate more standardized assessment tools to reduce heterogeneity. Additionally, cultural adaptation of interventions and economic evaluations of screening protocols warrant further investigation.

CONCLUSIONS

In conclusion, the incidence of FoP in Chinese stroke patients is 56%, indicating a high prevalence. Age, education level, economic income, body mass index, social support, illness perception, and family intimate are the main influencing factors of FoP in Chinese stroke patients. Clinical attention should be paid to the evaluation and screening of FoP in stroke patients, with a focus on key groups such as those with young age, low education level, low family income, high body mass index, and low social support. This approach will maximize the supportive role of family and society and reduce negative illness perceptions. Individualized health education and psychological guidance should be tailored to different groups, which is crucial for reducing the occurrence of FoP and improving patients' quality of life.

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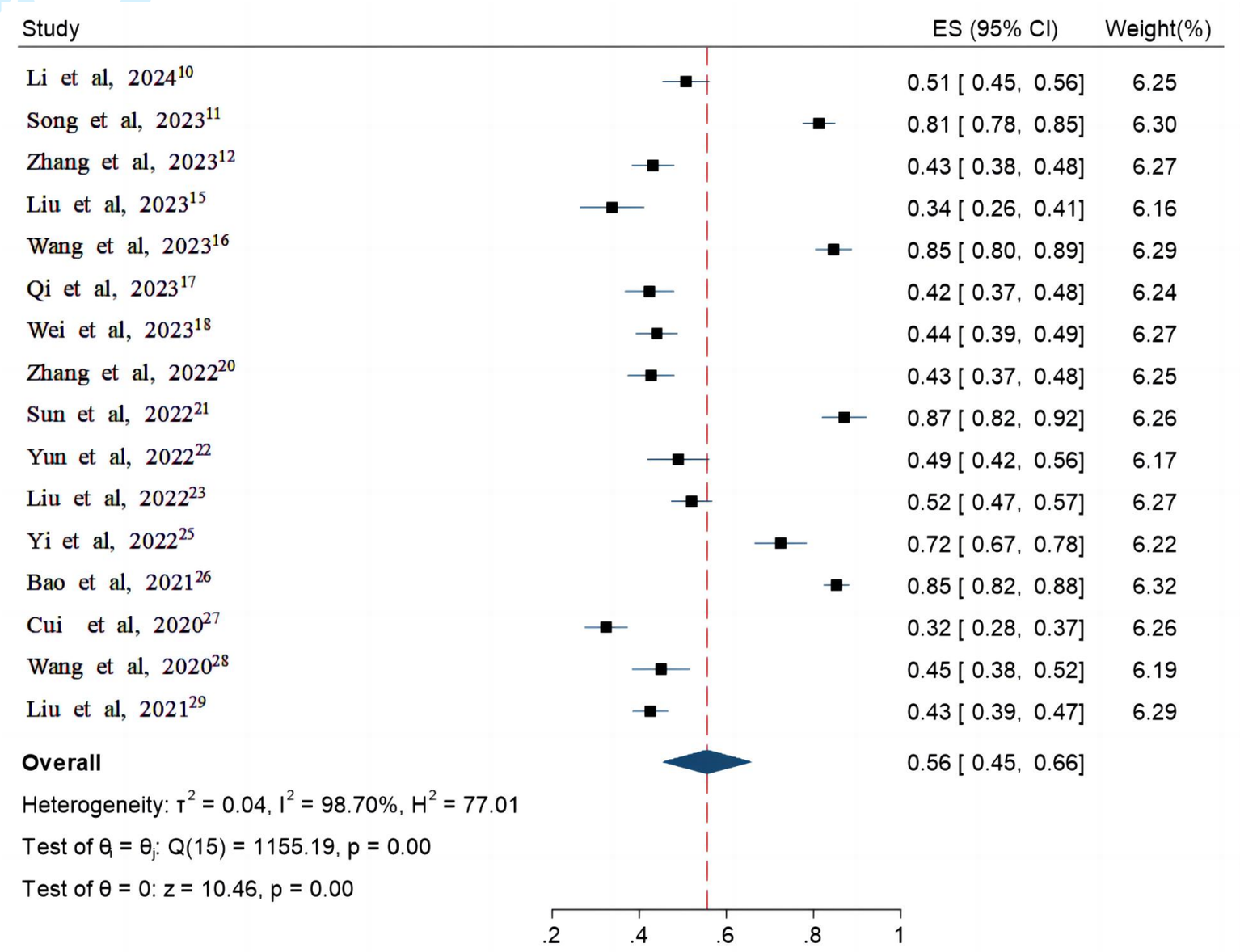
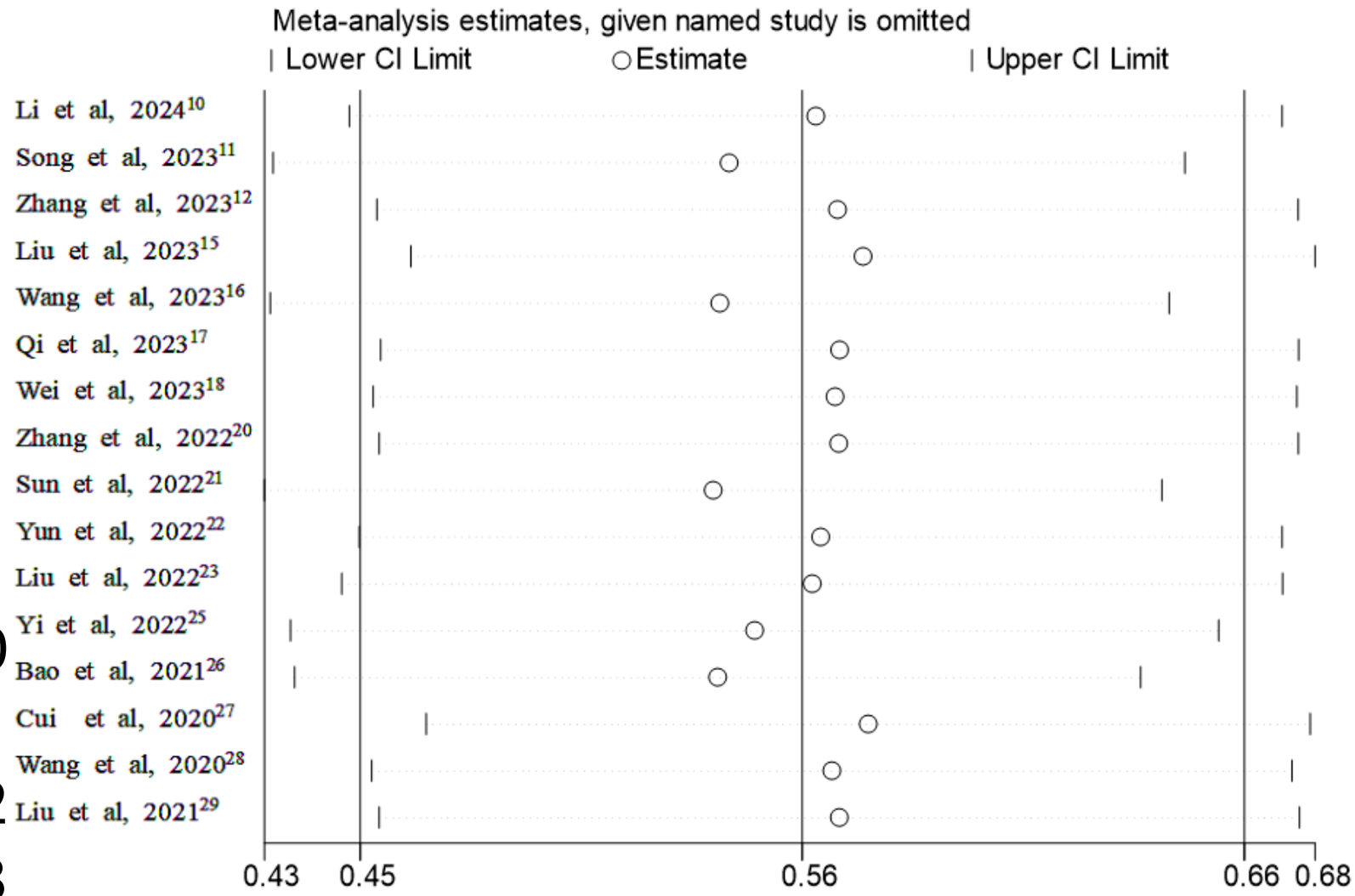
Figure 1 Forest plot of incidence of fear of disease progression in stroke in china

Figure 2 Sensitivity analysis of incidence of fear of disease progression in stroke in china





Supplementary Figure 1

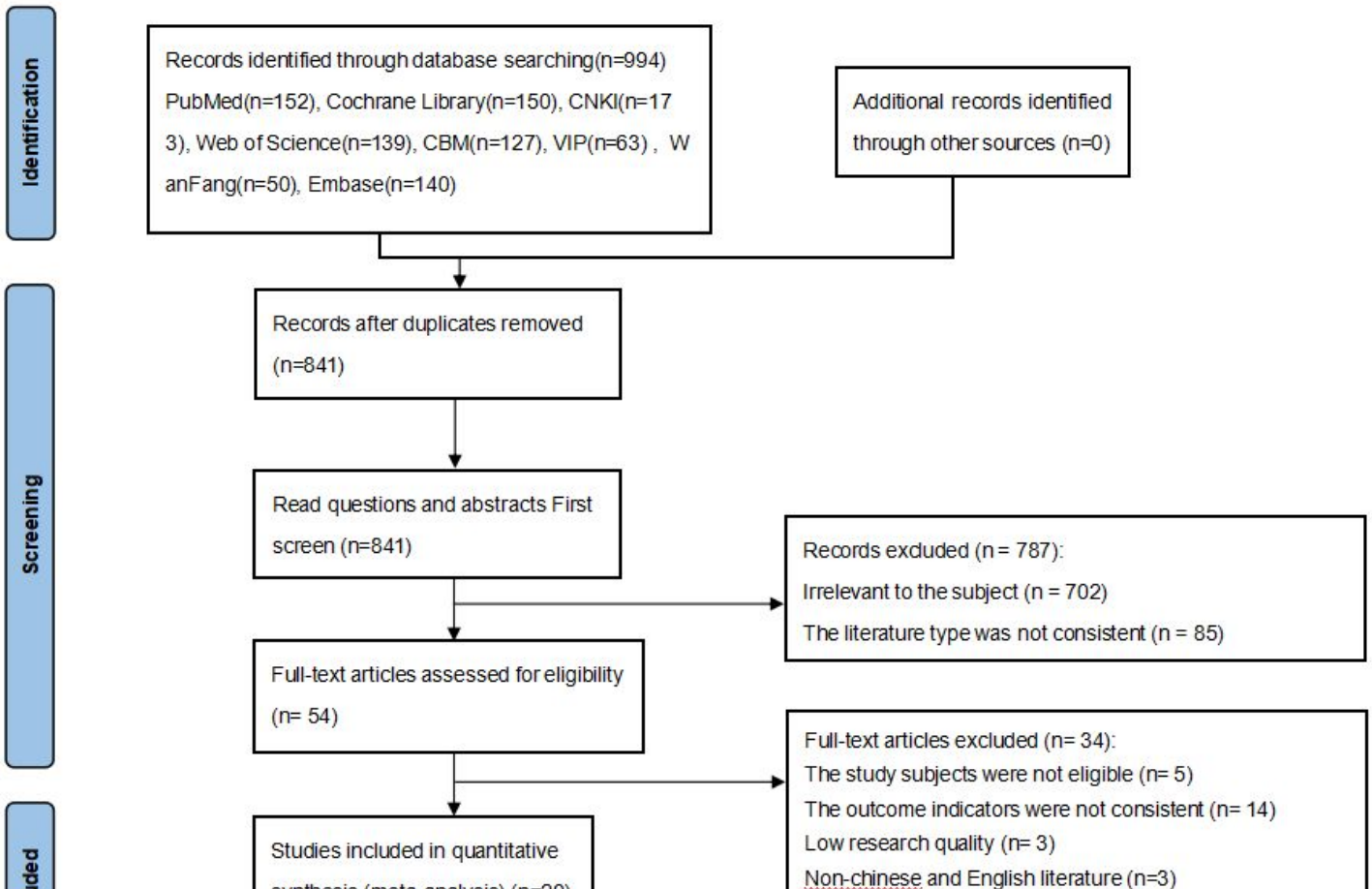


Figure 1 Flow diagram of study selection in the meta-analysis. FoP, fear of disease progression.

Supplementary Figure 2

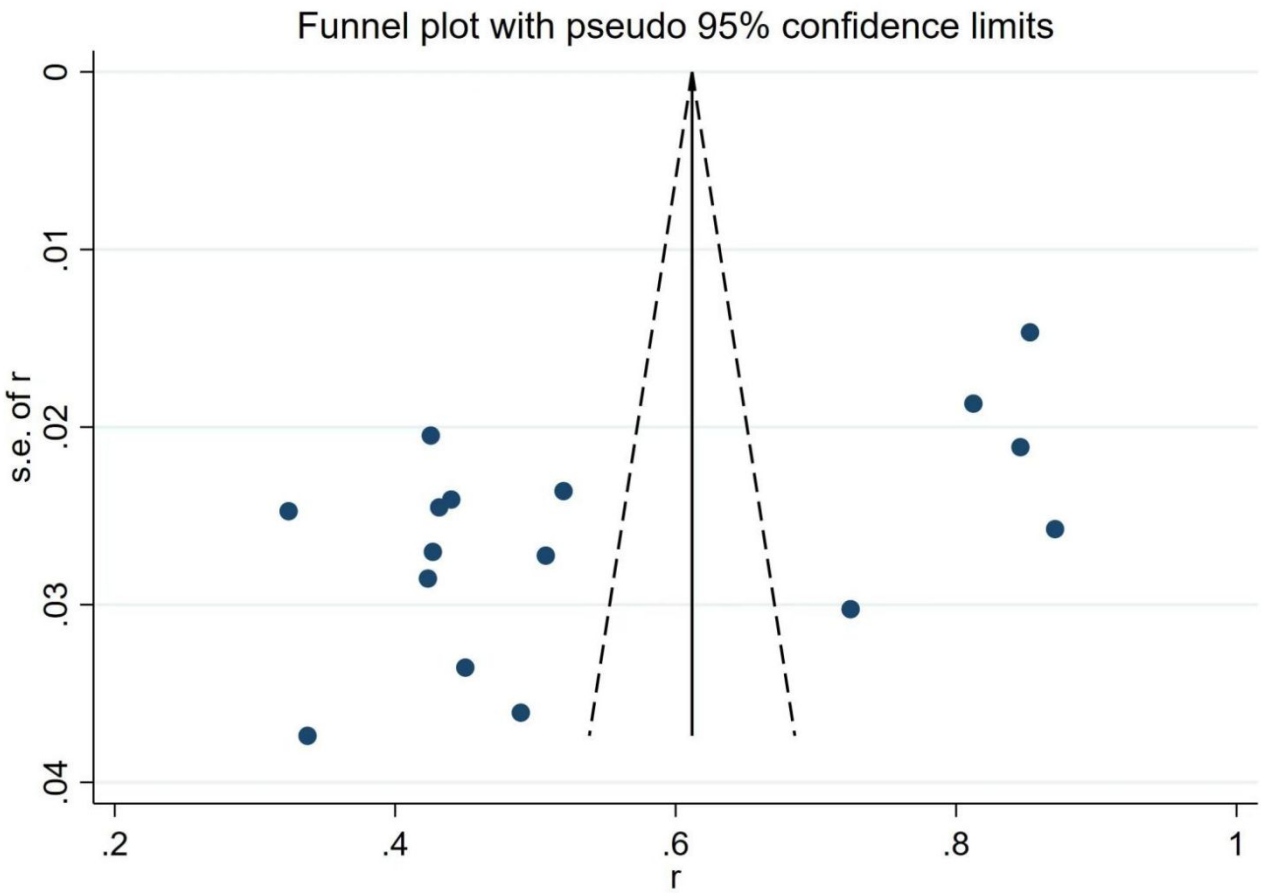


Figure 2 Funnel chart of FoP incidence.

Supplementary Table 1.

Search strategy used in Cochrane Library, Web of Science, Embase, PubMed, CBM, CNKI, Wanfang Data and VIP.

Search strategy used in Cochrane Library database.

1	MeSH descriptor: [Stroke] explode all trees
2	(stroke):ti,ab,kw OR (strokes):ti,ab,kw OR (apoplexy):ti,ab,kw OR (CVA):ti,ab,kw OR (cerebrovascular accident):ti,ab,kw
3	(poststroke):ti,ab,kw OR (cerebral infarction):ti,ab,kw OR (brain embolism):ti,ab,kw OR (brain hemorrhage):ti,ab,kw
4	#1 OR #2 OR #3
5	(anxiet*):ti,ab,kw OR (worr*):ti,ab,kw OR (afraid):ti,ab,kw OR (fear*):ti,ab,kw OR (concern):ti,ab,kw
6	(relapse):ti,ab,kw OR (recur*):ti,ab,kw OR (progress*):ti,ab,kw OR (return):ti,ab,kw
7	#4 AND #5 AND #6

Search strategy used in Web of Science database.

1	#1 TS=("stroke" OR "strokes" OR "apoplexy" OR "CVA" OR "cerebrovascular accident" OR "poststroke" OR "cerebral infarction" OR "brain embolism") #2 TS=("anxiet*" OR "worr*" OR "afraid" OR "fear*" OR "concern" OR "uncertainty") #3 TI=("relapse" OR "recur*" OR "progress*" OR "return") #4 #1 and #2 and #3

Search strategy used in EMBASE database.

1	'stroke'/exp
2	stroke:ab,ti OR strokes:ab,ti OR apoplexy:ab,ti OR 'CVA':ab,ti OR 'cerebrovascular accident':ab,ti OR poststroke:ab,ti OR 'cerebral infarction':ab,ti OR 'brain embolism':ab,ti OR 'brain hemorrhage':ab,ti
3	#1 OR #2
4	anxiet*:ab,ti OR worr*:ab,ti OR afraid:ab,ti OR fear*:ab,ti OR concern:ab,ti OR uncertainty:ab,ti
5	relapse:ab,ti OR recur*:ab,ti OR progress*:ab,ti OR return:ab,ti
6	'risk factor':ab,ti OR 'Risk factors':ab,ti OR factor:ab,ti OR 'influencing factor':ab,ti OR 'relevant factor':ab,ti OR 'contributing factor':ab,ti OR etiology:ab,ti OR 'disease rate':ab,ti OR prevalence:ab,ti
7	#3 AND #4 AND #5 AND #6

Search strategy used in Pubmed database.

1	"Stroke"[MeSH] OR "strokes"[Title/Abstract] OR "apoplexy"[Title/Abstract] OR "cerebrovascular accident"[Title/Abstract] OR "poststroke"[Title/Abstract] OR "cerebral infarction"[Title/Abstract] OR "brain embolism"[Title/Abstract] OR "brain hemorrhage"[Title/Abstract]
2	"anxiet*"[Title/Abstract] OR "worr*"[Title/Abstract] OR "afraid"[Title/Abstract] OR "fear*"[Title/Abstract] OR "concern"[Title/Abstract] OR "uncertainty"[Title/Abstract]
3	"relapse"[Title/Abstract] OR "recur*"[Title/Abstract] OR "progress*"[Title/Abstract] OR "return"[Title/Abstract]
4	"Incidence"[MeSH] OR "Prevalence"[MeSH] OR "frequency"[Title/Abstract] OR "occurrence"[Title/Abstract] OR "incidences"[Title/Abstract] OR "influence factor*"[Title/Abstract] OR "risk factor*"[Title/Abstract] OR "associated factor*"[Title/Abstract] OR "relevant factor*"[Title/Abstract]
5	#1 AND #2 AND #3 AND #4

Search strategy used in CBM database.

1	"Stroke"[MeSH] OR "strokes"[Title/Abstract] OR "apoplexy"[Title/Abstract] OR "cerebrovascular accident"[Title/Abstract] OR "poststroke"[Title/Abstract] OR "cerebral infarction"[Title/Abstract] OR "brain embolism"[Title/Abstract] OR "brain hemorrhage"[Title/Abstract]
2	"anxiet*"[Title/Abstract] OR "worr*"[Title/Abstract] OR "afraid"[Title/Abstract] OR "fear*"[Title/Abstract] OR "concern"[Title/Abstract] OR "uncertainty"[Title/Abstract]
3	"relapse"[Title/Abstract] OR "recur*"[Title/Abstract] OR "progress*"[Title/Abstract] OR "return"[Title/Abstract]
4	"Incidence"[MeSH] OR "Prevalence"[MeSH] OR "frequency"[Title/Abstract] OR "occurrence"[Title/Abstract] OR "incidences"[Title/Abstract] OR "influence factor*"[Title/Abstract] OR "risk factor*"[Title/Abstract] OR "associated factor*"[Title/Abstract] OR "relevant factor*"[Title/Abstract]
5	#1 AND #2 AND #3 AND #4

Search strategy used in CNKI database.

1	(主题: 中风) OR (主题: 脑卒中) OR (主题: 卒中) OR (主题: 脑梗死) OR 主题: 脑栓塞) OR (主题: 脑缺血) OR (主题: 脑血管意外) OR (主题: 脑血管病) OR (主题: 脑出血) OR (主题: 脑梗) AND (主题: 恐惧) OR (主题: 担忧) OR (主题: 不确定感) OR (主题: 担心)OR (主题: 害怕) AND (主题: 复发) OR (主题: 进展)

Search strategy used in Wanfang database.

1	主题：（中风 OR 脑卒中 OR 卒中 OR 脑梗死 OR 脑梗塞 OR 脑缺血 OR 脑血管意外 OR 脑血管病 OR 脑出血 OR 脑溢血 OR 脑梗 OR 脑血栓 OR 脑栓塞 OR 缺血性脑病）AND 主题：（恐惧 OR 担忧 OR 不确定感 OR 担心 OR 害怕）AND 主题：（复发 OR 进展）

Search strategy used in VIP database.

1	题名或关键词=中风 OR 脑卒中 OR 卒中 OR 脑梗死 OR 脑梗塞 OR 脑缺血 OR 脑血管意外 OR 脑血管病 OR 脑出血 OR 脑溢血 OR 脑梗 OR 脑血栓 OR 脑栓塞 OR 缺血性脑病 AND 题名或关键词=恐惧 OR 担忧 OR 不确定感 OR 担心 OR 害怕 AND 题名或关键词=复发 OR 进展

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Prevalence and Factors Influencing Fear of Disease Progression in Stroke Patients: A Systematic Review and Meta-Analysis with a Focus on China

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ABSTRACT

Objectives: To systematically estimate the prevalence and influencing factors of fear of disease progression (FoP) in stroke patients, with a focus on China.

Design: Systematic review and meta-analysis of observational clinical studies.

Data Sources: Eight databases (CNKI, Wanfang, VIP, CBM, Web of Science, PubMed, Cochrane Library, Embase) were searched from inception to March 2024, supplemented by manual reference screening.

Eligibility criteria: Cross-sectional studies reporting FoP incidence or influencing factors in Chinese stroke patients using the FoP-Q-SF scale were included.

Data extraction and synthesis: Two reviewers independently screened studies, extracted data, and assessed study quality using the Agency for Healthcare Research and Quality (AHRQ) tool (score range: 0-11 points). Random-effects models were applied to address substantial heterogeneity. Stata 17.0 software was used for meta-analysis.

Results: A total of 20 studies (15 medium-quality, 5 high-quality) involving 7,156 patients were included. The pooled incidence of FoP in Chinese stroke patients was 56% (95% CI = 45%-66%), derived from a random-effects model despite significant between-study heterogeneity (I^2 = 98.7%), with subgroup analyses and leave-one-out sensitivity analysis confirmed result robustness. Subgroup analysis revealed that the incidence was highest in East China (70%, 95% CI = 56%-83%), followed by Central China (55%, 95% CI = 36%-73%) and North China (43%, 95% CI = 38%-47%). The incidence of FoP in hemorrhagic stroke (72%, 95% CI = 49%-95%) was higher than that in ischemic stroke (45%, 95% CI = 27%-64%). The incidence of FoP after 2020 (59%, 95% CI = 48%-70%) was higher than that before 2020 (40%, 95% CI = 32%-47%). Meta-regression identified publication year (P=0.004) and research region (P=0.001) as key heterogeneity sources. The main influencing factors of FoP in Chinese stroke patients included age (OR = 0.94, 95% CI = 0.92-0.97, P < 0.05), education level (OR = 0.71, 95% CI = 0.67-0.76, P < 0.05), economic income (OR = 0.74, 95% CI = 0.69-0.78, P < 0.05), body mass index (OR = 1.22, 95% CI = 1.04-1.43, P < 0.05), social support (OR = 0.75, 95% CI = 0.63-0.90, P < 0.05),

illness perception (OR = 1.41, 95% CI = 1.37-1.45, P < 0.05), and family intimate (OR = 0.80, 95% CI = 0.67-0.96, P < 0.05). No significant publication bias was detected (Egger's p=0.052, Begg's p=0.444), though funnel plot asymmetry suggested potential heterogeneity effects.

Conclusion: The incidence of FoP in Chinese stroke patients is high (56%), influenced by age, education level, economic income, body mass index, social support, illness perception, and family intimate. Despite high heterogeneity, sensitivity analyses confirmed result robustness. Clinical staff should prioritize psychological screening for FoP and implement targeted interventions, such as cognitive-behavioural therapy for negative illness perception, social support programs for low-income patients, and family-centred education for younger patients.

PROSPERO registration number: CRD42024522147

Strengths and limitations of this study:

⇒ The meta-analysis followed PRISMA guidelines with a comprehensive search across 8 databases and manual reference tracking, minimising selection bias.

⇒ Two independent reviewers conducted study screening, data extraction, and quality asses sment using the AHRQ tool, enhancing methodological rigour.

⇒ Subgroup analyses and sensitivity tests were performed to address heterogeneity.

⇒ The small number of studies (n=20) limited subgroup analyses for some influencing fac tors, reducing statistical power.

⇒ Non-Chinese studies were excluded, potentially omitting unpublished data and limiting generalizability to non-Chinese populations.

Key words: stroke; fear of disease progression, incidence rate, the influencing factors, met a-analysis

INTRODUCTION

Stroke is currently the second leading cause of death globally and the leading cause of adult death and disability in China. By 2020, there were 17.8 million stroke patients in China over the age of 40[1-2], and the five-year recurrence rate in this population is as high as 41%[3]. Additionally, 70% to 80% of these patients will experience residual disabilities after treatment[4]. Stroke patients often suffer from negative emotions such as anxiety and depression due to the long-term and repeated impacts of the disease on their body and mind. Furthermore, patients may experience fear due to a lack of understanding of the disease and uncertainty about its treatment and prognosis[5]. Fear of Progression (FoP) is the fear patients experience concerning the disease's consequences or recurrence[6], extends beyond transient psychological distress to critically impair treatment adherence, health behaviors, and rehabilitation outcomes[7-8]. Therefore, understanding the incidence and influencing factors of FoP in stroke patients is crucial for early identification and management of their fears.

Emerging evidence highlights the global prevalence and clinical significance of FoP in stroke populations. A UK qualitative study revealed 56% of stroke survivors experience clinically significant FoP, primarily driven by uncertainty about functional recovery and social role disruption[9]. Crowe et al.[10] further demonstrated that stroke's sudden onset and chronicity foster profound self-worth loss and persistent fear of recurrence, severely compromising quality of life. Consistent with these findings, a Korean survey of 180 ischemic stroke patients[11] identified

elevated FoP levels associated with inadequate disease knowledge and maladaptive health behaviors (e.g., poor dietary habits, exercise avoidance, and medication nonadherence).

Despite these insights, critical gaps persist in understanding FoP among Chinese stroke patients. Current research predominantly focuses on Western and other Asian populations, with limited investigation into China's unique sociocultural context where family-centered care models and stigma surrounding chronic illness may amplify FoP[12-13]. No consensus exists regarding FoP incidence or modifiable risk factors in this population, hindering the development of culturally adapted interventions. Thus, this study uses meta-analysis to explore the incidence and influencing factors of FoP in Chinese stroke patients, aiming to provide evidence-based guidance for clinical staff to identify high-risk patients early and develop targeted, individualized intervention programs.

METHODS

Database and search strategies

Computer retrieval of data was conducted using CNKI, Wangfang database, VIP, CBM, Web of Science, PubMed, the Cochrane Library, and Embase—eight major databases. The search targeted literature on the incidence of FoP in stroke patients and/or related influencing factors, with a retrieval time limit up to March 2024. A combination of medical subject heading terms and free text words was used: "stroke", "apoplexy", "brain embolism", "brain hemorrhage", "cerebrovascular", "accident", "anxiet*", "worr*", "afraid", "fear*", "concern", "relapse", "recur*", "progress*", "return", "incidence", "occurrence", "influence", "factor*", and "relevant factor*". Additionally, references within the included literature were tracked to enhance recall. The search strategy was independently conducted by two experienced investigators (ZY and CC) in information retrieval. Complete details of the search strategy are available in the online supplemental table 1.

Protocol and registration

The review protocol is registered with PROSPERO (CRD42024522147).

Inclusion and exclusion criteria

In this review, the inclusion criteria are as follows: (1) Studies involving stroke patients aged 18 years or older; (2) Cross-sectional studies; (3) Outcome indicators for the incidence of FoP in stroke patients and/or influencing factors, with extractable research data presented as OR and 95% CI; (4) Use of the Fear of Progression Questionnaire-Short Form (FoP-Q-SF) as the research instrument. The exclusion criteria were as follows: (1) Conference abstracts, reviews, systematic reviews, case reports, editorials, letters to the editor, comments, conference summaries, chapters in books and animal studies; (2) Literature with incomplete data or inaccessible full texts; (3) Studies classified as low quality (score 0-3 points based on the US Agency for Healthcare Research and Quality [AHRQ][14] criteria); (4) Literature with repeated publication or data reuse; (5) Documents available in both Chinese and English.

Data extraction and synthesis

Two researchers (MW and YY) independently identified relevant literature by reviewing the titles, abstracts, and full texts of the retrieved studies. Initially, they read the titles and abstracts to exclude obviously irrelevant literature. Then, they conducted a second screening by reading the full texts to determine the final included literature and extract relevant data. Any disagreements were resolved through discussion and consultation with a third investigator. The extracted data primarily included the first author, year of publication, study area, age, total sample size, incidence of FoP, influencing factors, etc. Two researchers independently completed data extraction, and all researchers subsequently reviewed the data for accuracy.

Quality assessment

The quality of the included literature was independently evaluated by two investigators (M W and YY) using the evaluation criteria recommended by AHRQ[14]. The criteria include 1 1 items, with 1 point assigned for each item answered as "yes," "no," or "unclear." The t otal score ranges from 0 to 11 points, categorizing studies as low quality (0-3 points), me dium quality (4-7 points), or high quality (8-11 points). Any discrepancies between two in vestigators were resolved by consulting a third reviewer (LX).

Statistical analysis

Using Stata 17.0 software, a meta-analysis was conducted to determine the incidence and influencing factors of FoP in stroke patients. I2 was used to test the heterogeneity of the included literature. If $I^2 < 50\%$ and $P \geqslant 0.1$, a fixed effect model was used for analysis; otherwise, a random effects model was adopted. To further explore sources of heterogeneity, meta-regression analysis was conducted using covariates such as publication years, research area, and stroke type. Subgroup analysis and sensitivity analysis were performed to further investigate the source of heterogeneity. Subgroup analysis categories included average age, study area, types of stroke, and year of publication. A leave-one-out sensitivity analysis was performed by iteratively excluding each study to assess the robustness of the pooled estimates. Egger's test and Begg's test were used to evaluate publication bias, with $P < 0.05$ considered statistically significant. However, a funnel plot was not used to assess the presence of publication bias because the available literature pertaining to each individual risk factor fell below a threshold of 10, rendering the data too fragmented for meaningful comparisons.

Patient and public involvement

None.

RESULTS

Literature search

A total of 994 records were retrieved from the databases: 152 from PubMed, 150 from th e Cochrane Library, 173 from CNKI, 139 from Web of Science, 127 from CBM, 63 from VIP, 50 from WanFang, 140 from Embase, and none from additional records identified t hrough other sources. Subsequently, 153 duplicate studies were excluded. A total of 787 a

rticles were excluded following preliminary screening based on titles and abstracts. Followi ng a re-screening of the full texts, 34 articles were excluded, and 20 articles were ultimat ely included in the meta-analysis[15-34]. The PRISMA flow diagram illustrating the search str ategy and study selection is depicted in online supplemental figure 1.

Characteristics and quality of the included studies

A total of 20 articles were included in this study[15-34], all of which were in Chinese. The study involved 156 patients with cerebral apoplexy, among whom 3,054 cases of FoP wer e reported, with an incidence rate ranging from 32.4% to 87.05%. The study covered nine provinces in China: Shanxi, Shandong, Tianjin, Hainan, Sichuan, Henan, Jilin, Hebei, and Guangdong. The average age of the patients ranged from 27.45 to 69.42 years. A total o f 38 factors influencing FoP in patients with cerebral apoplexy were identified in China. The results of the literature quality evaluation indicated that 15 articles[16,17,19,21-29,32-34] were of medium quality, while 5 articles[15,18,20,30,31] were of high quality. The complete details of the characteristics and quality of the included studies are available in table 1.

Table 1 Characteristics and evaluated quality of the included studies

the first author	Research area	Stroke type	age (year)	Total sample size	The number of cases	incidence (%)	influencing factor	estimation of quality
Li et al, 2024[15]	Shanxi	And hemorrhagic and ischemic stroke	18～59	337	171	50.74	—	H
Song et al, 2023[16]	Shandong	And hemorrhagic and ischemic stroke	18～79	437	355	81.24	1、4、8、9	M
Zhang et al, 2023[17]	Tianjin	And hemorrhagic and ischemic stroke	⩾18	408	176	40.6	—	M
Gu et al, 2023[18]	Hainan	And hemorrhagic and ischemic stroke	⩾60	223	—	—	1、7、8、10、13	H
Huang et al, 2023[19]	Sichuan	cerebral arterial thrombosis	⩾18	314	—	—	1、6、11、12、14、15、22	M
Liu et al, 2023[20]	Shandong	cerebral arterial thrombosis	—	160	54	33.75	5、7、16、17、18、19	H
Wang et al, 2023[21]	Shandong	hemorrhagic apoplexy	⩾18	292	247	82.33	—	M
Qi et al, 2023[22]	Henan	cerebral arterial thrombosis	18～60	300	127	42.3	1、5、18、20、21	M
Wei et al, 2023[23]	Tianjin	And hemorrhagic and ischemic stroke	⩾18	425	187	44	3、6、8、22、23、24、25、26	M
Mei et al, 2023[24]	Jilin	cerebral arterial thrombosis	⩾18	276	—	—	5、7、8	M

Zhang et al, 2022[25]	Hebei	And hemorrhagic and ischemic stroke	⩾18	335	143	42.7	1、2、6、7、10、11、15、27、28	M
Sun et al, 2022[26]	Shandong	hemorrhagic apoplexy	18～69	170	148	87.05	—	M
Yun et al, 2022[27]	Henan	And hemorrhagic and ischemic stroke	⩾18	192	94	48.95	1、29	M
Liu et al, 2022[28]	Sichuan	And hemorrhagic and ischemic stroke	—	448	233	52	1、8、27、30、31、32、33、34	M
Deng et al, 2022[29]	Guangdong	And hemorrhagic and ischemic stroke	20～35	876	—	—	3、7、17、21、25、35、36	M
Yi et al, 2022[30]	Henan	cerebral arterial thrombosis	24～59	218	158	72.5	22、25、31、37	H
Bao et al, 2021[31]	Shandong	And hemorrhagic and ischemic stroke	⩾60	584	498	85.27	1、4、8、10、22	H
Cui et al, 2020[32]	Hebei	cerebral arterial thrombosis	18～80	358	116	32.4	1、2、3、8、16、17、18	M
Wang et al, 2020[33]	Shandong	hemorrhagic apoplexy	⩾18	220	99	45	4、15、38	M
Liu et al, 2021[34]	Tianjin	And hemorrhagic and ischemic stroke	⩾18	583	248	42.5	—	M

Note: 1 is age; 2 was gender; 3 family history; 4 for the course; 5: education level; 6 for working conditions; 7 for the economic income; 8 for disease recurrence rate; 9, ADL; 10 is Barthel index; 11 for body mass index; 12 were marital status; 13 was self-efficacy; 14 for reproductive condition; 15 for social support; 16 was MRS Score; 17 for family care; 18 for understanding social support; 19: illness uncertainty; 20 was Eysenck personality type; 21 with underlying diseases; 22 for illness perception; 23 for health literacy; 24 for family resilience; 25 for medical burden; 26 for stroke type; 27 for family intimacy; 28 for nerve function defect degree; 29 for multiple dimensions of fatigue; 30 were the main caregivers; 31 for living conditions; 32 cases visited hospital within 6 hours; 33 as the disease shame; 34 were self-perceived burden; 35 for SAS scores; 36 was SDS score; 37 were coping style; 38 HADS scores; M: Medium quality (AHRQ score 4-7 points); H: High quality (AHRQ score 8-11 points); - Indicates no relevant content.

Meta-analysis of the incidence of FoP in Chinese stroke patients

Among the included 20 articles[15-34], 16 articles[15-17,20-23,25-28,30-34]reported the incidence of FoP in patients with stroke. There was significant heterogeneity among the studies (I^2=98.7%, P < 0.001), so the random effect model was used for Meta-analysis. The results showed that the incidence of FoP in Chinese stroke patients was 56% (95%CI= 45%-66%). The forest plot of FoP incidence in Chinese stroke patients is shown in Figure 1.

Will be included in the document in accordance with the study area, the types of cerebral apoplexy, year of publication on subgroup analysis, the results showed: (1) The incidence in North China, East China and central China was 43% (95%CI= 38%-47%), 70% (95%CI= 56%-83%)

and 55% (95%CI= 36%-73%), respectively. (2) The incidence of FoP in ischemic and hemorrhagic stroke was 45% (95%CI= 27%-64%) and 72% (95%CI= 49%-95%), respectively. (3) Grouped by year of publication, the incidence of FoP before 2020 and after 2020 was 40% (95%CI= 32%-47%) and 59% (95%CI= 48%-70%), respectively. The subgroup analysis of the incidence of FoP in Chinese stroke patients is shown in Table 2. To explore potential sources of heterogeneity, we performed meta-regression analyses using publication years, research area, and stroke type as covariates. Publication years (B= 0.28, 95%CI= 0.12-0.61, P= 0.004) and research area (B= 0.41, 95%CI= 0.26-0.65, P= 0.001) were statistically significant predictors of FoP incidence, indicating that more recent studies and studies from specific regions reported higher FoP rates. Stroke type (B= 0.30, 95%CI= 0.08-1.13, P= 0.065) showed a marginal association but did not reach statistical significance. Meta-regression results are presented in Table 3.

Table 2 Subgroup analysis of incidence of fear of disease progression in stroke in china

subunit	The number of research (a piece of writing)	Occurrence rate (95%CI)（%）	Effect model	Heterogeneity test	
				P	I^2 (%)
Research area					
North China	6[15,17,23,25,32,34]	0.43（0.38~0.47）	random	<0.001	80.96
East China	6[16,20-21,26,31,33]	0.70（0.56~0.83）	random	<0.001	98.25
Central China	3[22,27,30]	0.55（0.36~0.73）	random	<0.001	96.42
Stroke type					
ischemic	4[20,22,30,32]	0.45（0.27~0.64）	random	<0.001	97.46
hemorrhagic	3[21,26,33]	0.72（0.49~0.95）	random	<0.001	98.32
Year of publication					
2020 and before	3[32-34]	0.40（0.32~0.47）	random	<0.001	84.76
After 2020	13[15-17,20-23,25-28,30-31]	0.59（0.48~0.70）	random	<0.001	98.61

Table 3 Meta-regression analysis of incidence of fear of disease progression in stroke

Covariates	B	SE	I^2 (%)	P value	95%CI
Publication years	0.28	0.10	97.71	0.004	[0.12, 0.61]
Research area	0.41	0.09	98.23	0.001	[0.26, 0.65]
Stroke type	0.30	0.14	97.96	0.065	[0.08, 1.13]

Meta-analysis of influencing factors of FoP in Chinese stroke patients

In this study, the influencing factors of FoP were extracted from 15 articles [16,18-20,22-25,27-33], and the studies with ⩾2 influencing factors were combined. Meta analysis results showed that age, education level, income, body mass index, perception of social support, illness perception, and the family intimacy degree is the main factors affecting China's FoP patients with cerebral apoplexy, statistically significant difference ($P < 0.05$); Among them, age, education level, economic income, social support, and family intimacy were protective factors, as shown in Table 4.

Table 4 Meta-analysis of influencing factors of fear of disease progression in stroke

influencing factor	Included literature (part)	Meta analytic result		Effect model	Results of the heterogeneity test	
		OR （95%CI）	P		P	I^2 (%)
age (year)	9[16,18-19,22,25,27-28,31-32]	0.94 (0.92~0.97)	<0.001	fixed	0.07	44.8
course of disease	3[16,31,33]	0.43 (0.11~1.64)	0.22	stochastic	<0.001	91.3
economic income	3[18,24-25]	0.74 (0.69~0.78)	<0.001	fixed	0.14	49.7
number of disease recurrences	7[16,18,23-24,28,31-32]	1.12 (0.89~1.41)	0.34	stochastic	0.001	73.1
barthel index	2[18,31]	0.76 (0.52~1.11)	0.15	fixed	0.67	0
family history	2[29,32]	1.23 (0.99~1.54)	0.07	fixed	0.87	0
body mass index	2[19,25]	1.22 (1.04~1.43)	0.02	fixed	0.90	0
underlying diseases	2[22,29]	1.32 (0.98~1.79)	0.07	fixed	0.83	0
social support	3[19,25,33]	0.75 (0.63~0.90)	0.002	stochastic	0.002	84.0
illness perception	4[19,23,30-31]	1.41 (1.37~1.45)	<0.001	fixed	0.95	0
family intimacy	2[25,28]	0.80 (0.67~0.96)	0.01	stochastic	0.002	89.0
education level	2[22,24]	0.71 (0.67~0.76)	<0.001	fixed	0.24	28.2

Sensitivity analysis

The leave-one-out sensitivity analysis demonstrated robust pooled estimates. The amount of total consolidation effect is 0.56 (95%CI= 45%-66%). No single study significantly altered the effect size, confirming the stability of our findings, as shown in figure 2.

Test of publication bias

Using Egger 's inspection and Begg' s inspection respectively to evaluate publication bias incidence FoP research, Egger 's inspection (t = 2.13, P = 0.0517), Begg' s inspection (Z = 0.86, P = 0.4440) indicate no significant publication bias. Despite mild asymmetry in the funnel plot (Supplementary Figure 2), this pattern is likely attributable to high between-study heterogeneity (I^2 = 98.7%) rather than selective publication. Sensitivity analyses further confirmed the robustness of our findings, as the pooled incidence estimate remained stable when individual studies were sequentially excluded. Involved in each of the seven factors of the number included in the study, not for publication bias.

DISCUSSION

A total of 16 studies on the incidence of FoP in Chinese stroke patients were included in this study. Meta-analysis results showed that the incidence of FoP in stroke patients in China was 56% (95% CI = 45%-66%), which is considered high and consistent with the research results of Ellen Townend et al. (56%)[9]. The significant heterogeneity among the included studies, with an I^2 of 98.7% as shown in the meta-analysis of FoP incidence in Chinese stroke patients, poses a challenge to the validity of our results. This high degree of heterogeneity can be attributed to multiple factors. Firstly, the studies were conducted in different regions, such as North China, East China, and Central China, where there are differences in social and living habits, cultural background, and economic and medical development levels. These regional disparities may lead

to variations in the reporting of FoP rates. Secondly, different types of stroke (hemorrhagic and ischemic) have distinct prognoses, sequelae, morbidity, and mortality, which can influence patients' psychological states and thus the incidence of FoP. Additionally, the studies were carried out in different time periods, and changes in social environment, such as the faster pace of modern life after 2020, may have affected patients' mental stress levels and the reporting of FoP. Such diverse influencing factors contribute to the disparate values reported in the included studies and may introduce bias into our overall analysis. Therefore, when interpreting our results, it is crucial to consider the impact of this heterogeneity.

Meta-regression analyses further identified publication years ($p = 0.004$) and research area ($p = 0.001$) as significant predictors of heterogeneity, suggesting that more recent studies and studies from specific regions reported higher FoP rates. The results of the subgroup analysis showed that: (1) The incidence of FoP in East China (70%) was higher than that in Central China (55%) and North China (43%). This regional disparity may be driven by variations in healthcare accessibility and socioeconomic stressors. For instance, East China's rapid urbanization and competitive work environments may exacerbate psychological distress despite better medical infrastructure[35], whereas limited mental health resources in rural Central and North China could delay FoP diagnosis and intervention[36]. (2) For different types of stroke, the incidence of FoP in hemorrhagic stroke patients (72%) was significantly higher than that in ischemic stroke patients (45%), consistent with the findings of Wei Lirong[23]. This may be because the overall prognosis, sequelae, morbidity, and mortality are higher in hemorrhagic stroke patients, leading to lower quality of life and increased psychological distress[37-38]. (3) The incidence of FoP after 2020 (59%) was higher than before 2020 (40%), which could be related to the faster pace of modern life and greater mental stress.

Social and demographic factors are significant categories of influencing factors for FoP in stroke patients in China, including age, education level, economic income, and body mass index (BMI). (1) Age: The results of this study showed that age was a protective factor for FoP in stroke patients. This may be because elderly patients usually have rich life experience and most are in the stage of retirement and home care, which grants them stronger psychological tolerance to disease and lower fear of disease progression[39]. (2) Education level: The study indicates that a higher level of education is a protective factor for FoP in stroke patients. This is likely because patients with higher education levels have a stronger ability to comprehend disease-related information. After illness, they can independently acquire disease information through books, the internet, and other means, and can adopt more effective coping strategies when facing symptoms, thus avoiding excessive fear[40]. (3) Economic income: The results of this study showed that economic income was a protective factor for FoP in stroke patients. Stroke has a high morbidity rate, and most patients require long rehabilitation treatment cycles and significant economic support. Patients with low family income have limited medical expenditure, making it difficult to cope with sudden illness and its associated burdens, leading to poor psychological status and more serious fear of the disease[41]. (4) BMI: This study suggests that BMI is positively correlated with FoP in stroke patients. Patients with a higher BMI often have insufficient disease cognition or self-management ability[42], leading to a lack of confidence in self-control and management after the onset of the disease. Additionally, overweight and obesity can result in various abnormal health indicators, increasing the risk of stroke recurrence and aggravating patients' fear of disease progression. Although statistically significant (OR=1.22), the modest effect size indicates BMI should be

interpreted cautiously as a predictor of FoP, and clinical interventions should prioritize stronger risk factors. Therefore, clinical medical staff should focus on young patients, those with low education levels, low family income, and high BMI. Strengthening the assessment and screening of FoP in these patients, providing predictive nursing care, and offering personalized health education and psychological guidance according to patients' conditions can help improve their confidence in coping with the disease and reduce their fear of disease progression.

Disease-related factors, including illness perception, are a type of influencing factors of FoP in Chinese stroke patients. Illness perception refers to the process by which patients use previous knowledge and experience of the disease to analyze and explain current symptoms or disease, representing the patient's understanding, recognition, and emotional response to the disease[43]. This research shows that disease awareness and FoP in stroke patients are positively correlated, meaning the more negative the illness perception, the more severe the FoP. The reason may be that patients with high levels of negative illness perception lack correct understanding of disease-related knowledge and treatment, believe they cannot control disease progression, and this sense of losing control over their health contributes to the fear of the disease. Therefore, clinical medical staff should identify patients with high levels of negative illness perception as soon as possible and use acceptance and commitment therapy and cognitive behavioral therapy to intervene cognitively, correct misconceptions, establish accurate illness perception, and enhance patients' confidence in managing the disease to reduce their fear of disease progression.

Social psychological factors, including social support and family intimate, are major influencing factors for FoP in Chinese stroke patients. (1) Social support: This study showed that social support was a protective factor for FoP in stroke patients. The occurrence of stroke is a negative stress event for patients. During treatment and rehabilitation, patients are very eager to receive help and support from family, friends, and other sources. High levels of social support can provide patients with more favorable social resources and emotional care, alleviating their fear to some extent and helping them face life with optimism[44-45]. Conversely, low levels of social support can lead to pessimism in patients, which can exacerbate their fear of the disease and its progression. (2) Family intimacy: Family intimacy refers to the closeness, trust, understanding, and support between family members. This study shows that family intimacy is a protective factor for FoP in stroke patients. Good family intimate can provide adequate emotional support, help buffer the discomfort caused by stressful events, and encourage positive coping mechanisms, thus reducing psychological pressure and the fear of disease progression[46]. Therefore, clinical medical staff should actively mobilize patients' social support systems, encourage them to express their ideas, and seek support from various sources. In addition, caregivers should be encouraged to strengthen communication and care, improve family relationships and positive interactions, jointly cope with the challenges of the disease, and reduce patients' fear of disease progression.

Based on current clinical evidence, psychological interventions such as cognitive behavioral therapy[47] and mindfulness-based approaches[48] have demonstrated efficacy in reducing fear of progression in stroke patients. These interventions should be implemented within a multidisciplinary rehabilitation framework, with particular attention to cultural adaptation in the Chinese healthcare context.

However, several limitations of this study should be noted. First, there was significant h eterogeneity (I^2=98.7%) across the included studies. While subgroup analyses and meta-regr ession were conducted to explore potential sources of this heterogeneity, the high variabilit

y remains a concern and may limit the interpretability of the results. Second, the majority of the included studies were cross-sectional in design, which restricts the ability to establish causal relationships and may introduce recall and selection biases. Third, the quality of the studies varied, with many being of medium quality, which could impact the reliability of the findings. Despite screening the studies using the Agency for Healthcare Research and Quality (AHRQ) tool, the presence of lower-quality studies may undermine the robustness of the conclusions. Additionally, all studies were conducted in China, which may limit the generalizability of the findings to other countries or cultural contexts. These limitations should be carefully considered when interpreting the results of this meta-analysis. Future research should aim to improve study quality by incorporating longitudinal designs, addressing potential biases, and including more high-quality studies with diverse populations. Expanding research to include varied cultural and geographical settings will also help confirm the broader applicability of these results.

CONCLUSIONS

In conclusion, the incidence of FoP in Chinese stroke patients is 56%, indicating a high prevalence. Age, education level, economic income, body mass index, social support, illness perception, and family intimate are the main influencing factors of FoP in Chinese stroke patients. Clinical attention should be paid to the evaluation and screening of FoP in stroke patients, with a focus on key groups such as those with young age, low education level, low family income, high body mass index, and low social support. This approach will maximize the supportive role of family and society and reduce negative illness perceptions. Individualized health education and psychological guidance should be tailored to different groups, which is crucial for reducing the occurrence of FoP and improving patients' quality of life.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval No ethical approval was required.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

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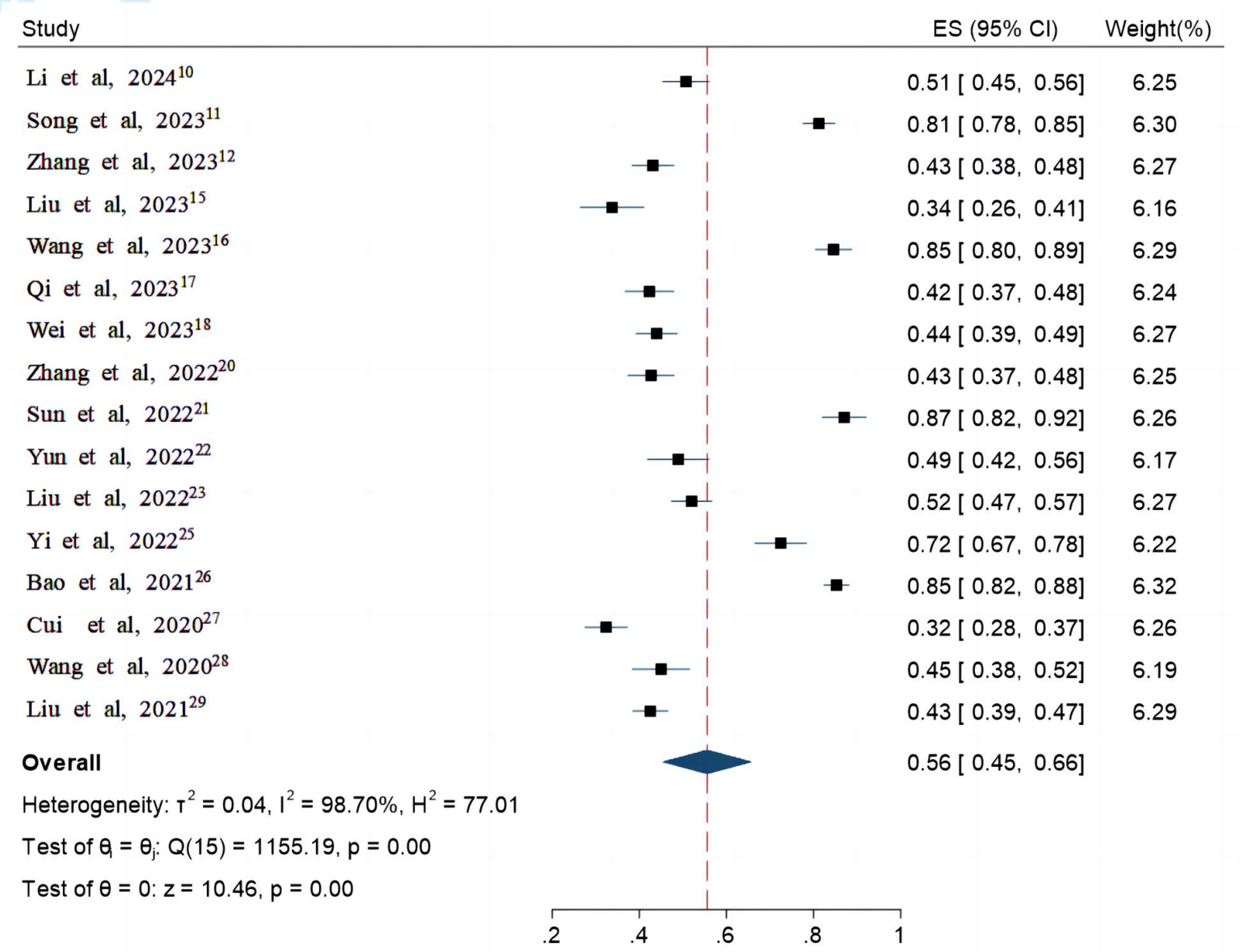
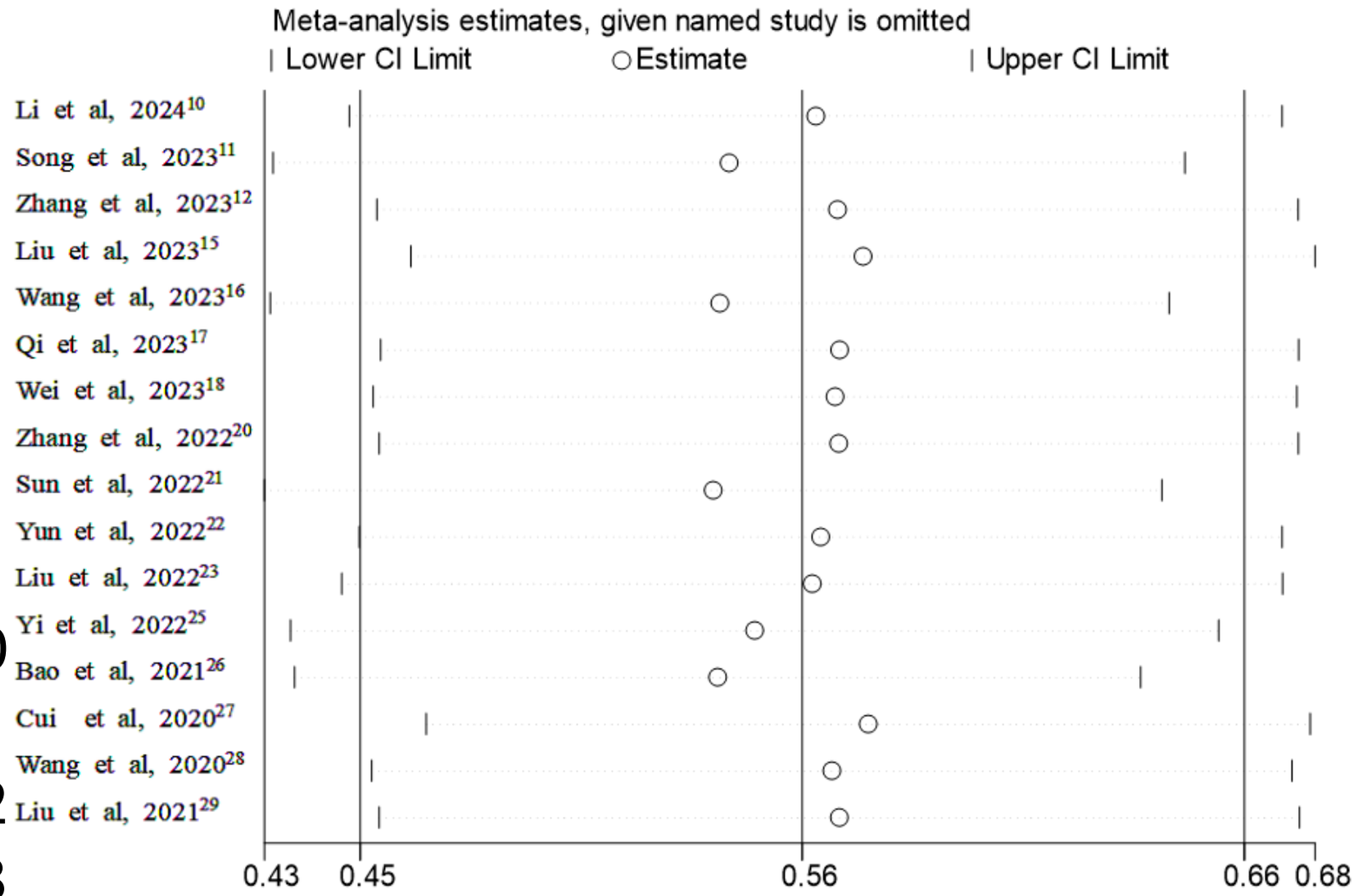
Figure 1 Forest plot of incidence of fear of disease progression in stroke in china

Figure 2 Sensitivity analysis of incidence of fear of disease progression in stroke in china





Supplementary Figure 1

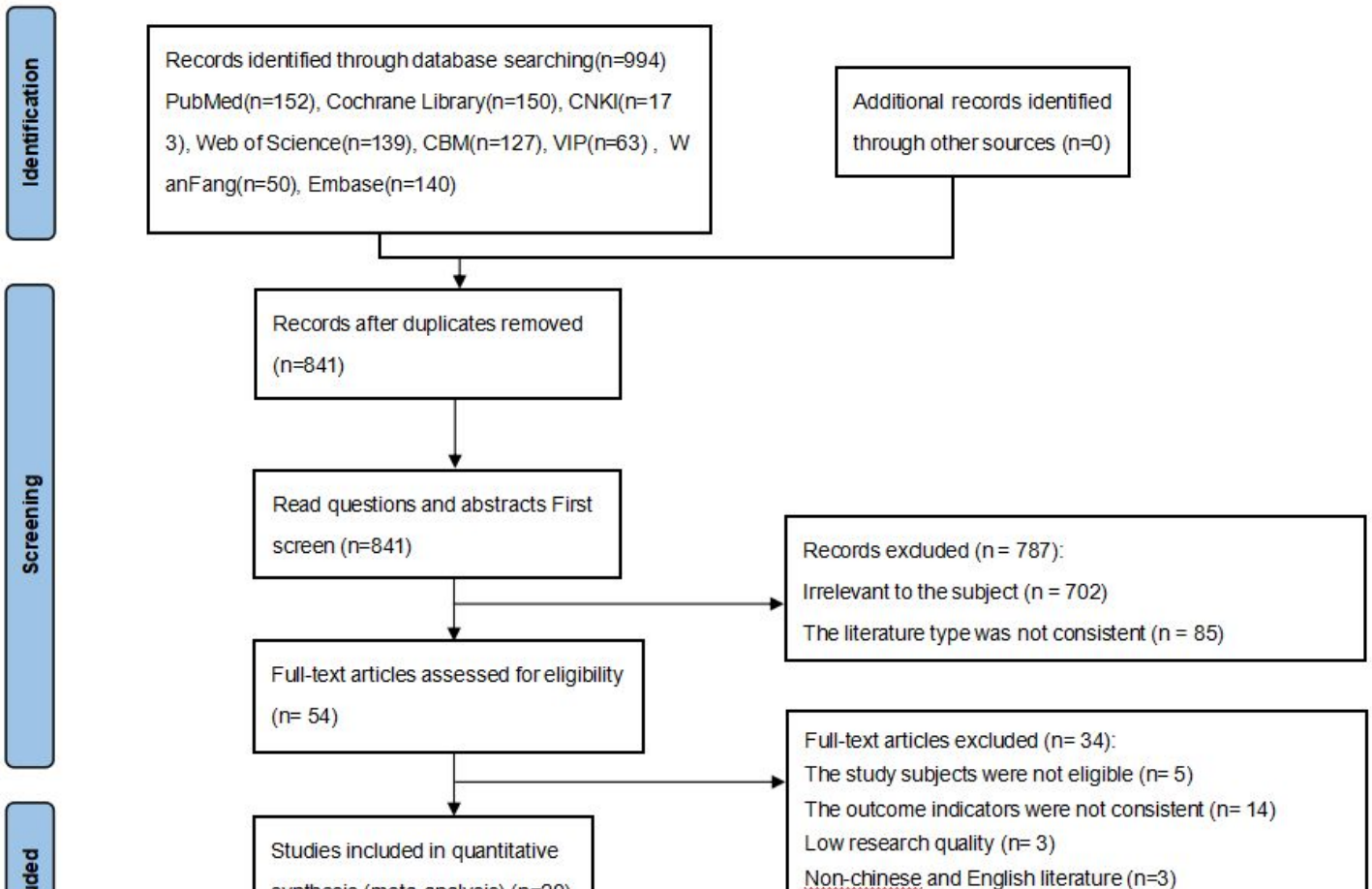


Figure 1 Flow diagram of study selection in the meta-analysis. FoP, fear of disease progression.

Supplementary Figure 2

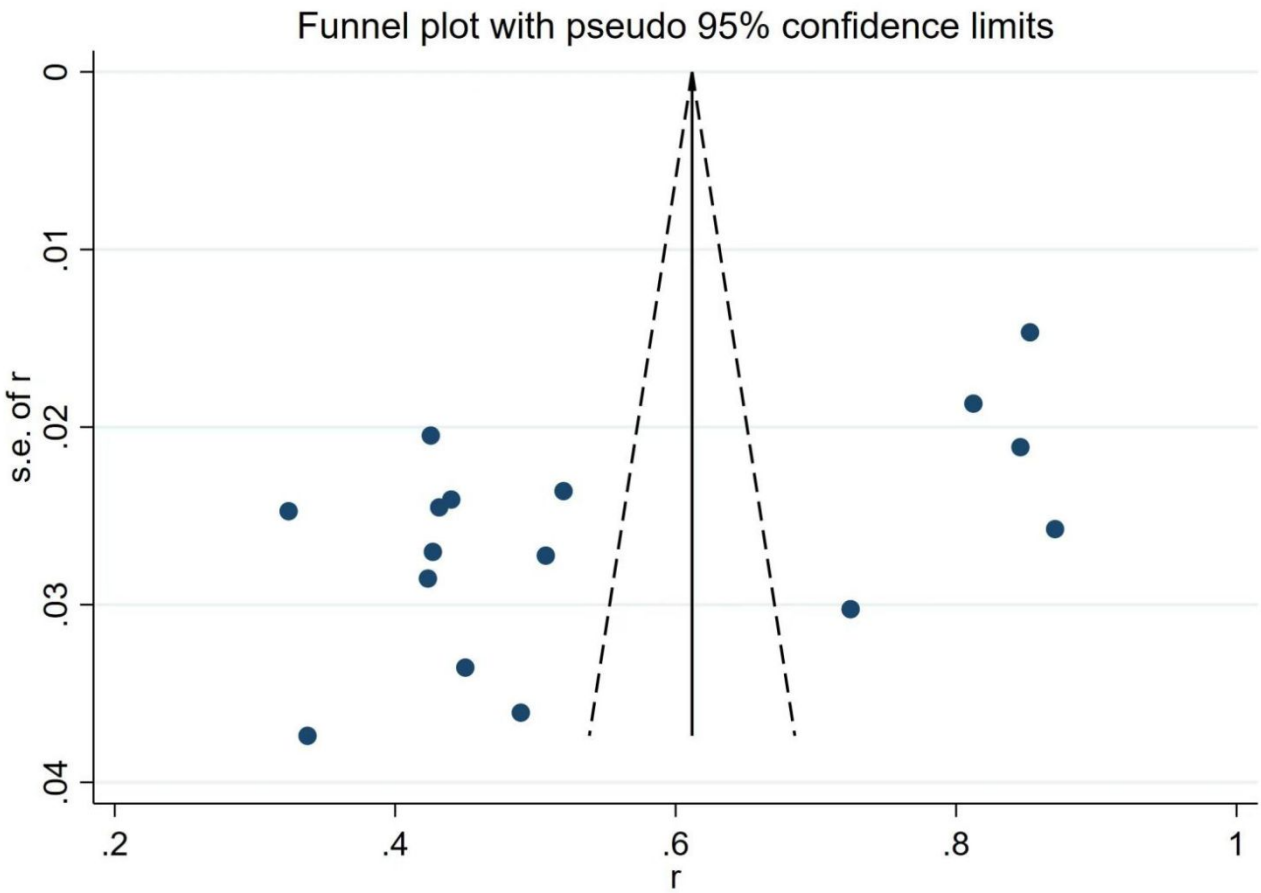


Figure 2 Funnel chart of FoP incidence.

Supplementary Table 1.

Search strategy used in Cochrane Library, Web of Science, Embase, PubMed, CBM, CNKI, Wanfang Data and VIP.

Search strategy used in Cochrane Library database.

1	MeSH descriptor: [Stroke] explode all trees
2	(stroke):ti,ab,kw OR (strokes):ti,ab,kw OR (apoplexy):ti,ab,kw OR (CVA):ti,ab,kw OR (cerebrovascular accident):ti,ab,kw
3	(poststroke):ti,ab,kw OR (cerebral infarction):ti,ab,kw OR (brain embolism):ti,ab,kw OR (brain hemorrhage):ti,ab,kw
4	#1 OR #2 OR #3
5	(anxiet*):ti,ab,kw OR (worr*):ti,ab,kw OR (afraid):ti,ab,kw OR (fear*):ti,ab,kw OR (concern):ti,ab,kw
6	(relapse):ti,ab,kw OR (recur*):ti,ab,kw OR (progress*):ti,ab,kw OR (return):ti,ab,kw
7	#4 AND #5 AND #6

Search strategy used in Web of Science database.

1	#1 TS=("stroke" OR "strokes" OR "apoplexy" OR "CVA" OR "cerebrovascular accident" OR "poststroke" OR "cerebral infarction" OR "brain embolism") #2 TS=("anxiet*" OR "worr*" OR "afraid" OR "fear*" OR "concern" OR "uncertainty") #3 TI=("relapse" OR "recur*" OR "progress*" OR "return") #4 #1 and #2 and #3

Search strategy used in EMBASE database.

1	'stroke'/exp
2	stroke:ab,ti OR strokes:ab,ti OR apoplexy:ab,ti OR 'CVA':ab,ti OR 'cerebrovascular accident':ab,ti OR poststroke:ab,ti OR 'cerebral infarction':ab,ti OR 'brain embolism':ab,ti OR 'brain hemorrhage':ab,ti
3	#1 OR #2
4	anxiet*:ab,ti OR worr*:ab,ti OR afraid:ab,ti OR fear*:ab,ti OR concern:ab,ti OR uncertainty:ab,ti
5	relapse:ab,ti OR recur*:ab,ti OR progress*:ab,ti OR return:ab,ti
6	'risk factor':ab,ti OR 'Risk factors':ab,ti OR factor:ab,ti OR 'influencing factor':ab,ti OR 'relevant factor':ab,ti OR 'contributing factor':ab,ti OR etiology:ab,ti OR 'disease rate':ab,ti OR prevalence:ab,ti
7	#3 AND #4 AND #5 AND #6

Search strategy used in Pubmed database.

1	"Stroke"[MeSH] OR "strokes"[Title/Abstract] OR "apoplexy"[Title/Abstract] OR "cerebrovascular accident"[Title/Abstract] OR "poststroke"[Title/Abstract] OR "cerebral infarction"[Title/Abstract] OR "brain embolism"[Title/Abstract] OR "brain hemorrhage"[Title/Abstract]
2	"anxiet*"[Title/Abstract] OR "worr*"[Title/Abstract] OR "afraid"[Title/Abstract] OR "fear*"[Title/Abstract] OR "concern"[Title/Abstract] OR "uncertainty"[Title/Abstract]
3	"relapse"[Title/Abstract] OR "recur*"[Title/Abstract] OR "progress*"[Title/Abstract] OR "return"[Title/Abstract]
4	"Incidence"[MeSH] OR "Prevalence"[MeSH] OR "frequency"[Title/Abstract] OR "occurrence"[Title/Abstract] OR "incidences"[Title/Abstract] OR "influence factor*"[Title/Abstract] OR "risk factor*"[Title/Abstract] OR "associated factor*"[Title/Abstract] OR "relevant factor*"[Title/Abstract]
5	#1 AND #2 AND #3 AND #4

Search strategy used in CBM database.

1	"Stroke"[MeSH] OR "strokes"[Title/Abstract] OR "apoplexy"[Title/Abstract] OR "cerebrovascular accident"[Title/Abstract] OR "poststroke"[Title/Abstract] OR "cerebral infarction"[Title/Abstract] OR "brain embolism"[Title/Abstract] OR "brain hemorrhage"[Title/Abstract]
2	"anxiet*"[Title/Abstract] OR "worr*"[Title/Abstract] OR "afraid"[Title/Abstract] OR "fear*"[Title/Abstract] OR "concern"[Title/Abstract] OR "uncertainty"[Title/Abstract]
3	"relapse"[Title/Abstract] OR "recur*"[Title/Abstract] OR "progress*"[Title/Abstract] OR "return"[Title/Abstract]
4	"Incidence"[MeSH] OR "Prevalence"[MeSH] OR "frequency"[Title/Abstract] OR "occurrence"[Title/Abstract] OR "incidences"[Title/Abstract] OR "influence factor*"[Title/Abstract] OR "risk factor*"[Title/Abstract] OR "associated factor*"[Title/Abstract] OR "relevant factor*"[Title/Abstract]
5	#1 AND #2 AND #3 AND #4

Search strategy used in CNKI database.

1	(主题: 中风) OR (主题: 脑卒中) OR (主题: 卒中) OR (主题: 脑梗死) OR 主题: 脑栓塞) OR (主题: 脑缺血) OR (主题: 脑血管意外) OR (主题: 脑血管病) OR (主题: 脑出血) OR (主题: 脑梗) AND (主题: 恐惧) OR (主题: 担忧) OR (主题: 不确定感) OR (主题: 担心)OR (主题: 害怕) AND (主题: 复发) OR (主题: 进展)

Search strategy used in Wanfang database.

1	主题：（中风 OR 脑卒中 OR 卒中 OR 脑梗死 OR 脑梗塞 OR 脑缺血 OR 脑血管意外 OR 脑血管病 OR 脑出血 OR 脑溢血 OR 脑梗 OR 脑血栓 OR 脑栓塞 OR 缺血性脑病）AND 主题：（恐惧 OR 担忧 OR 不确定感 OR 担心 OR 害怕）AND 主题：（复发 OR 进展）

Search strategy used in VIP database.

1	题名或关键词=中风 OR 脑卒中 OR 卒中 OR 脑梗死 OR 脑梗塞 OR 脑缺血 OR 脑血管意外 OR 脑血管病 OR 脑出血 OR 脑溢血 OR 脑梗 OR 脑血栓 OR 脑栓塞 OR 缺血性脑病 AND 题名或关键词=恐惧 OR 担忧 OR 不确定感 OR 担心 OR 害怕 AND 题名或关键词=复发 OR 进展