

The Prevalence of Mild Cognitive Impairment Among the Elderly Population based on Spatio-temporal Data in the Yangtze River Delta Region of China

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Abstract

Background: With the development of China's economy, China's aging process has accelerated. The prevalence of mild cognitive impairment (MCI) in the elderly population showed a gradual increase. The Yangtze River Delta Economic Belt plays a very important role in China's economic development. China's seventh national census data show that the aging degree in the Yangtze River Delta is higher than the national average, and the dependency ratio of the elderly population in the Yangtze River Delta also presents the same characteristics. little is known about the prevalence of MCI in the Yangtze River Delta in recent years. It is necessary to summarize and analyze the prevalence and distribution of mild cognitive impairment in the elderly population in the Yangtze River Delta in the past 10 years. This can provide data support for formulating elderly care service policies and is of great significance for promoting healthy aging in China.

Methods: By searching the Chinese and English databases to obtain the original research literature on the prevalence of MCI in the elderly population in China. Select the study about the Yangtze River Delta population. Extract relevant data on prevalence in the literature. According to the results of the heterogeneity test, a random-effect model was adopted to estimate the prevalence of MCI, followed by subgroup analyses and meta-regression.

Results: A total of 18 articles were included in this study with a total sample size of 33042. In the past decade, the overall prevalence of MCI in the elderly population in the Yangtze River Delta was 18% (95% CI: 15-22%). Spatial distribution results: the prevalence difference between regions was (16%-23%). In the past 10 years, the prevalence of MCI has increased first and then decreased. Analyzed the demographic characteristics, the prevalence of women, low education, old age, rural areas, and no spouse groups was relatively higher.

Conclusions: The prevalence of MCI in the Yangtze River Delta region was lower than the national average. There were differences between different regions. Besides, age, gender, and education level were all important factors affecting the prevalence of MCI.

Background

The rapid development of China's social economy has led to an increase in the average life expectancy, a sharp rise in the proportion of the elderly population, and the acceleration of the population's aging process. The seventh national census data of China shows that, as of 2020, there were nearly 264 million people aged 60 and over in China, and the dependency ratio of the elderly population reaches 18.7%. It was estimated that this figure would reach 28.4% by 2035 [1]. With the aging of the population intensifying, the prevalence of mild cognitive impairment (MCI) in China was increasing year by year [2], and the cognitive impairment of the elderly would progress to Alzheimer's in different degrees [3, 4]. Research predicts that by 2030, the Chinese population with dementia will reach 23.3 million. The total

cost of dementia will reach \$114.2 billion in 2030 [5], which will bring a heavy burden to both families and society.

China has a vast territory, and many factors will lead to differences in the distribution of the prevalence of MCI in the elderly, including diet, environment, climate, culture, economy, genetics, etc. The Yangtze River Delta is located in the eastern coastal area of China. It is the most economically developed area in China and the main engine of China's economy from high speed to high quality. The Yangtze River Delta region includes Shanghai, Jiangsu Province, Zhejiang Province, and Anhui. The total population of the Yangtze River Delta was close to 216 million people, accounting for 16.65% of the total population of the country, but the proportion of people over 60 years old can reach 22.19%, which was higher than the national average level of aging(18.7%). The aging degree in the Yangtze River Delta is even more serious. Exploring the development trend and distribution of the prevalence of MCI in the elderly in the Yangtze River Delta will provide data support for the prevention and treatment of cognitive impairment in China, which is of great significance to promoting healthy aging and the plan of “Healthy China 2030” in China.

Methods

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol, which delineates a four-phase flow diagram and a 27-item checklist (www.prisma-statement.org).

Search strategy

The literature on the prevalence of MCI among the elderly in the Yangtze River Delta has been published in domestic and foreign journals, screen out research with scientific, rigorous, accurate, and reliable design schemes. Studies published in Chinese journals were identified by using China Biology Medicine Disc (CBMD), CQVIP, CNKI, Wanfang electronic database. Those reported in English were examined by searching PubMed. All of the databases were searched from January 1, 2011, to January 1, 2021, using a combination of the following searching terms: (“mild cognitive impairment” or “cognitive dysfunction” or “early dementia”) and (“epidemiology” or “prevalence”) and (“old” or “elderly) and (“Chinese” or “China”). Hand searches were also performed to identify related papers through reference lists of the identified studies. Take PubMed as an example, the specific retrieval strategies were shown in Table 1. Then all researchers screened out articles in the Yangtze River Delta region by reading abstracts and topics.

Table 1

Search strategy in PubMed

Step	Search strategy
#1	prevalence OR (epidemi*)
#2	cognitive dysfunction OR cognitive impairment OR mild cognitive impairment OR MCI
#3	old OR elderly
#4	China OR Chinese
#5	#1 AND #2 AND #3 AND #4

Inclusion and exclusion criteria

Inclusion criteria (1) The research object is the elderly who live for a long time in Zhejiang Province, China; (2) The age is greater than or equal to 60 years of age; (3) The research design is a random sampling survey; (4) Simple mental status check is used The survey population was screened by tools such as the Hasegawa Dementia Scale (HDS) or the Montreal Cognitive Assessment Scale (MoCA); the diagnostic criteria include the National Institute of Aging and Alzheimer's Association (National Institute on Aging-Alzheimer's Association, NIA-AA) diagnostic criteria, diagnostic and statistical manual of mental disorders (diagnostic and statistical manual of mental disorders, DSM) diagnostic criteria and Petersen criteria, etc.; (5) Published in January 2011 ~ January 2021; (6) Original research.

Exclusion criteria (1) The research design plan was not clear, (2) The population was a specific group, such as the physical examination population, veteran officials, older people in orphanages, etc., (3) Secondary cognitive impairment such as surgery and accidents; (4) The original research data was incomplete; (5) The research is published repeatedly, or the actual data was identical.

Assessment of risk of bias and quality of evidence

We selected two researchers who are familiar with scientific research statistical methods and have the English reading ability in the field of study. We screened research literature initially independently by reading the titles and abstracts for the first time. Then got the full text from the database and read the full text to evaluate the research quality. We resolved any disputes between inclusion and exclusion through discussion in the research team.

This study's quality evaluation criteria mainly include the representativeness of the surveyed population, the study's total sample size, whether random sampling, response rate, screening and diagnosis tools, and data extractability. The data information extracted from the literature includes (1) Basic information: author, publication time, research start and end time (or research start time), research area, design type, screening standard, response rate; (2) Outcome indicators: The total sample size and prevalence of the study, as well as the sample size and prevalence related to gender, age, marriage, and place of residence.

Data extraction and analysis

We used Office Excel to calculate the prevalence P (Formula 1) and its standard error SE (Formula 2) according to the following formula [6]. X is the number of patients, n is the sample size.

$$\text{Formula 1: } P = \frac{X}{n} \quad \text{Formula 2: } SE = \sqrt{\frac{P(1-P)}{n}}$$

All statistical analyses were performed using Stata MP 16 software (Stata Corp, College Station, TX, USA). We also reported 95% confidence intervals for the results. Selecting the random or fixed effect model to merge the data based on heterogeneity test and Egger's publication bias results. The heterogeneity test results between the studies were represented by I^2 , its values of 25, 50 and 75% correspond to low, moderate and high. We chose a random effect model for meta-analyses in our study. Using IBM SPSS 23 software to perform the chi-square test. A two-sided $p < 0.05$ was considered statistically significant.

Results

Literature search results

After rechecking, preliminary screening, and full-text screening, a total of 18 pieces of literature were included [7-24]. The specific inclusion process was shown in Figure 1.

Basic information of the literature

The 18 eligible studies involved 33042 study participants, they were all randomly sampled original studies in the Yangtze River Delta. All of the studies restricted participants from the age of over 60 years and 83% of the included studies had a sample size of over 1000 participants. All survey respondents have received training and used face-to-face standardized questionnaire surveys. The basic information of the studies was shown in Table 2.

Table 2

Basic information of the studies

Author, year published	Location	Random sample	Screen	Diagnose	≥60years	Population	Prevalence
Wang et al.2017 ^[7]	Shanghai	Y	Y	Y	Y	1005	22.30%
Huo et al.2020 ^[8]	Shanghai	Y	Y	Y	Y	885	18.76%
Ding et al.,2015 ^[9]	Shanghai	Y	Y	Y	Y	2985	20.10%
Zhang et al.,2018 ^[10]	Shanghai	Y	Y	Y	Y	1033	41.63%
Qin et al.,2014 ^[11]	Shanghai	Y	Y	Y	Y	4086	14.98%
Wu et al.,2017 ^[12]	Jiangsu	Y	Y	Y	Y	1846	17.17%
Zhang et al.,2011 ^[13]	Jiangsu	Y	Y	Y	Y	5388	12.80%
Zhu et al.,2013 ^[14]	Zhejiang	Y	Y	N	Y	1211	20.70%
He et al.,2013 ^[15]	Zhejiang	Y	Y	N	Y	1393	15.94%
Zhou et al.,2011 ^[16]	Zhejiang	Y	Y	Y	Y	1227	8.72%
Pan et al.,2020 ^[17]	Zhejiang	Y	Y	Y	Y	1012	21.10%
Pan et al.,2012 ^[18]	Zhejiang	Y	Y	Y	Y	897	17.20%
Zhu et al.,2018 ^[19]	Zhejiang	Y	Y	N	Y	1569	7.71%
Zhong et al.,2018 ^[20]	Zhejiang	Y	Y	Y	Y	1801	6.77%
Zhang et al.,2014 ^[21]	Zhejiang	Y	Y	Y	Y	1277	35.32%
Zhu et al.,2019 ^[2]	Zhejiang	Y	Y	Y	Y	4109	13.09%
Wang et	Zhejiang	Y	Y	Y	Y	313	25.24%

al.,2018 ^[23]							
Liu et al.,2018 ^[24]	Anhui	Y	Y	Y	Y	1005	15.62%

Publication bias

Publication bias of the included studies was assessed through Egger's. Visual symmetry of the plots (Fig. 2) and a p value($p=0.254$ $p>0.05$) indicate an absence of publication bias.

The overall prevalence of mild cognitive impairment in the elderly

Based on the crude prevalence of MCI in the elderly provided by 18 studies, the combined analysis was carried out. After the heterogeneity test, high levels of heterogeneity were found ($I^2 = 98\%$) across the 18 included studies, so the random-effects model was used to combine the data of these researches. The results showed that the prevalence of MCI was 18% (95% CI:15-22%) among Chinese people aged 60 and above in the Yangtze River Delta, as shown in Fig. 3.

Results of the spatial distribution of mild cognitive impairment in the elderly

Table 3 shows regional distribution characteristics: In the Yangtze River Delta of China, Shanghai has the highest prevalence of MCI, the prevalence of MCI in Jiangsu province was the lowest. There was a statistically significant difference in the prevalence of MCI between regions ($\chi^2=268.531$, $P<0.0001$). There was no statistically significant difference in the prevalence between Zhejiang province and Anhui province. The difference in prevalence among the remaining groups was statistically significant. Between regional subgroups, using the post-calibration inspection level $\alpha=0.008$. Table 4 reflects the seventh census data of the Yangtze River Delta in China. The data shows that the mean proportion of the elderly over 60 years of age in the Yangtze River Delta is higher than the national average (18.7%), and the aging of Shanghai is the most serious with the proportion of 23.38% among elderly people over 60 years old.

Table 3

Regional prevalence of MCI in the elderly

Regions	Numbers of MCI	Total sample	Prevalence[95%CI]	Chi-Square[P]
Shanghai	2032	9994	23%[0.17, 0.30] ^a	268.531[0.000]
Jiangsu	1007	7234	15%[0.11, 0.19] ^b	
Zhejiang	2259	14809	17%[0.13, 0.22] ^c	
Anhui	157	1005	16%[0.13, 0.18] ^c	
Merge	5455	33042	18%[0.15, 0.22]	

Note: The upper right footnote indicates the difference between the groups. The same means that the difference between the two groups was not statistically significant, and the difference shows that the difference between the two groups was statistically significant. The calibration test level was used.

Table 4

Proportion of total population and elderly in the Yangtze River Delta

Regions	Total population*	≥60 years (%)*	≥65 years(%)*	MCI[95%CI]
Shanghai	24870895	23.38%	16.28%	23%[0.17, 0.30] ^a
Jiangsu	84748016	21.84%	16.20%	15%[0.11, 0.19] ^b
Zhejiang	64567588	18.70%	13.27%	17%[0.13, 0.22] ^c
Anhui	61027171	18.79%	15.01%	16%[0.13, 0.18] ^c
Merge	215726585	22.19%	16.49%	18%[0.15, 0.22]
*Data from China's seventh census				

Time distribution of the prevalence of cognitive impairment in the past ten years

The time interval was 10 years from 2011 to 2020 of the 18 studies, analyzing the prevalence time trend every two years. Figure 4 shows the trend of the prevalence of MCI among the elderly in the Yangtze River Delta over the past ten years. In 2011-2012, the pooled prevalence rate was the lowest [13% (95%CI:9-17%)]. In 2013-2014, the pooled prevalence rate was the highest [22% (95%CI:14-29%)], since then the prevalence has gradually declined slightly. But, the overall trend was increasing in general between 2011-2020.

Demographic distribution of the prevalence of MCI

Table 5 shows the demographic distribution of the prevalence of MCI in the elderly population in the Yangtze River Delta. The pooled prevalence rate of MCI among older men was 14% (95%CI: 11-17%), the pooled prevalence rate for women was 19% (95%CI: 15-22%). Women had a higher prevalence of MCI than men. ($\chi^2=112.894$, $P<0.0001$).

The prevalence of MCI increased with age: 11% (95%CI: 9-14%) for 60-69 years old; 20% (95%CI: 16-24%) for 70-79 years; 80 years and older was 34% (95%CI: 26-43%). The Chi-square test result of the age group was $\chi^2=980.045$ ($P<0.0001$), the prevalence difference has statistically significant. The difference was also statistically significant between the age subgroups (test level $\alpha=0.016$).

The prevalence rate decreased with the increase of education level. The prevalence rate of illiteracy (years of education <1 year) was 32%, while the prevalence rate of the university group (years of education >12 years) dropped to 8%. The chi-square test result was $\chi^2=1157.760$ ($P<0.0001$) between the education subgroups, the difference was also statistically significant (test level $\alpha=0.005$). The prevalence rate in rural areas [20% (95%CI: 19-22%)] was higher than that in urban areas [15% (95%CI: 11-19%)]. The prevalence of the elderly population without a spouse [24% (95%CI: 18-31%)] was higher than that of the elderly population with a spouse [14% (95% CI: 11-17%)].

Table 5

Demographic characteristics of the prevalence of MCI in the elderly population

Subgroup	MCI	Total	Prevalence (95%CI)	Chi-Square	P-Value
Gender					
Male	1914	11258	14% (0.11, 0.17)	112.894	0.000
Female	2728	14358	19% (0.15, 0.22)		
Age, years					
60-69	1405	12770	11% (0.09, 0.14) ^a	980.045	0.000
70-79	1809	9044	20% (0.16, 0.24) ^b		
≥80	990	2911	34% (0.26, 0.43) ^c		
Education, years					
<1	1323	5016	32% (0.23, 0.41) ^a	1157.760	0.000
1-6	911	6965	19% (0.14, 0.24) ^b		
7-9	305	7591	12% (0.09, 0.15) ^c		
10-12	173	3046	10% (0.06, 0.14) ^d		
>12	1323	2164	8% (0.04, 0.12) ^d		
Residence location					
Rural	627	3135	20% (0.19, 0.22)	42.07	0.000
Urban	1303	8684	15% (0.11, 0.19)		
Spouse					
Yes	1286	9187	14% (0.11, 0.17)	137.347	0.000
No	554	2308	24% (0.18, 0.31)		
<p>Note: The upper right footnote in the table indicates the difference between the groups. The same means that the difference between the two groups was not statistically significant, and the difference shows that the difference between the two groups was statistically significant. The calibration test level was used.</p>					

Discussion

The medical imaging and pathological changes of MCI are very similar to the early stage of Alzheimer's [25,26]. Some studies believed that MCI was the transitional stage of dementia and the basis for the occurrence of dementia. At present, disease-modifying drugs are not available and symptomatic medications have been found to have only modest benefit. Primary prevention of dementia is therefore of great importance. Mild cognitive impairment (MCI) is an intermediate state between normal cognitive

aging and dementia. Identification of MCI is thought to be crucial to early intervention. Indeed, MCI is associated with an increased risk of dementia, as well as with future disability and mortality in some studies[27].

It is a crucial intervention stage to delay senile dementia, and MCI has become an important research topic worldwide. Studies by Brodaty H et al. found that about 30% of MCI patients diagnosed by Petersen criteria progressed to dementia within 3 three years [28]. Early screening of cognitive impairment in the elderly is helpful for early prevention and intervention and can delay the occurrence of Alzheimer's to a large extent [29].

The overall prevalence of MCI

A total of 18 studies were included this time, and the total number of studies was 33042 and the combined prevalence rate of MCI was 18%. The prevalence rate of MCI in the Yangtze River Delta was lower than the national average (20.8%) calculated by the Jianping Jia team[30]. First, the lack of homogeneity in the prevalence of MCI is partially due to the differences in the diagnostic criteria and the heterogeneity of the population in China. The Yangtze River Delta locates on the southeast coast of China, with a relatively developed economy, a warm and humid climate, good public health policies, and generally high health literacy among the elderly. These factors would also lead to a low prevalence of cognitive impairment in the elderly. Secondly, cultural and traditional diversity could also explain the differences between these results and those found in previous studies in China. As we all known, a positive relationship between Mediterranean diet (MeDi) adherence and reduced risk for cognitive decline or dementia has been demonstrated by most cross-sectional and prospective epidemiological studies[31]. The Jiangnan diet is very similar to the Mediterranean diet and is a healthy diet suitable for Chinese people, which the native inhabitants in the Yangtze River Delta region have eaten for several hundreds of years[32]. Besides, people in the Yangtze River Delta generally have the habit of drinking tea [33]. Experiments and animal studies have shown that catechins can promote neural progenitor cells' proliferation, improve spatial cognitive learning ability, and reduce amyloid-mediated cognitive impairment [34,35].

Differences in the spatial distribution

There were also considerable differences in the prevalence of MCI between the regions in the Yangtze River Delta. Generally speaking, the prevalence of MCI in Shanghai [23% (95% CI:17- 30)] was higher than that in other regions. Several factors likely underlie the high prevalence of MCI in Shanghai. According to the seventh national census data, Shanghai's elderly accounted for 23.38% of the population, making it the most aging area in the Yangtze River Delta. Secondly, the area of Shanghai is smaller than other provinces. The difference is small between factors (diet, education, culture, etc.) that affect the prevalence of MCI. The data deviation between the studies was small, which eliminates the influence of extreme data on the combined prevalence. Third, compared with Shanghai, Zhejiang and Anhui have a

lower proportion of the elderly population (18.70%, 18.79%), and the prevalence of MCI in the elderly population is lower than that of Shanghai correspondingly.

Time distribution of the prevalence

By analyzing the development trend of the prevalence of MCI in the elderly in the Yangtze River Delta over the past ten years, we found that the prevalence rate has shown an increasing trend over time, reaching the highest in 2013-2014, and the data dropped slightly since then. Does this fall have any significance? Furthermore, research was needed. The trend of the prevalence of MCI in the elderly with time in this study was consistent with the reports of Emma F and Xue J et al. [36,37]. However, other studies have shown that in many high-income countries, including the United States, the risk of cognitive impairment in later life was declining. For example, Jo Mhairi Hale et al. found that the prevalence of MCI in the elderly showed a downward trend under models that only considered gender, age, and race [38]. The possible reason was related to the improvement of the test score for the subjects who received repeated measurements. Similarly, Kenneth M et al. found that from 1993 to 2002, the prevalence of cognitive impairment in the elderly in the United States dropped from 12.2% to 8.7%, an absolute drop of 3.5% [39]. Given the development trend of the prevalence of MCI in the elderly in the Yangtze River Delta, long-term investigation and more researches are needed. In addition to the prevalence, we should also pay more attention to the incidence for it will reflect the fact of MCI of the elderly in current.

Educational level and prevalence of MCI

In terms of education level and prevalence of MCI in the elderly, the present study revealed a steep increase in the MCI prevalence as the educational level declined. We found that the prevalence difference between the illiterate group and other groups was statistically significant. Most studies also have shown that the lower the level of education, the higher the prevalence of MCI. Leggett A et al. proved that those who have received university education maintain a high level of cognitive function throughout their lives, and the incidence of cognitive dysfunction only increases rapidly after the age of 80 [40]. The higher the level of education, the more developed the knowledge reserve and the brain's cognitive network, and the higher the health information literacy. A 10-year longitudinal, multicenter, prospective cohort study in Korea showed that low Cognitive Reserve (CR) increased the risk of post-stroke cognitive impairment. The level of education, occupation and CR scores all alleviated the slope of the cognitive impairment curve: the higher the level of education, the higher the vocational or composite CR score, the faster the recovery[41]. It is suggested that higher education can minimize the decline of long-term cognitive ability, especially in elderly patients. Therefore, increasing people's educational opportunities or mental activities is an important strategy to reduce the risk of cognitive dysfunction in later life.

Gender and Prevalence of MCI

In terms of gender and the prevalence of MCI in the elderly, most studies currently show that women's prevalence was higher than that of men, suggesting that women may be a risk factor for cognitive impairment. As mentioned above, considering the relationship between education level and the prevalence of cognitive impairment, the possible reason for the higher prevalence of women than men may be related to the fact that women's education level was generally lower than that of men. Based on the current research on the elderly, their birth date was before 1960, which was in the early days of China's liberation. Under the socio-economic conditions at that time, women's education level was generally lower than that of men, and their knowledge reserves and health knowledge literacy were lower than men's. So the prevalence of cognitive impairment in older women was higher than that in men.

In 1986, China began to implement nine-year compulsory education. Since then, the level of female education has gradually improved. According to data from the National Bureau of Statistics, as of 2019, there were 18.82 million female students in high school education, accounting for 47.1% of all students. The gender gap in education has been eliminated. With the improvement of women's education level, the prevalence of cognitive impairment in Chinese older women will decline, but further empirical research is still needed.

Age and Prevalence of MCI

All included studies found that the prevalence of MCI increased with age. After comprehensive prevalence, we found that the prevalence of MCI of people over 80 years old was statistically different from that of the 60-69 years old group and the 70-79 years old group. Highly consistent with the results of various studies at home and abroad, advanced age was a risk factor for cognitive impairment in the elderly [42-44]. First, The gray matter atrophy of the prefrontal cortex of the medial brain increases with age, and these areas are related to cognitive function associated with impaired long-term memory retention in older adults [45]. Secondly, brain tissue atrophy related to cognition has also changed the sleep patterns of the elderly, and the reduction in the proportion of slow-wave sleep further promotes the impairment of memory function [46]. Also, as the age increases, various organs and tissues of the elderly have undergone degeneration, which indirectly leads to cognitive impairment. Nowadays, due to a lack of an effective treatment regimen, lots of evidence shows that early intervention measures are considered to be the most cost-effective way for managing dementia [47]. It is necessary to study and formulate effective comprehensive intervention measures for the elderly to delay this change's occurrence and development as much as possible.

Other factors and prevalence of MCI

This study also compared the relationship between the prevalence of MCI in rural and urban elderly. We found a higher prevalence of MCI in the rural than in the urban population. First, The

less-advanced conditions (the income, living conditions, education level, social and health rights enjoyed by most rural residents, and low-skill occupations) in rural areas may explain the high prevalence of MCI. Besides, with the increase of young and middle-aged rural adults leaving their hometown for work, the number of “empty nester” elderly in rural areas has gradually increased. These older people have long been in loneliness and social isolation which also exacerbated the decline in cognitive function of rural elderly to a certain extent. The higher MCI prevalence in rural than in urban areas indicates that special attention must be given to implementing new strategies for these areas. At the same time, we found that the prevalence of MCI in the elderly without a spouse (including unmarried, widowed, divorced, and separated elderly) was higher than that of the elderly with a spouse. This may be related to the long-term lack of communication in the elderly, leading to emotional anxiety and depression [48-50].

More and more evidence indicated that lifestyle changes and early treatment of cardiovascular risk factors might lead to delayed cognitive decline [51]. With our society’s progress, improving people’s living conditions, education, and medical conditions has positively impacted people’s physical, mental, and cognitive health. These effects will reduce the difference in prevalence caused by regions and education, which may reduce the overall prevalence of MCI in the elderly population in China. The sample size included in this study was large enough to cover most of China’s provinces. To a certain extent, it can reflect the development trend and distribution of the prevalence of MCI in China.

Limitations

Our research still has certain limitations. First of all, the included studies were mainly regional, lack of the study which samples covered the entire Yangtze River Delta region. Therefore, the pooled prevalence will still have a certain deviation from the actual situation. Secondly, there was a lack of data in some cities, especially in underdeveloped regions, because regional economic levels would impact the prevalence, reducing the reliability of the results. Finally, MCI was further categorized by imaging into MCI caused by prodromal Alzheimer’s disease (MCI-A), MCI resulting from cerebrovascular disease (MCI-CVD), MCI with vascular risk factors (MCI-VRF), and MCI caused by other diseases (MCI-O). This study did not reflect the differences between various types of cognitive impairment, and we will continue future studies. Accordingly, we will carry out a large-scale epidemiological survey in the Yangtze River Delta region to accurately assess the prevalence of MCI and subtypes in the Yangtze River Delta region.

In summary, the prevalence of MCI among the elderly population in the Yangtze River Delta was relatively high, and there were differences in the prevalence of MCI among the elderly in different regions, genders, ages, and education levels. The following research on cognitive impairment in the elderly should focus on: The following research directions: (1) For areas not covered by the study, we must strengthen the screening of elderly cognitive impairment and policy attention; (2) Research and formulate unified and reliable standards for the diagnosis of various types of cognitive impairment; (3) Screen high-risk populations from mild cognitive impairment to dementia, and improve the pertinence of prevention and intervention; (4) Formulate relevant public health policies, and accelerate the establishment of a

socialized service system for the elderly with cognitive impairment, such as a comprehensive intervention system with a three-level linkage between “family -community-hospital”; (5) Increase efforts to train high-level home care service personnel to make up for the lack of care resources caused by changes in family structure.

Declarations

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None

Authors' contributions

LPS performed data analysis work and wrote the manuscript. HPQ, MZ edited the manuscript. WW designed the study. All authors read and approved the final manuscript.

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Availability of data and materials

All data generated and analyzed during this study are included in this manuscript and the supporting file.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare there are no conflicts of interest for this study.

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Figures

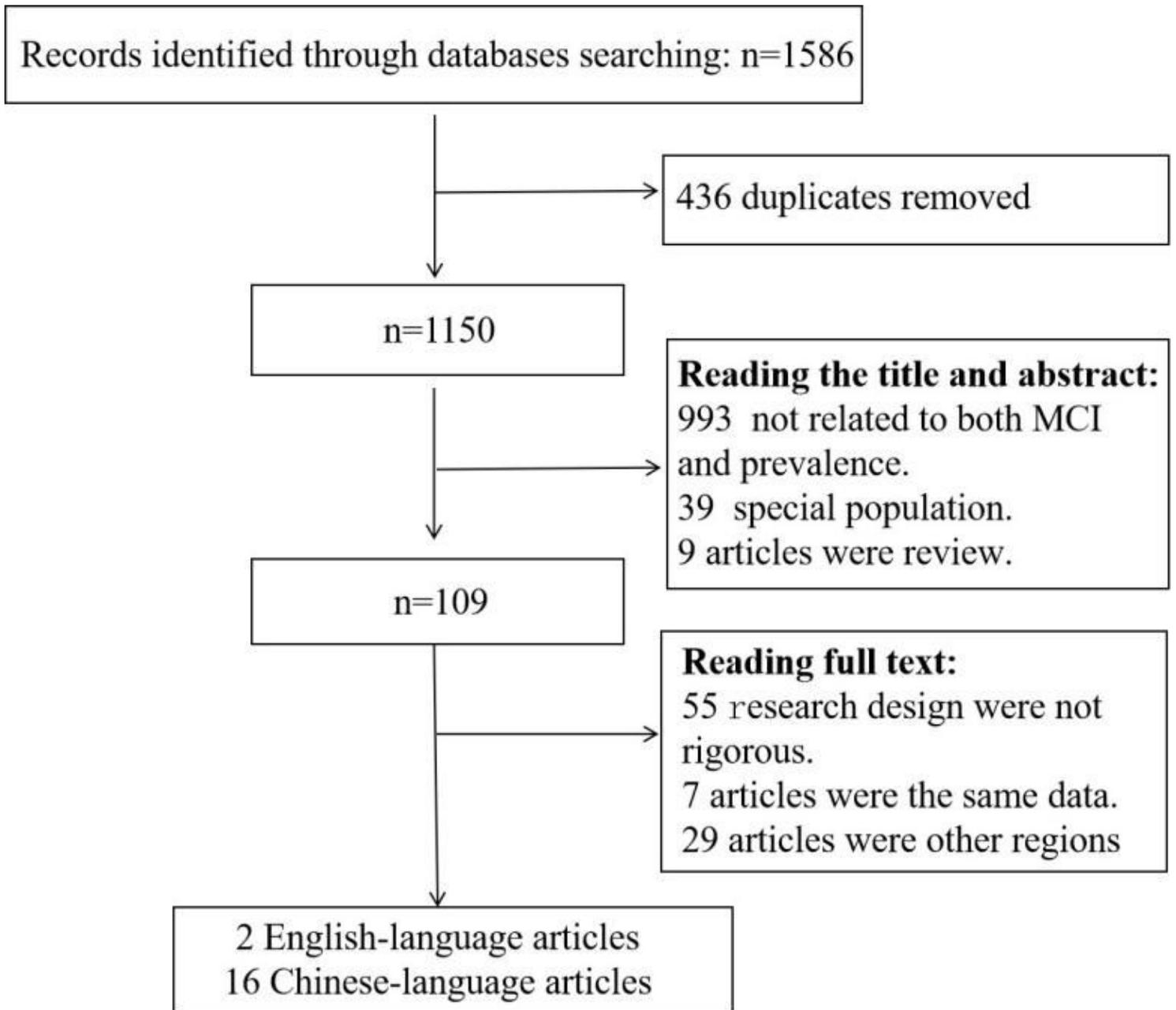


Figure 1

Flow chart of literature screening

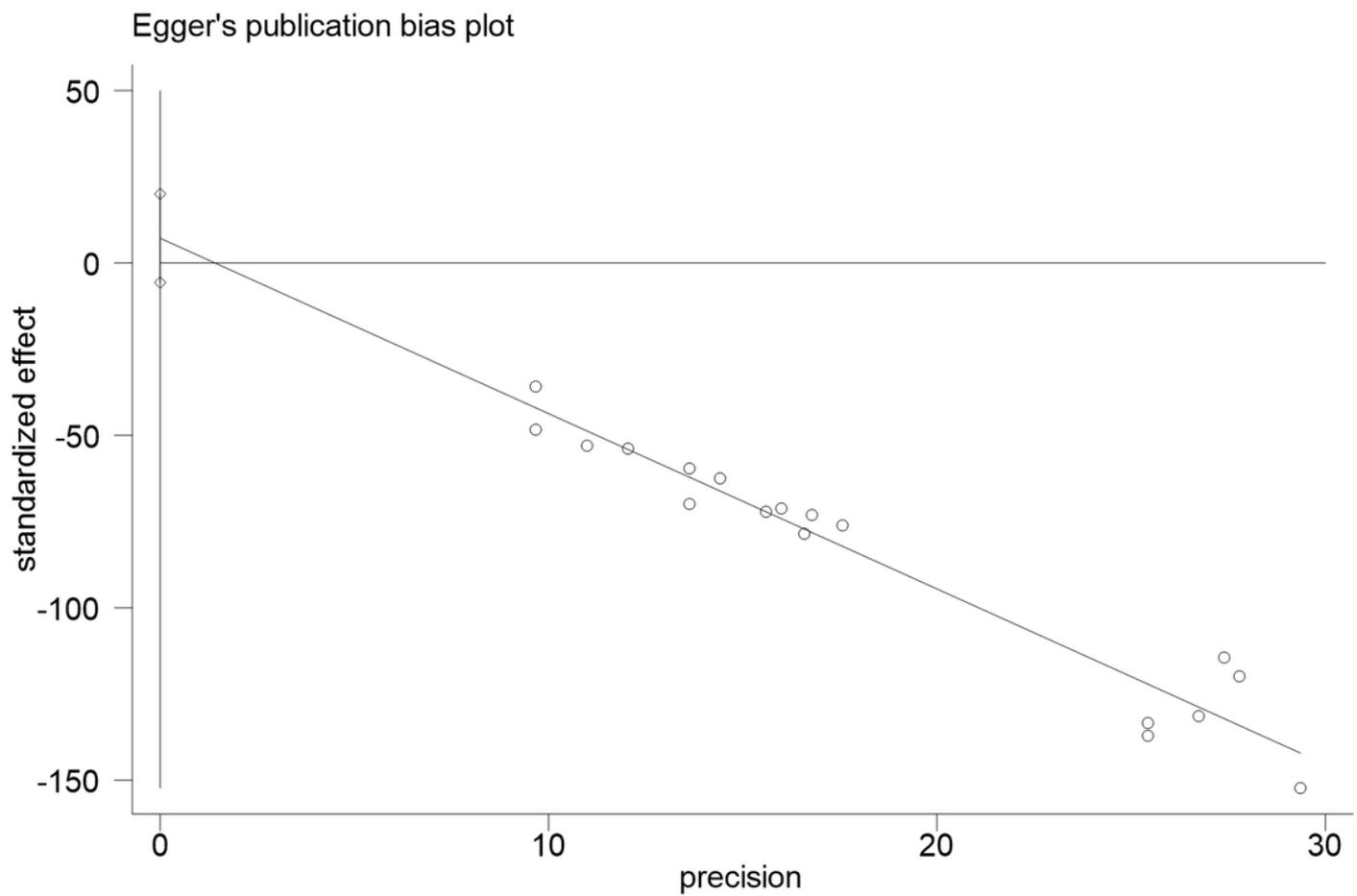


Figure 2

Egger's publication bias plot

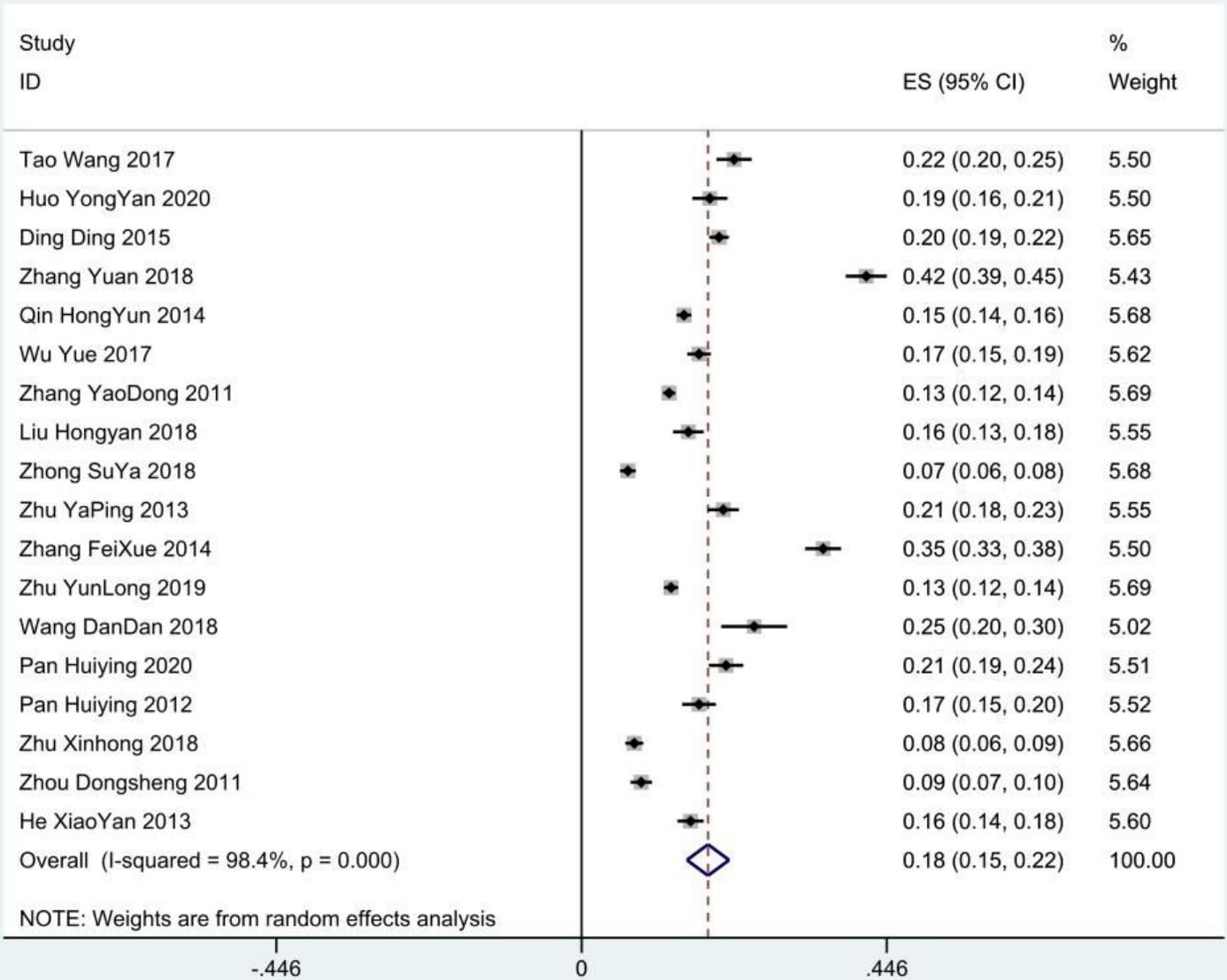


Figure 3

Forest plot of the pooled Prevalence of MCI among elderly

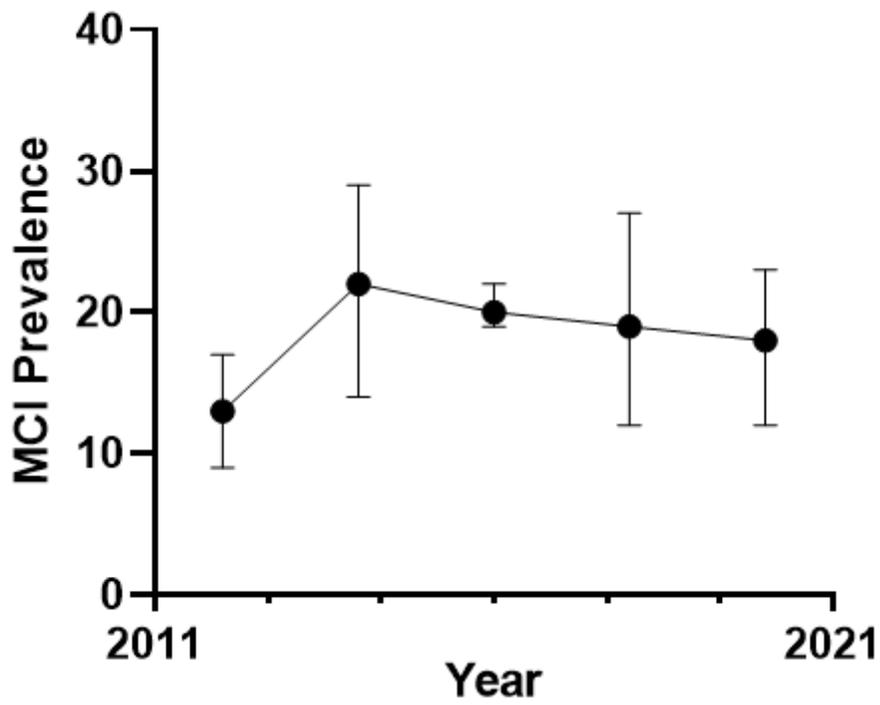


Figure 4

Temporal trend of the Prevalence of MCI over the past ten years