Annual rates of and factors influencing inpatient and outpatient transient ischaemic attacks in Chinese population: a nationally representative cross-sectional survey

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ABSTRACT

Objectives To investigate the rates and influencing factors of transient ischaemic attack (TIA) inpatient admissions and outpatient visits in China.

Setting A door-to-door survey of 178,059 families from 155 urban and rural areas in 31 provinces in China, 2013.

Participants Total 596,536 people were assessed in the annual rate analysis, and 829 TIA patients were assessed in the influencing factor analysis.

Main outcome measures The weighted annual rates of TIA inpatient admissions and outpatient visits and the factors influencing inpatient admissions and outpatient visits for TIA patients.

Results The weighted annual inpatient admission rate per TIA patient was 25.8 (95% CI: 18.4 to 36.2) per 100,000 in the population, whereas the weighted annual inpatient admission rate for patients with TIAS was 32.5 (95% CI: 26.2 to 45.1) per 100,000 in the population. The weighted annual inpatient admission rate per TIA patient was 25.8 (95% CI: 18.4 to 36.2) per 100,000 in the population, whereas the weighted annual inpatient admission rate for patients with TIAS was 32.5 (95% CI: 26.2 to 45.1) per 100,000 in the population. The weighted annual inpatient admission rate per TIA patient was 25.8 (95% CI: 18.4 to 36.2) per 100,000 in the population, whereas the weighted annual inpatient admission rate for patients with TIAS was 32.5 (95% CI: 26.2 to 45.1) per 100,000 in the population.

Conclusions It is particularly urgent for TIA care to be integrated into the national healthcare system. However, organised stroke care, including TIA care, is still far from being implemented nationwide, with 0.31 million new cases of TIA annually. TIA patients are not managed well prior to a stroke in China, although the early assessment and management of TIAS and minor strokes can result in an 80% reduction in the incidence of early recurrent strokes. It is particularly urgent for TIA care to be integrated into the national healthcare system. However, organised stroke care, including TIA care, is still far from being implemented in the majority of hospitals in China, as well as in many developing countries worldwide. Accurate estimates of the rates of and factors influencing the inpatient admissions and outpatient visits of patients with TIAS may be necessary for the integration of TIA care into nationwide, with 0.31 million new cases of TIAS annually.1 TIA patients are not managed well prior to a stroke in China1, although the early assessment and management of TIAs and minor strokes can result in an 80% reduction in the incidence of early recurrent strokes.2 3 It is particularly urgent for TIA care to be integrated into the national healthcare system. However, organised stroke care, including TIA care, is still far from being implemented in the majority of hospitals in China, as well as in many developing countries worldwide.4 Accurate estimates of the rates of and factors influencing the inpatient admissions and outpatient visits of patients with TIAs may be necessary for the integration of TIA care into national healthcare systems.
the national healthcare system. However, no evidence of the rates of and factors influencing inpatient admissions and outpatient visits of patients with TIAs is available. Thus, we aimed to investigate the rates of and factors influencing inpatient admissions and outpatient visits of patients with TIAs based on the National Epidemiological Survey of Transient Ischaemic Attacks in China.

METHODS

Study design and participants
A nationally representative cross-sectional survey on strokes and TIAs was conducted in 157 disease surveillance points (DSPs) or survey sites of the 31 provincial regions in mainland China from 1 September 2013 to 31 December 2013 which was described in detail in previous studies. Briefly, participants with suspected stroke or TIA symptoms were screened from the sampled populations by China’s Centers for Disease Control and Prevention (CDC) investigators and further interviewed by neurologists in this study. Ultimately, all definite or probable cases of first-ever TIAs or strokes in the life time of an individual by midnight on 31 August 2013 (ie, prespecified time point of the survey) were confirmed according to diagnostic criteria.

Inquiries for the TIA participants
For each diagnosed TIA case with or without stroke, the inpatient times and charges due to TIAs or strokes following TIAs and the outpatient times and charges due to TIAs and its related comorbidities in the past year (prior to midnight on 31 August 2013) were investigated and recorded by neurologists by asking the following questions: (1) How many times have you been hospitalised in the past 1 year? How many days were the overall hospital stay? How many RMB (monetary units in China) were the overall medical charges during the total hospital stay? (2) In the past year, how many times have you visited the outpatient departments of community hospitals? How many times have you visited the outpatient departments of district/county hospitals? How many times have you visited the outpatient departments of provincial/municipal hospitals? (3) In the past month, how many times have you visited the outpatient departments of community hospitals? How many RMB were the total medical charges in the outpatient departments of community hospitals during the past month? In the past month, how many times have you visited the outpatient departments of district/county hospitals? How many RMB were the total medical charges in the outpatient departments of district/county hospitals during the past month? In the past month, how many times have you visited the outpatient departments of provincial/municipal hospitals? How many RMB were the total medical charges in the outpatient departments of provincial/municipal hospitals during the past month?

Diagnostic criteria
In this study, a TIA was defined as the sudden onset of a focal neurological symptom or sign lasting less than 24 hours, presumably brought on by a transient decrease in blood supply that rendered the brain ischaemic in the area producing the symptom. In this epidemiological survey, only definite TIAs (the sudden onset of transient limb paralysis, with or without other signs, lasting up to 24 hours and leaving no significant deficits) or probable TIAs (other transient focal neurological deficits lasting up to 24 hours) were diagnosed according to the TIA definition after the neurologist completed a physical examination and reviewed disease histories and previous medical documents, including cardio-cerebro-vascular-related medical records, CT/MRI scans. The minimum criterion for definite or probable stroke was evidence of a sudden or rapid onset of neurological symptoms lasting for >24 hours or leading to death without evidence of a non-stroke cause. Self-reported information on ethnicity, education, marital status, current occupation and medical insurance was used. Hypertension was defined as having a history of hypertension, or taking antihypertensive medication in the recent 2 weeks, having a systolic blood pressure ≥140 mm Hg or having a diastolic blood pressure ≥90 mm Hg. A history of diabetes mellitus was defined by patients’ self-report of having been told by a doctor that they had diabetes mellitus or by their use of antidiabetic drugs. Atrial fibrillation was diagnosed by ECG, as per the medical records. The diagnosis of coronary heart disease included a history of myocardial infarction or angina documented in the medical records. Dyslipidaemia was defined by a diagnosis in the medical records. Current smoking (≥1 cigarette per day) and alcohol intake (any dose of alcohol, ≥1 time per week) were defined by the subjects’ self-report.

Patient and public involvement
In this survey, TIA/patients who had a stroke and members of the general population were involved in all aspects of the survey, including planning, which was performed based on patients’ concerns and public awareness; ethical auditing from non-medical member of the Ethics Committee; revising of the operational manual in line with suggestions made by patients and members of the public after the pilot survey and organising and mobilising of the formal survey with the help of the directors of local neighbourhood/village committees and local volunteers. Public promotion and mobilisation (including introducing posters and slogans to local communities and distributing appointment letters to residents) prior to the field survey were performed to ensure that local residents were aware of the purpose and significance of the survey and to secure their cooperation as much as possible during the field work. The TIA presentation as harbingers of a stroke event were also well recognised by the public through public promotion and mobilisation.

Statistical analysis
Weighting method
Statistical analyses were conducted with weighted data to account for the complex sampling design. Weighted
coefficients were calculated by considering the sampling weights, non-response weights and poststratification weights to obtain the national estimates. Population data from the 2010 China census were used to calculate poststratification weights adjusted for sex (men, women), age (<24, 25 to 29, 30 to 34, 35 to 39, 40 to 44, 45 to 49, 50 to 54, 55 to 59, 60 to 64, 65 to 69, 70 to 74, 75 to 79 and 80+ years), residence (urban or rural) and geographical location (eastern, central or western China).

**Estimation of nationwide annual rates of inpatient and outpatient TIA**

In this retrospective epidemiological survey, TIA inpatient and outpatient rates per TIA patient were defined as the proportion of inpatient or outpatient patients with TIAs among the sampled population in the past year, whereas the TIA inpatient admission and outpatient visit rates were defined as the total event rates of inpatient admissions or outpatient visits made by TIA patients among the sampled population in the past year. National estimates of the annual rates (and 95% CIs) of TIA inpatient admissions and outpatient visits were computed with individual final weights.

**Estimation of nationwide inpatient and outpatient charges associated with TIAs**

National estimates of charges (95% CIs) associated with TIA inpatient admissions and outpatient visits, weighted mean charges per admission or visit and length of stay per admission were also computed with individual final weights.

**Analyses of hospital access rates among TIA patients and influence factors**

Hospital access rates among TIA patients were calculated, and further compared between subgroups in the multivariate analysis. Factors influencing inpatient or outpatient (yes or no) TIA patients were separately determined after adjusting for different explanatory factors in a model using binary logistic regression analysis. The explanatory risk factors included age group (25 to 34/35 to 44/45 to 54/55 to 64/65 to 74/75 to 84/85 years), sex (men/women); stroke prognosis or history (TIA with stroke/isolated TIA); ethnicity (Han ethnicity/other ethnicity); education (primary school/middle school/college and higher); marriage status (single or widowed/married); occupation (retiree or homemaker/farmer/worker or employee or entrepreneur); hypertension (yes/no); history (yes/no/unknown) of diabetes mellitus, hyperlipidaemia, atrial fibrillation and coronary heart disease; smoking (regular smoking/occasional smoking/quit smoking/never smoked/unknown); alcohol consumption (regular alcohol consumption/occasional alcohol consumption/stopped consuming alcohol/never consumed alcohol/unknown); insurance (urban employee medical insurance (free medical care)/urban resident essential medical insurance/new rural cooperative medical insurance/no medical insurance); place of residence (urban/rural). A sensitivity analysis for the multivariable regression analysis was further performed to validate the results using only patients who experienced a TIA event between 1 September 2012 and midnight on 31 August 2013 because most of those patients should have but did not access inpatient or outpatient services in response to a TIA.

All of these statistical calculations were performed with SPSS 15.0 software (SPSS Inc, Chicago, Illinois, USA). P < 0.05 was considered statistically significant.

**RESULTS**

**Study participants**

For this survey, 596536 people (table 1) were finally evaluated in 155 DSPs, with a response rate of 80.0% among 745538 people. The characteristics of the study sample from the national epidemiological survey of patients with TIAs in China in 2013 are shown in table 1. Among the 596536 people evaluated, 26596 had positive symptoms of stroke and TIA. Among them, 26305 were further reviewed by neurologists and only 290 were missing or refused. Ultimately, both 7679 cases of stroke and 829 cases of TIAs were confirmed prior to 31 August 2013 (see figure 1). Among the 829 TIA cases, 470 cases (56.7%) had ever experienced a TIA event between 1 September 2012 and midnight on 31 August 2013.

**Estimate of nationwide TIA inpatient admissions and the associated charges**

In China, the weighted annual inpatient admission rate per TIA patient was 25.8 (95% CI: 18.4 to 36.2) per 100 000 in the population, whereas the weighted annual inpatient admission rate of patients with TIAs was 32.5 (95% CI: 23.3 to 38.9) per 100 000 in the population. According to the above-estimated rates, there were an estimated 338589 (95% CI: 204782 to 472396) individuals with TIAs who accounted for 425253 (252847 to 597658) inpatient admissions in the population in China per year. The length of stay and charges per inpatient admission were 12.6 (10.5 to 14.6) days and RMB 6334.9 (5113.7 to 7556.1), respectively. The total inpatient charges associated with TIAs in China were RMB 2447706113.3 (1408328146.7 to 3487084079.9) or US$ 587 755 423.9 (223 101 488.6 to 552 409 359.2) per year. Both the length of stay and the inpatient charges per admission among TIA patients with stroke (16.1 (11.9 to 20.3) days and RMB 7880.0 (5685.1 to 10074.9)) were higher than those among patients with isolated TIAs (9.5 (8.1 to 11.0) days and RMB 4955.1 (4062.6 to 5847.5)). The length of stay per admission was higher for women than for men and for urban residents than for rural residents, whereas the inpatient charges per admission and total inpatient charges associated with TIAs was higher for men than for women and for urban residents than for rural residents. (table 2)

**Estimate of nationwide TIA outpatient visits and the associated charges**

In China, the weighted annual outpatient visit rate per TIA patient was 34.4 (95% CI: 26.2 to 45.1) per 100 000 in...
Table 1  Characteristics of the study sample from the national epidemiological survey of transient ischaemic attacks (TIAs) in China, 2013

| Characteristic                        | Population No. (rates) | Weighted rates* (95% CI) |
|---------------------------------------|------------------------|--------------------------|
| Estimated prevalence (1 per 100 000)  | 829 (138.9)            | 103.3 (83.9 to 127.2)    |
| Age group, n (%)                      |                        |                          |
| 0–24                                  | 160 382 (26.9%)        | 33.8% (32.5% to 35.3%)   |
| 25–34                                 | 91 435 (15.3%)         | 14.9% (14.2% to 15.5%)   |
| 35–44                                 | 99 582 (16.7%)         | 18.3% (17.6% to 19.0%)   |
| 45–54                                 | 93 763 (15.7%)         | 13.9% (13.4% to 14.5%)   |
| 55–64                                 | 80 155 (13.4%)         | 10.5% (10.0% to 11.1%)   |
| 65–74                                 | 44 840 (7.5%)          | 5.5% (5.1% to 5.8%)      |
| 75–84                                 | 22 200 (3.7%)          | 2.6% (2.5% to 2.8%)      |
| ≥85                                   | 4179 (0.7%)            | 0.5% (0.4% to 0.5%)      |
| Sex, n (%)                            |                        |                          |
| Men                                   | 300 192 (50.3%)        | 51.1% (50.8% to 51.5%)   |
| Women                                 | 296 344 (49.7%)        | 48.9% (48.5% to 49.2%)   |
| Ethnicity, n (%)                      |                        |                          |
| Han                                   | 521 343 (87.4%)        | 91.8% (88.6% to 94.1%)   |
| Other                                 | 75 193 (12.6%)         | 8.2% (5.9% to 11.4%)     |
| Education, n (%)                      |                        |                          |
| Primary school                        | 248 916 (41.7%)        | 39.6% (35.9% to 43.4%)   |
| Middle school                         | 294 209 (49.3%)        | 49.0% (46.5% to 51.5%)   |
| College and higher                    | 51 730 (8.7%)          | 11.2% (9.0% to 14.0%)    |
| Missing                               | 1681 (0.3%)            | 0.19% (0.16% to 0.23%)   |
| Marital status, n (%)                 |                        |                          |
| Married                               | 391 160 (65.6%)        | 60.9% (59.9% to 61.9%)   |
| Single                                | 116 817 (19.6%)        | 24.0% (22.3% to 25.8%)   |
| Widowed                               | 32 734 (5.5%)          | 4.2% (3.8% to 4.6%)      |
| Other                                 | 53 735 (8.7%)          | 10.6% (8.9% to 12.6%)    |
| Missing                               | 2090 (0.4%)            | 0.25% (0.21% to 0.30%)   |
| Occupation, n (%)                     |                        |                          |
| Students                              | 108 978 (18.3%)        | 23.1% (21.7% to 24.6%)   |
| Worker                                | 45 021 (7.5%)          | 8.7% (7.1% to 10.8%)     |
| Farmer                                | 271 068 (45.4%)        | 38.6% (33.5% to 44.0%)   |
| Employee                              | 46 676 (7.8%)          | 9.8% (7.5% to 12.7%)     |
| Entrepreneurs                         | 52 518 (8.8%)          | 10.2% (8.0% to 12.9%)    |
| Retiree or homemaker                  | 66 169 (11.1%)         | 8.7% (6.8% to 11.2%)     |
| Other                                 | 4439 (0.7%)            | 0.70% (0.51% to 0.97%)   |
| Missing                               | 1667 (0.3%)            | 0.20% (0.16% to 0.24%)   |
| Insurance, n (%)                      |                        |                          |
| Urban employee medical insurance/free medical care | 101 064 (16.9%)      | 17.9% (13.8% to 23.0%)   |
| Urban resident essential medical insurance | 75 335 (12.6%)   | 14.0% (10.8% to 17.9%)   |
| New rural cooperative medical insurance | 398 284 (66.8%)    | 63.2% (55.2% to 70.6%)   |
| No medical insurance                  | 21 853 (3.7%)          | 4.9% (3.7% to 6.3%)      |
| Place of residence, n (%)             |                        |                          |
| Urban                                 | 282 945 (47.4%)        | 52.9% (44.3% to 61.3%)   |
| Rural                                 | 313 591 (52.6%)        | 47.1% (38.7% to 55.7%)   |

*Complex sample weights were used to obtain nationally representative estimates.
and for urban residents than for rural residents. (table 2) associated with TIAs was higher for women than for men outpatient charges per visit and total outpatient charges 413 677.0 (28 640 229.8 to 64 187 124.3) per year. The 986 336.3 (180 791 450.7 to 405 181 221.9) or US$ 46 population in China per year. The outpatient charges per 1 960 026 (1 375 872 to 2 544 181) outpatient visits in the Jiang B, et al. BMJ Open 2020;10:e033786. doi:10.1136/bmjopen-2019-033786

Figure 1 Flowchart for transient ischaemic attack (TIA) case ascertainment. CDC, Centers for Disease Control and Prevention; DSP, disease surveillance points.

Inpatient rates among TIA patients and influence factors

Only 23.6% of the 829 patients with TIAs were hospitalised in the past year, for a total of 261 hospital admissions attributable to the treatment of TIAs. Factors influencing TIA-related inpatient admissions included sex, stroke prognosis, marriage status, hypertension, dyslipidaemia and place of residence (table 3). The inpatient rate was higher for men than for women (OR: 2.24; 95% CI: 1.40 to 3.59; p=0.001), for TIA patients with stroke than for isolated TIA patients (2.93; 2.01 to 4.25; p<0.001), for TIA patients with hypertension than for TIA patients without hypertension (2.60; 1.65 to 4.11; p<0.001), for TIA patients with dyslipidaemia than for TIA patients without dyslipidaemia (1.71; 1.11 to 2.62; p=0.014) and for urban TIA patients than for rural TIA patients (1.63; 1.02 to 2.60; p=0.040); however, the inpatient rate was lower for married patients with a positive TIA history than for single or widowed patients with a positive TIA history (0.58; 0.35 to 0.95; p=0.029). Correspondingly, weighted rate of TIA inpatient was 35.3/100 000 in married people aged ≥25 years, lower than 57.5/100 000 in single or widowed people (p=0.011). In the sensitivity analysis, only 31.9% of the 470 TIA patients were hospitalised in the past year, and all of the above-mentioned factors but dyslipidaemia and place of residence were further confirmed to be factors influencing the inpatient admission rate. (online supplementary table 1; marginally significant (p=0.051) for marriage status).

Outpatient rates among TIA patients and influence factors

Only 34.4% of the 829 patients with TIAs had visited outpatient clinic for TIAs in the past year, for a total of 1290 outpatient visits attributable to the treatment of TIAs. Factors influencing TIA-related outpatient visits included stroke prognosis, hypertension and dyslipidaemia (table 4). The outpatient rate was higher for TIA patients with stroke than for isolated TIA patients (1.88; 1.33 to 2.64; p<0.001), for TIA patients with hypertension than for TIA patients without hypertension (1.64; 1.14 to 2.35; p=0.008), and for TIA patients with dyslipidaemia than for TIA patients without dyslipidaemia (1.92; 1.30 to 2.83; p=0.001). In the sensitivity analysis, only 40.2% of 470 TIA patients had visited the outpatient clinic for TIAs in the past year, and all of the above-mentioned factors but hypertension were further confirmed to be factors influencing the outpatient-visit rate (online supplementary table 2).

DISCUSSION

Underestimated inpatients, outpatients and charges in transient ischaemic attacks in China

To the best of our knowledge, this is the first study to investigate inpatient and outpatient rates for patients with TIAs in China nationwide. To date, no data comparing TIA inpatient and outpatient rates have been documented in other populations. However, the TIA-related inpatient and outpatient rates were higher than the incidence rate of first-ever TIAs in this survey, which is mainly attributable to recurrent TIAs or strokes after TIAs. This is also the first study to investigate the direct charges associated with TIA-related inpatient admissions and outpatient visits and the factors influencing inpatient admissions and outpatient visits for TIAs in China nationwide. The estimated total inpatient charges and outpatient charges associated with TIAs per year in China were RMB 2.45 billion and 0.29 billion, respectively. Given that the majority of TIA patients in the population did not respond to TIAs or the symptoms of TIAs, the estimated total inpatient and outpatient charges associated with TIAs may be underestimated. Therefore, the current demand for TIA care is less than the actual demands in China. In fact, the low awareness and treatment rates of hypertension7, diabetes mellitus,8 and dyslipidaemia9 in China seems to indirectly support our findings. The mean length of stay per admission for isolated TIA in our study was 9.5 days, which was close to the 9.4 days reported in a previous study,10 shorter than the 11.1 days reported by a study11 at Philipps University in Marburg, Germany, and longer than the 3.4 days reported in an American study.12 Different systems of healthcare and finance prevent further comparisons of inpatient and outpatient charges.
Inpatient admissions and charges

|                     | Total Estimates (95% CI) | Men Estimates (95% CI) | Women Estimates (95% CI) | Urban areas Estimates (95% CI) | Rural areas Estimates (95% CI) |
|---------------------|--------------------------|------------------------|--------------------------|--------------------------------|--------------------------------|
| Inpatient-admission rate per TIA patient (1/100 000) | 25.8 (18.4 to 36.2) | 29.7 (19.7 to 44.9) | 21.8 (15.3 to 30.9) | 29.1 (17.0 to 49.9) | 22.1 (17.4 to 28.2) |
| Persons | 338 588.8 (204 761.6 to 472 393.1) | 199 308.4 (109 078.1 to 289 538.8) | 139 280.4 (81 646.8 to 196 914.0) | 201 873.1 (77 080.1 to 326 666.0) | 136 715.8 (88 434.2 to 184 997.3) |
| Admissions | 425 252.5 (252 846.9 to 597 658.1) | 258 425.7 (137 893.2 to 376 958.3) | 166 826.8 (99 022.7 to 234 630.8) | 259 354.5 (97 019.8 to 421 689.1) | 165 898.1 (107 836.5 to 223 959.6) |
| Length of stay/per admission (days) | 12.6 (10.5 to 14.6) | 11.8 (10.6 to 13.0) | 13.6 (8.9 to 18.2) | 13.4 (10.3 to 16.5) | 11.4 (9.5 to 13.4) |
| Inpatient charge/per admission (RMB) | 6334.9 (5113.7 to 7556.1) | 6953.3 (5338.1 to 8568.5) | 5381.2 (4282.9 to 6479.2) | 7003.3 (5240.3 to 8765.6) | 5297.8 (3660.7 to 6933.2) |
| Total inpatient charge (RMB) | 2 447 706 113.3 (1 408 328 147 to 3 487 084 080) | 1 658 966 994.4 (863 592 527.5 to 2 454 341 461.0) | 788 739 118.9 (420 891 754.2 to 1 568 586 258.0) | 1 688 508 429 (866 712 525.4 to 2 690 304 330.0) | 759 197 684.3 (482 229 229.1 to 1 036 166 140.0) |

Outpatient visits and charges

|                     | Total Estimates (95% CI) | Men Estimates (95% CI) | Women Estimates (95% CI) | Urban areas Estimates (95% CI) | Rural areas Estimates (95% CI) |
|---------------------|--------------------------|------------------------|--------------------------|--------------------------------|--------------------------------|
| Outpatient-visit rate per TIA patient (1/100 000) | 34.4 (26.2 to 45.1) | 34.0 (24.8 to 46.5) | 34.9 (25.9 to 46.8) | 34.6 (22.6 to 52.9) | 34.2 (24.8 to 47.1) |
| Persons | 450 864.3 (304 999.6 to 596 368.9) | 227 518.5 (144 444.4 to 310 592.5) | 223 165.8 (148 237.2 to 298 094.4) | 239 394.1 (117 532.9 to 361 255.3) | 211 290.1 (131 453.6 to 291 126.6) |
| Outpatient-visit rate (1/100 000) | 149.6 (127.0 to 165.5) | 156.8 (121.2 to 181.9) | 142.0 (114.7 to 161.3) | 138.5 (103.5 to 159.6) | 162.1 (127.0 to 183.4) |
| Visits | 1 960 026.3 (1 375 871.6 to 2 544 181.1) | 1 050 789.6 (671 051.2 to 1 430 527.9) | 909 236.8 (607 108.5 to 1 211 365.1) | 959 380.5 (540 848.1 to 1 377 913.0) | 1 000 645.8 (593 132.2 to 1 408 159.4) |
| Outpatient charge/per visit (RMB) | 486.5 (150.4 to 822.7) | 312.1 (193.7 to 430.6) | 619.5 (48.1 to 1193.9) | 680.6 (56.0 to 1305.3) | 287.5 (72.8 to 502.3) |
| Total outpatient charge (RMB) | 292 986 336.3 (180 791 450.7 to 405 181 221.9) | 137 213 039.1 (66 730 298.6 to 207 695 778.9) | 155 773 297.2 (68 438 803.6 to 243 341 870.8) | 185 985 103.4 (92 629 336.3 to 279 107 790.8) | 107 001 232.8 (44 777 177.8 to 169 228 287.9) |

RMB, monetary units in China; TIA, transient ischaemic attack.

Factors influencing inpatient and outpatient transient ischaemic attacks

In this study, we investigated whether socio-demographic characteristics, disease histories, stroke prognoses and medical insurance were associated with inpatient admissions and outpatient visits and confirmed that the factors influencing TIA-related inpatient admissions were sex, hypertension and stroke prognosis, and the factors influencing TIA-related outpatient visits were dyslipidaemia and stroke prognosis. It seems logical that the presence of risk factors and poorer prognoses increased the rates of inpatient admissions and outpatient visits, and marriage may influence the rate of inpatient admissions by lowering the incidence of TIs. In the present study, weighted incidence was 34.3/100 000 in married people.
| Factors                                | TIA no. | Inpatient no. | %   | Adjusted* OR | 95% CI       | P value |
|----------------------------------------|---------|---------------|-----|--------------|--------------|---------|
| **Age group**                          |         |               |     |              |              |         |
| 25–34                                  | 6       | 1             | 16.7% | 0.75        | 0.04 to 15.16 | 0.851   |
| 35–44                                  | 30      | 4             | 13.3% | 0.45        | 0.06 to 3.20  | 0.424   |
| 45–54                                  | 137     | 25            | 18.2% | 0.67        | 0.13 to 3.38  | 0.630   |
| 55–64                                  | 266     | 67            | 25.2% | 0.69        | 0.15 to 3.31  | 0.646   |
| 65–74                                  | 265     | 67            | 25.3% | 0.56        | 0.12 to 2.64  | 0.460   |
| 75–84                                  | 115     | 29            | 25.2% | 0.42        | 0.09 to 2.05  | 0.282   |
| ≥85                                    | 10      | 3             | 30.0% | Reference   | Reference     |         |
| **Sex**                                |         |               |     |              |              |         |
| Men                                    | 393     | 109           | 27.7% | 2.24        | 1.40 to 3.59  | 0.001   |
| Women                                  | 436     | 87            | 20.0% | Reference   | Reference     |         |
| **Stroke prognosis or history**        |         |               |     |              |              |         |
| TIA with stroke†                       | 241     | 99            | 41.1% | 2.93        | 2.01 to 4.25  | <0.001  |
| Isolated TIA                           | 588     | 97            | 16.5% | Reference   | Reference     |         |
| **Ethnicity**                          |         |               |     |              |              |         |
| Han ethnicity                          | 705     | 179           | 25.4% | 1.34        | 0.72 to 2.49  | 0.357   |
| Other                                  | 124     | 17            | 13.7% | Reference   | Reference     |         |
| **Education**                          |         |               |     |              |              |         |
| Middle school                          | 314     | 82            | 26.1% | 0.89        | 0.58 to 1.38  | 0.605   |
| College and higher                     | 28      | 10            | 35.7% | 1.20        | 0.44 to 3.21  | 0.724   |
| Primary school                         | 487     | 104           | 21.4% | Reference   | Reference     |         |
| **Marriage status**                    |         |               |     |              |              |         |
| Married                                | 679     | 156           | 23.0% | 0.58        | 0.35 to 0.95  | 0.029   |
| Single/widowed                         | 150     | 40            | 26.7% | Reference   | Reference     |         |
| **Occupation**                         |         |               |     |              |              |         |
| Worker/employee/entrepreneurs          | 75      | 19            | 25.3% | 1.10        | 0.54 to 2.25  | 0.796   |
| Farmer                                 | 469     | 91            | 19.4% | 0.78        | 0.40 to 1.50  | 0.451   |
| Retiree or homemaker                   | 285     | 86            | 30.2% | Reference   | Reference     |         |
| **Disease history**                    |         |               |     |              |              |         |
| Hypertension                           |         |               |     |              |              |         |
| Yes                                    | 562     | 164           | 29.2% | 2.60        | 1.65 to 4.11  | <0.001  |
| No                                     | 267     | 32            | 12.0% | Reference   | Reference     |         |
| Diabetes mellitus                      |         |               |     |              |              |         |
| Yes                                    | 121     | 39            | 32.2% | 1.14        | 0.71 to 1.85  | 0.581   |
| No                                     | 613     | 145           | 23.7% | Reference   | Reference     |         |
| Unknown                                | 95      | 12            | 12.6% | 0.54        | 0.26 to 1.09  | 0.086   |
| Dyslipidaemia                          |         |               |     |              |              |         |
| Yes                                    | 204     | 73            | 35.8% | 1.71        | 1.11 to 2.62  | 0.014   |
| No                                     | 398     | 83            | 20.9% | Reference   | Reference     |         |
| Unknown                                | 227     | 40            | 17.6% | 1.14        | 0.69 to 1.89  | 0.597   |
| Atrial fibrillation                    |         |               |     |              |              |         |
| Yes                                    | 35      | 8             | 22.9% | 0.87        | 0.36 to 2.11  | 0.754   |
| No                                     | 647     | 161           | 24.9% | Reference   | Reference     |         |
| Unknown                                | 147     | 27            | 18.4% | 1.21        | 0.67 to 2.19  | 0.531   |
| **Coronary heart disease**             |         |               |     |              |              |         |

Continued
Factors | TIA no. | Inpatient no. | % | Adjusted* OR | 95% CI | P value
---|---|---|---|---|---|---
Yes | 148 | 45 | 30.4% | 1.09 | 0.69 to 1.73 | 0.711
No | 531 | 131 | 24.7% | Reference | Reference | Reference
Unknown | 150 | 20 | 13.3% | 0.40 | 0.22 to 0.73 | 0.003
Smoking | | | | | | |
Regular smoking | 149 | 37 | 24.8% | 0.72 | 0.39 to 1.32 | 0.286
Occasional smoking | 97 | 17 | 17.5% | 0.56 | 0.26 to 1.22 | 0.144
Quit smoking | 102 | 27 | 26.5% | 0.57 | 0.27 to 1.18 | 0.128
Never smoked/unknown | 481 | 115 | 23.9% | Reference | Reference | Reference
Alcohol consumption | | | | | | |
Regular alcohol consumption | 71 | 13 | 18.3% | 0.72 | 0.32 to 1.59 | 0.414
Occasional alcohol consumption | 172 | 34 | 19.8% | 0.82 | 0.45 to 1.48 | 0.506
Stopped consuming alcohol | 99 | 26 | 26.3% | 0.68 | 0.34 to 1.36 | 0.273
Never consumed alcohol/unknown | 487 | 123 | 25.3% | Reference | Reference | Reference
Insurance | | | | | | |
Urban employee medical insurance/free medical care | 232 | 69 | 29.7% | 0.58 | 0.12 to 2.82 | 0.503
Urban resident essential medical insurance | 89 | 25 | 28.1% | 0.69 | 0.14 to 3.44 | 0.651
New rural cooperative medical insurance | 497 | 99 | 19.9% | 0.89 | 0.20 to 4.10 | 0.885
No medical insurance | 11 | 3 | 27.3% | Reference | Reference | Reference
Place of residence | | | | | | |
Urban | 420 | 123 | 29.3% | 1.63 | 1.02 to 2.60 | 0.040
Rural | 409 | 73 | 17.8% | Reference | Reference | Reference

*All other variables in the table were adjusted for each interesting variable in a multivariate logistic regression model.
††It was meant that 241 cases of TIA with stroke included 61 cases of TIA patients with previous stroke, and 180 cases of TIA patients with subsequent.

and 57.5/100,000 in single or widowed people aged ≥25 years, respectively. Interestingly, inpatient and outpatient responses to TIA did not increase with age, and only different inpatient response to TIA was found in both sexes, rather than outpatient response. A study of TIA patients presenting to emergency departments in the USA from 2006 to 2008 found that median household income, insurance status and the hospital type affiliated with the emergency department play important roles in the decision to admit TIA patients to hospitals. Another study of TIA patients presenting to emergency departments also found that differences in admission status were associated with hospital type and socio-demographic characteristics, including county of residence and insurance status. Thus, the possible explanations may be complex and are probably attributable to factors unrelated to the condition of the patients. Regrettably, we could not distinguish emergency department visits from other outpatient visits in our study, although a TIA is an emergency. Medical insurance also failed to explain the differences in TIA inpatient and outpatient rates in our study.

We also noted that most of the TIA risk factors (eg, coronary heart disease, diabetes, smoking, alcohol consumption) and socio-demographic characteristics (eg, education and insurance) were not related with inpatient admissions and outpatient visits in TIA patients in this study. The possible reasons were postulated as follows: first, generally poor awareness or responses to TIA symptoms with 24 hours disappearing in population; second, lower rate of accessing to inpatient and outpatient TIA services in TIA patients; third, recall bias in the survey. Indeed, it is hard to determine the real reason in this cross-sectional survey, thus further prospective studies are needed.

The implication of the findings
The guidelines recommend that patients with TIA who are at high risk of stroke (that is, with an ABCD² score of 4 or above) should undergo neuroimaging and be assessed by a specialist within 24 hours of symptom onset, while those at a lower risk of stroke should be assessed within a week. However, only a minority of high-risk TIA patients are seen within 24 hours of symptom onset in hospitals, mainly due to their failure to respond urgently to their symptoms. Data from the Chinese National Stroke Registry showed that only 22% to 36% of TIA patients arrive at hospitals within 24 hours of symptom onset. A community-based stroke registry in three cities in China showed that only 16.9% of patients...
## Table 4  Factors influencing outpatient visits in patients with transient ischaemic attacks (TIAs) in China, 2013

| Factors                          | TIA no. | Outpatient no. | %       | Adjusted* OR | 95% CI     | P value |
|---------------------------------|---------|----------------|---------|--------------|------------|---------|
| **Age group**                   |         |                |         |              |            |         |
| 25–34                           | 6       | 3              | 50.0%   | 1.44         | 0.16 to 13.21 | 0.749  |
| 35–44                           | 30      | 9              | 30.0%   | 0.65         | 0.13 to 3.13  | 0.587  |
| 45–54                           | 137     | 30             | 21.9%   | 0.29         | 0.07 to 1.17  | 0.081  |
| 55–64                           | 266     | 95             | 35.7%   | 0.51         | 0.13 to 1.98  | 0.329  |
| 65–74                           | 265     | 104            | 39.2%   | 0.60         | 0.15 to 2.31  | 0.454  |
| 75–84                           | 115     | 39             | 33.9%   | 0.42         | 0.11 to 1.68  | 0.221  |
| ≥85                             | 10      | 5              | 50.0%   | Reference    | Reference   |         |
| **Sex**                         |         |                |         |              |            |         |
| Men                             | 393     | 145            | 36.9%   | 1.18         | 0.79 to 1.76  | 0.431  |
| Women                           | 436     | 140            | 32.1%   | Reference    | Reference   |         |
| **Stroke prognosis or history** |         |                |         |              |            |         |
| TIA with stroke†                | 241     | 114            | 47.3%   | 1.88         | 1.33 to 2.64  | <0.001 |
| Isolated TIA                    | 588     | 171            | 29.1%   | Reference    | Reference   |         |
| **Ethnicity**                   |         |                |         |              |            |         |
| Han ethnicity                   | 705     | 259            | 36.7%   | 1.57         | 0.94 to 2.62  | 0.082  |
| Other                           | 124     | 26             | 21.0%   | Reference    | Reference   |         |
| **Education**                   |         |                |         |              |            |         |
| Middle school                   | 314     | 114            | 36.3%   | 1.16         | 0.79 to 1.69  | 0.455  |
| College and higher              | 28      | 14             | 50.0%   | 2.17         | 0.88 to 5.32  | 0.092  |
| Primary school                  | 487     | 157            | 32.2%   | Reference    | Reference   |         |
| **Marriage status**             |         |                |         |              |            |         |
| Married                         | 679     | 229            | 33.7%   | 0.80         | 0.52 to 1.24  | 0.316  |
| Single/widowed                  | 150     | 56             | 37.3%   | Reference    | Reference   |         |
| **Occupation**                  |         |                |         |              |            |         |
| Worker/employee/entrepreneurs   | 75      | 25             | 33.3%   | 1.02         | 0.55 to 1.91  | 0.945  |
| Farmer                          | 469     | 150            | 32.0%   | 0.93         | 0.52 to 1.66  | 0.811  |
| Retiree or homemaker            | 285     | 110            | 38.6%   | Reference    | Reference   |         |
| **Disease history**             |         |                |         |              |            |         |
| Hypertension                    |         |                |         |              |            |         |
| Yes                             | 562     | 222            | 39.5%   | 1.64         | 1.14 to 2.35  | 0.008  |
| No                              | 267     | 63             | 23.6%   | Reference    | Reference   |         |
| Diabetes mellitus               |         |                |         |              |            |         |
| Yes                             | 121     | 55             | 45.5%   | 1.17         | 0.75 to 1.80  | 0.491  |
| No                              | 613     | 204            | 33.3%   | Reference    | Reference   |         |
| Unknown                         | 95      | 26             | 27.4%   | 0.71         | 0.42 to 1.21  | 0.210  |
| Dyslipidaemia                   |         |                |         |              |            |         |
| Yes                             | 204     | 94             | 46.1%   | 1.92         | 1.30 to 2.83  | 0.001  |
| No                              | 398     | 113            | 28.4%   | Reference    | Reference   |         |
| Unknown                         | 227     | 78             | 34.4%   | 1.69         | 1.12 to 2.56  | 0.013  |
| Atrial fibrillation             |         |                |         |              |            |         |
| Yes                             | 35      | 15             | 42.9%   | 1.29         | 0.61 to 2.72  | 0.503  |
| No                              | 647     | 229            | 35.4%   | Reference    | Reference   |         |
| Unknown                         | 147     | 41             | 27.9%   | 0.62         | 0.37 to 1.04  | 0.071  |
| Coronary heart disease          |         |                |         |              |            |         |

Continued
with stroke were aware that their initial symptom represented a stroke. In fact, over half of TIA patients with stroke have already developed a stroke within 2 days of symptom onset. This implies that TIA care should be focussed on pre-TIA care as well as inpatient and outpatient patient care. Therefore, first, organised stroke care covering prehospital care and inpatient and outpatient services for strokes, including TIA, should be strengthened. Second, TIA clinics should also be integrated into the national healthcare system in primary, secondary and tertiary hospitals. Third, pre-TIA care, including TIA warning signs and identification, should be promoted in health education to control of hypertension and dyslipidaemia among the general public.

**Strengths and limitations**

The strengths of this study are its professional design, implementation and case ascertainment, and the diagnosis of TIA. Furthermore, TIA or stroke symptoms were screened by a pre-set, structured questionnaire in addition to the professional diagnosis of TIs, guaranteeing the validity of the survey. Neurologists interviewed participants with positive TIA/stroke symptoms and ultimately confirmed 829 cases of TIA with information on the time of onset, duration and disappearance of symptoms, and a detailed record of the TIA-related inpatient admissions and outpatient visits in the past year. However, a recall bias existed in this cross-sectional survey because we could not obtain accurate TIA information for deceased inpatients or outpatients within the defined periods, even though we examined all deaths in the period. Indeed, it was also difficult for elderly subjects to accurately recall TIA episodes that occurred prior to strokes. Unlike in clinical trials, it was also difficult to trace each TIA event clearly and accurately in the population, although we attempted to do so. Also, we should be cautious with the interpretation on those factors influencing inpatient and outpatient TIs, especially those self-reported conditions.

**CONCLUSIONS**

In conclusion, the annual rates of TIA inpatient admissions and outpatient visits in the population are low. The
estimated total inpatient and outpatient charge related to TIs per year in China may be lower than those justified by the actual demands for TIA care in China, probably due to the lack of access to inpatient and outpatient services experienced by the majority of TIA patients in the population. Socio-demographic characteristics, disease histories and stroke prognoses might be associated with inpatient and outpatient TIs. The factors influencing TIA inpatients and outpatients in the population suggested that TIA warning signs and identification should be promoted and integrated into hypertension management and cholesterol education programmes implemented in the population.

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Acknowledgements

We thank Drs LY Wu and LZ Kong from the Ministry of Health, China; Dr XF Liang from the Chinese Center for Disease Control and Prevention. We also thank all the 383 neurologists and 1626 CDC staff from 31 provinces who worked very hard to ensure the accuracy of the data, and all the study participants for their participation and contribution.

Contributors

BJ and WW were the principal investigators responsible for the survey, as such, had full access to all the data in the study and took responsibility for the integrity of the data and the accuracy of the data analysis. All authors (BJ, DS, HS, XR, HL, SG, LW, LW, WW) contributed to the study conception and design, its implementation and field works, data collection and analysis. BJ performed the statistical analysis and manuscript writing. All contributors discussed the findings and approved the final version for publication.

Funding

This study was funded by the Ministry of Science and Technology and the Ministry of Health of the People’s Republic of China under grant No. 2011BAI08B01 of the National Key Technology R&D Program, and the National Natural Science Foundation of China under grant No. 8157110090.

Competing interests

None declared.

Patient consent for publication

Not required.

Ethics approval

This study was approved by the Ethics Committee of the Beijing Tiantan Hospital affiliated with Capital Medical University (Ethic ID: KY2013-006-01). Written informed consent was obtained from all participants or their caregivers. This study was performed in accordance with the Declaration of Helsinki.

Provenance and peer review

Not commissioned; externally peer reviewed.

Data availability statement

All data relevant to the study are included in the article or uploaded as supplementary information. No additional data available.

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