ABSTRACT

Objectives This study reports the life satisfaction of middle-aged and elderly patients who had a stroke in China, and explores its association with patients' sociodemographic characteristics, health status, lifestyles and family relationship.

Design Cross-sectional survey.

Setting and participants The samples of this study were selected from the data of China Health and Retirement Longitudinal Study (CHARLS) in 2018, which covered 28 provinces, 150 countries/districts and 450 village/urban communities. 1154 patients who had a stroke aged 45 and over were included in this study as qualified samples.

Outcome measures Descriptive analysis was used to report sociodemographic characteristics, health status, lifestyles, family relationship and life satisfaction of middle-aged and elderly patients who had a stroke. χ² analysis and binary logistic regression were used to analyse the factors influencing the life satisfaction of the patients who had a stroke.

Results Overall, 83.1% of patients who had a stroke were satisfied with their lives, although only 8.7% rated their own health as being good. Patients who had a stroke who were male, elderly, married, living with their spouses and having a pension were more likely to report satisfaction with life (p<0.05). Self-rated health, health satisfaction, chronic lung disease, fall, pain, ability to work and family relationships were also significantly associated with life satisfaction (p<0.05). Patients who drank alcohol (86.8% vs 81.7%, p=0.041), had physical activity (84.4% vs 75.6%, p=0.004) and had social activity (85.3% vs 80.8%, p=0.041) were more satisfied with their lives than those who did not. Multivariable analysis confirmed that age, health satisfaction, physical pain, working ability, relationships with spouse and with children had significant effects on life satisfaction of patients who had a stroke (p<0.05).

Conclusions Our study indicates the importance of improving the overall health of patients who had a stroke and mediating factors, such as pain management, and work ability, spouse and children relationship in improving the life satisfaction of patients in the poststroke rehabilitation.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study is based on China Health and Retirement Longitudinal Study in 2018, which aims to establish a high-quality microdatabase representing middle-aged and elderly residents in mainland China.
⇒ This study will enrich the literature on the factors associated with life satisfaction, including sociodemographic characteristics, health status, lifestyles and family relations.
⇒ Use of only a single item to assess life satisfaction may lead to bias in the analysis.
⇒ Around 200 patients (16% of patients who had a stroke) were excluded for analysis due to the lack of life satisfaction data, which may deviate our results to some extent.

INTRODUCTION

Stroke is characterised by high morbidity, high recurrence rate, high disability rate and high mortality rate as the second largest cause of death in the world. 1 2 Although morbidity and mortality rates of patients who had a stroke have been declining in many developed countries over the past two decades, they have continued to rise in low-income and middle-income countries, including China. 3 Compared with developed countries, middle-income and low-income countries tend to have poorer stroke awareness, lower control rate of some stroke risk factors (such as malnutrition, diabetes, hypertension and obesity). 4 In the recent years, due to the development of the national economy, the change of people’s lifestyle, the imbalance of nutritional intake and the ageing of the population and other factors, the prevalence of stroke in China has been increasing year by year. It has become one of the major diseases leading to the death of the Chinese population. 5 6

Stroke is an important cause of long-term disability, which has a rapid onset and serious
consequences, leading to declined physical function and quality of life of patients. Studies have shown that complications, pain and disability are the most common clinical features of patients who had a stroke. However, patients who had a stroke are often older, complicated with various chronic diseases, and with a lack of physical and social activities. For instance, based on China Health and Retirement Longitudinal Study (CHARLS) (2011–2015), Cai et al found that more than half of the patients reported no social participation.

Life satisfaction can be defined as the perception of a person’s overall quality of life, reflecting an individual’s overall subjective evaluation of life. A number of studies have shown that after stroke, patients’ life satisfaction will decrease to varying degrees. Many studies have explored the influence of social and demographic factors, such as gender, age, education, marital status and occupational status on life satisfaction of patients who had a stroke. Other studies found that the limitation of physical function after stroke, such as the impairment of physical condition, the changes of communication and visual ability, pain and fatigue, psychological factors, depression and patients’ perceived knowledge of stroke reduced the life satisfaction of patients who had a stroke.

Life satisfaction may also be associated with the patient’s lifestyle, as lifestyle behaviour, including drinking, smoking, coffee intake, dietary habits, physical exercise and social activity, could to some extent lead to changes in quality of life. However, the current research regarding the association between the lifestyle behaviour and life satisfaction of patients after stroke is quite limited, although previous studies found that the social activities of patients after a stroke had a significant impact on their life satisfaction.

To date, research on life satisfaction of patients who had a stroke and their associated factors are mainly focused on the aspects of social demographic characteristics, disease situation or psychological changes, less on lifestyles and social activity. While previous studies have identified the impact of socioeconomic conditions like gender, age, education and income on the poststroke lifestyle, it is important to explore the associations between the lifestyle behaviour and life satisfaction of patients who had a stroke to provide the evidence base of improving life satisfaction through lifestyle interventions. This study will report the life satisfaction of middle-aged patients and elderly patients who had a stroke in China, and explore its association with patients’ sociodemographic characteristics, health status, lifestyles and family relationship. The research finding will be informative for the improvement of the poststroke rehabilitation care.

**METHODS**

**Data sources**

This study is based on the 2018 survey data of the CHARLS. The CHARLS is a large-scale interdisciplinary and nationally representative survey project, hosted by the National Development Research Institute of Peking University and jointly executed by the Chinese Social Science Research Center of Peking University and the Youth League Committee of Peking University. The survey aims to establish a high-quality microdatabase representing middle-aged and elderly residents in mainland China, which can provide a wide range of information from socioeconomic status to health status, to serve the needs of scientific and policy research on the elderly (online supplemental file 1). The national baseline data of CHARLS was conducted in 2011–2012, covering 28 provinces, 150 countries/districts and 450 village/urban communities, involving 17708 people in 10257 households, with wave 2 in 2013, wave 3 in 2015 and wave 4 in 2018. The survey in 2018 mainly covers: (1) cover-screening questions (to screen age-eligible members for a refresher sample and identify whether the main respondent divorces, remarries or dies so as to generate new questionnaire survey); (2) demographics; (3) family interactions; (4) health; (5) health insurance and healthcare utilisation; (6) work, retirement and pension; (7 and 8) income, expenditures and assets; (9) housing characteristics and the community and policy modules. The CHARLS survey is mainly conducted in the form of interview. In case of the respondent’s physical or cognitive impairment or inability to complete the investigation for other reasons, a proxy interview will be conducted. Most of the proxies are close family members of the respondents, such as spouses or children. In waves 4, the overall proxy rate was 8.1%.

**Study samples**

The selection of study samples is based on the questions in the questionnaire: The question ‘Have you been diagnosed with stroke by a doctor?’, which is mainly aimed at the new respondents, or those who did not have a stroke diagnosed by the doctor in the last wave of interview, and the respondents who answered ‘1 (yes)’ to this question were included in our study. We also included the respondents who had been diagnosed with stroke in the previous waves of survey which were already recorded in the wave 4 database. In total, we include 1372 patients diagnosed with stroke out of 19816 subjects in the 2018 round of investigation. After excluding the study participants who lacked the key variable of life satisfaction, 1154 valid samples were finally included in this study.

**Patient characteristics**

According to the research objectives, this paper selects the data from five sections of the questionnaire, including (1) demographics, (2) family interactions, (3) health, (4) health insurance and healthcare utilisation, (5) work, retirement and pension, and in total 26 variables are selected, such as gender, age, self-rated health, hypertension and smoking. These selected variables were further sorted into four aspects: sociodemographic characteristics, health status, lifestyles (including social activity) and
family relationship. In order to facilitate statistical analysis and interpretation, we recode some of the variables in the original questionnaire as necessary (online supplemental file 2).

Life satisfaction
Life satisfaction was assessed by a question from the questionnaire: How satisfied are you with your life-as-a-whole? The answer to this question consists of five options: (1) completely satisfied; (2) very satisfied; (3) somewhat satisfied; (4) not very satisfied and (5) not at all satisfied. Consistent with the previous study, we combined the response categories of 1, 2 and 3 as ‘satisfied’, while those of 4 and 5 as ‘not satisfied’. This classification was consistent with the Chinese semantic as the first three categories represent more positive response of life satisfaction, while the last two represent more negative response. As a one-dimensional assessment of the individual quality of life, life satisfaction is widely used in large-scale national surveys in China.

Statistical analysis
We used SPSS V.22.0 (SPSS) for data analysis. Descriptive statistics were conducted to understand the sociodemographic characteristics, health status, lifestyles and social activity, family relationships and the current situation of life satisfaction of patients who had a stroke in China. Then, χ² test was used for univariate analysis. In order to further explore the specific factors influencing the life satisfaction of patients who had a stroke, binary logistic regression was used for multivariable analysis. In this case, we did not look at relative contributions of different factors to the life satisfaction but examining a number of exposures individually to describe the potential relationships. The significant variables with p<0.2 resulting from the univariate analysis were included in logistic regression. We made sure to cover important variables such as gender, age, marital status, educational level, working ability, pain and social activities in the multivariable analysis. The results of regression analysis showed the adjusted OR values with 95% CI.

Patient and public involvement
We used the data from CHARLS 2018, which is a nationally representative longitudinal survey. Therefore, there was no direct participation of patients or the public in the design, implementation, reporting or dissemination of our research.

RESULTS
Sociodemographic characteristics and life satisfaction of patients who had a stroke
Table 1 shows the descriptive results of sociodemographic characteristics and the univariate analysis results of their relationship with life satisfaction. Of 1154 participants, 959 (83.1%) were satisfied with their lives, while 195 (16.9%) were not satisfied. Most (76.6%) of the participants were aged 60 or above, and 52.8% were males; 76.9% were married and lived with their spouse. They mainly resided in villages, accounting for 69.9% of the selected sample. 64.2% attended primary and secondary school, and 23.3% were illiterate. The vast majority of patients participated in health insurance or pension insurance (98.7%, 89%), and 76.3% had a personal income.

The univariate analysis showed that gender, age, marital status and participation in pension insurance had significant effects on the life satisfaction of patients who had a stroke (table 1). Specifically, male had higher life satisfaction than female (86.9% vs 78.9%, p<0.001), and the elderly were more likely to be satisfied with life (84.5% vs 78.5%, p=0.022). Patients having a stroke who were married and lived with their spouses had higher life satisfaction than those who did not (84.9% vs 77.2%, p=0.003); patients with pension insurance had higher life satisfaction (84% vs 75.6%, p=0.017).

Health status and life satisfaction of patients who had a stroke
The basic information of health status and the univariate analysis results of its relationship with life satisfaction are shown in table 2. In terms of self-rated health, only 8.7% thought they were good, 36.1% thought fair and more than half of patients thought poor. Only half (49.3%) of the patients were satisfied with their health. The majority (78.9%) of patients who had a stroke had two or more other chronic diseases. A total of 69.7%, 25.2%, 38.1% and 17.1% of patients had hypertension, diabetes, heart disease and chronic lung disease, respectively. 69.9% of the patients were receiving stroke treatment, 30.7% of the patients had fallen in the past year and 70.6% of the patients had physical pain symptoms. In terms of the ability to work, 36.6% of patients could work properly, while 31.5% of patients could not work for a long time due to physical reasons and 31.9% of patients were unable to work.

The univariate analysis showed that self-rated health, health satisfaction, chronic lung disease, fall, pain and the ability to work were significantly related to life satisfaction of patients who had a stroke (table 2). Patients who rated themselves with good or fair health were more satisfied with life than those who rated themselves as poor (92% vs 91.1% vs 76.5%, p<0.001). Patients who felt satisfied with their health status had higher life satisfaction (96.3% vs 70.3%, p<0.001). The presence of hypertension, heart disease and diabetes had no significant effect on life satisfaction (p>0.05). However, patients who had a stroke with chronic lung disease showed lower life satisfaction than those without chronic lung disease (76.1% vs 84.5%, p=0.004). Falling and physical pain symptoms may reduce patients’ life satisfaction (p=0.001; p<0.001). As far as work ability is concerned, the stronger the ability to work, the higher the life satisfaction (89.4% vs 83.5% vs 75.5%, p < 0.001).
Lifestyles and life satisfaction of patients who had a stroke

Table 3 shows the basic information of lifestyles and social activity and the univariate analysis results of its relationship with life satisfaction. A small proportion of patients (23.8%) had the habit of smoking, while the rest did not smoke or had quitted smoking. Those who drank alcohol accounted for 26.9%. Most (85.1%) had the habit of physical activity, while only half (50.8%) had social activities.

The univariate analysis showed that the patients who drank alcohol (86.8% vs 81.7%, p=0.041), had physical activity (84.4% vs 75.6%, p=0.004) and had social activity (85.3% vs 80.8%, p=0.041) might have a higher life satisfaction than those who did not. Smoking status variables had no significant effect on life satisfaction of patients who had a stroke (p>0.05).

Family relationships and life satisfaction of patients who had a stroke

The descriptive statistical results of family relationships are shown in table 4. In terms of the relationship with their spouse, 74.7% of the patients were satisfied, 10.9% were not satisfied, and 14.4% had no spouse. Most of the patients (65.8%) had three or fewer children, while the
The majority (92.7%) of patients were satisfied with the relationship with their children. Patients who were satisfied with their relationships with their spouses had the highest life satisfaction, followed by those who had no spouse and patients who were not satisfied with this relationship (89.7% vs 72.3% vs 52.4%, p < 0.001). Patients who were satisfied with their relationships with children also showed the highest satisfaction with life, followed by those who had no child, and patients who were not satisfied with this relationship (85.9% vs 54.5% vs 46.6%, p < 0.001). No significant correlation was found between the number of children and life satisfaction (p>0.05).

### Table 2 Health status and life satisfaction of patients who had a stroke in China

| Variable                  | Total   | Life satisfaction | Univariate analysis | χ²   | P value |
|---------------------------|---------|-------------------|---------------------|------|---------|
|                           |         | Satisfied         | Not satisfied       |      |         |
| Total                     | 1154    | 959 (83.1%)       | 195 (16.9%)         | 44.823 | <0.001* |
| Self-rated health         |         |                   |                     |      |         |
| Good                      | 100 (8.7%) | 92 (92.0%)       | 8 (8.0%)           |      |         |
| Fair                      | 415 (36.1%) | 380 (91.1%)   | 37 (8.9%)          |      |         |
| Poor                      | 637 (55.2%) | 487 (76.5%)       | 150 (23.5%)       |      |         |
| Health satisfaction       |         |                   |                     | 139.423 | <0.001 |
| Satisfied                 | 569 (49.3%) | 548 (96.3%)       | 21 (3.7%)         |      |         |
| Not satisfied             | 585 (50.7%) | 411 (70.3%)       | 174 (29.7%)       |      |         |
| Comorbid conditions       |         |                   |                     | 1.885 | 0.390   |
| 0                         | 61 (5.3%) | 52 (85.2%)        | 9 (14.8%)         |      |         |
| 1                         | 182 (15.8%) | 157 (86.3%)      | 25 (13.7%)        |      |         |
| ≥2                        | 911 (78.9%) | 750 (82.3%)       | 161 (17.7%)       |      |         |
| Hypertension              |         |                   |                     | 0.038 | 0.845   |
| 1                         | 804 (69.7%) | 667 (83.0%)      | 137 (17.0%)       |      |         |
| 0                         | 350 (30.3%) | 292 (83.4%)       | 58 (16.6%)        |      |         |
| Diabetes                  |         |                   |                     | 2.005 | 0.157   |
| 1                         | 291 (25.2%) | 234 (80.4%)      | 57 (19.6%)        |      |         |
| 0                         | 863 (74.8%) | 725 (84.0%)       | 138 (16.0%)       |      |         |
| Heart attack              |         |                   |                     | 0.184 | 0.668   |
| 1                         | 440 (38.1%) | 363 (82.5%)       | 77 (17.5%)        |      |         |
| 0                         | 714 (61.9%) | 596 (83.5%)       | 118 (16.5%)       |      |         |
| Chronic lung diseases     |         |                   |                     | 8.195 | 0.004   |
| 1                         | 197 (17.1%) | 150 (76.1%)       | 47 (23.9%)        |      |         |
| 0                         | 957 (82.9%) | 809 (84.5%)       | 148 (15.5%)       |      |         |
| Stroke treatment          |         |                   |                     | 0.055 | 0.815   |
| Yes                       | 807 (69.9%) | 672 (83.3%)       | 135 (16.7%)       |      |         |
| No                        | 347 (30.1%) | 287 (82.7%)       | 60 (17.3%)        |      |         |
| Fall down                 |         |                   |                     | 10.677 | 0.001  |
| Yes                       | 354 (30.7%) | 275 (77.7%)       | 79 (22.3%)        |      |         |
| No                        | 800 (69.3%) | 684 (85.5%)       | 116 (14.5%)       |      |         |
| Pain                      |         |                   |                     | 27.278 | <0.001 |
| Yes                       | 815 (70.6%) | 647 (79.4%)       | 168 (20.6%)       |      |         |
| No                        | 339 (29.4%) | 312 (92.0%)       | 27 (8.0%)         |      |         |
| Ability to work           |         |                   |                     | 26.811 | <0.001 |
| Unable to work            | 368 (31.9%) | 278 (75.5%)       | 90 (24.5%)        |      |         |
| Unable to work for a long time | 363 (31.5%) | 303 (83.5%) | 60 (16.5%)       |      |         |
| works properly            | 423 (36.7%) | 378 (89.4%)       | 45 (10.6%)        |      |         |

*There is statistical significance between ‘fair’ and ‘poor’, p<0.001; there is statistical significance between ‘good’ and ‘poor’, p<0.001.
Results of multivariable analysis

We included the variables with p<0.2 from the univariate analysis in the logistic regression analysis, which also covered those variables often discussed in the literature (Table 5). The regression analysis suggested that, age, health satisfaction, pain, ability to work, relationships with spouse and relationships with children were independent factors influencing life satisfaction of patients who had a stroke (Table 5). Elderly patients who had a stroke (≥60 years old) were more satisfied with life than middle-aged patients (<60 years old), OR=2.098 (95% CI 1.268 to 3.471). Patients who had a stroke who reported being satisfied with their health were 7.986 times more likely to report being satisfied with their lives than those who reported being ‘not satisfied’ with their health (95% CI 4.569 to 13.959). Patients with pain symptoms were more likely to express dissatisfaction with life than those without pain symptoms (OR=0.427, 95% CI 0.255 to 0.713). Compared with patients with ‘unable to work’, patients with ‘unable to work for a long time’ had higher life satisfaction (OR 1.618, 95% CI 1.025 to 2.556). Patients who were satisfied with the relationships with their spouses were 5.120 times more likely to be satisfied with their lives, than those who reported ‘not satisfied’ with their spouses (95% CI 3.126 to 8.384). Similarly, patients who were ‘satisfied’ with their children had

Table 3  Lifestyles and life satisfaction of patients who had a stroke in China

| Variable           | Total | Life satisfaction | Univariate analysis |
|--------------------|-------|-------------------|---------------------|
|                    |       | Satisfied         | Not satisfied       | $\chi^2$ | P value |
| Total              | 1154  | 959 (83.1%)       | 195 (16.9%)         |         |         |
| Smoke              |       |                   |                     |         |         |
| Yes                | 275 (23.8%) | 227 (82.5%) | 48 (17.5%) | 0.080  | 0.778   |
| No                 | 879 (76.2%) | 732 (83.3%) | 147 (16.7%) |         |         |
| Drink              |       |                   |                     |         |         |
| Yes                | 311 (26.9%) | 270 (86.8%) | 41 (13.2%) | 4.183  | 0.041   |
| No                 | 843 (73.1%) | 689 (81.7%) | 154 (18.3%) |         |         |
| Physical activity  |       |                   |                     |         |         |
| Yes                | 982 (85.1%) | 829 (84.4%) | 153 (15.6%) | 8.142  | 0.004   |
| No                 | 172 (14.9%) | 130 (75.6%) | 42 (24.4%) |         |         |
| Social activity    |       |                   |                     |         |         |
| Yes                | 586 (50.8%) | 500 (85.3%) | 86 (14.7%) | 4.186  | 0.041   |
| No                 | 568 (49.2%) | 459 (80.8%) | 109 (19.2%) |         |         |

Table 4  Family relationship and life satisfaction of patients who had a stroke in China

| Variable               | Total | Life satisfaction | Univariate analysis |
|------------------------|-------|-------------------|---------------------|
|                       |       | Satisfied         | Not satisfied       | $\chi^2$ | P value |
| Total                  | 1154  | 959 (83.1%)       | 195 (16.9%)         |         |         |
| No of children         |       |                   |                     |         |         |
| 0                      | 10 (0.9%) | 6 (60.0%) | 4 (40.0%) | 3.938  | 0.140   |
| ≤3                     | 749 (64.9%) | 622 (83.0%) | 127 (17.0%) |         |         |
| >3                     | 395 (34.2%) | 331 (83.8%) | 64 (16.2%) |         |         |
| Relationships with spouses |       |                   |                     |         |         |
| Satisfied              | 862 (74.7%) | 773 (89.7%) | 89 (10.3%) | 125.028<0.001 |
| Not satisfied          | 126 (10.9%) | 66 (52.4%) | 60 (47.6%) |         |         |
| No spouse              | 166 (14.4%) | 120 (72.3%) | 46 (27.7%) |         |         |
| Relationships with children |       |                   |                     |         |         |
| Satisfied              | 1070 (92.7%) | 919 (85.9%) | 151 (14.1%) | 81.660<0.001* |
| Not satisfied          | 73 (6.3%) | 34 (46.6%) | 39 (53.4%) |         |         |
| No children            | 11 (1.0%) | 6 (54.5%) | 5 (45.5%) |         |         |

*There is statistical significance between ‘satisfied’ and ‘not satisfied’, p<0.001; there is statistical significance between ‘satisfied’ and ‘no children’, p<0.05.
Table 5  Multivariable analysis of life satisfaction of patients who had a stroke in China

| Variable                                      | B     | SE    | Wald   | P value | OR   | 95% CI        |
|-----------------------------------------------|-------|-------|--------|---------|------|---------------|
| **Sociodemographic characteristics**          |       |       |        |         |      |               |
| Gender                                        | −0.191| 0.214 | 0.795  | 0.373   | 0.826| 0.543 to 1.257|
| Age                                           | 0.741 | 0.257 | 8.314  | 0.004   | 2.098| 1.268 to 3.471|
| Marital status                                | 0.032 | 0.347 | 0.008  | 0.928   | 1.032| 0.523 to 2.037|
| Education*                                    |       |       |        |         |      |               |
| Illiterate                                    | 0.052 | 0.386 | 0.018  | 0.892   | 1.054| 0.494 to 2.246|
| Primary and secondary                         | −0.194| 0.330 | 0.346  | 0.556   | 0.824| 0.432 to 1.572|
| Pension                                       | 0.393 | 0.286 | 1.889  | 0.169   | 1.482| 0.846 to 2.597|
| Personal income                               | −0.190| 0.255 | 0.456  | 0.502   | 0.827| 0.502 to 1.363|
| **Health status**                             |       |       |        |         |      |               |
| Self-rated health†                            |       |       |        |         |      |               |
| Good                                          | −0.603| 0.493 | 1.495  | 0.221   | 0.547| 0.208 to 1.438|
| Fair                                          | 0.244 | 0.250 | 0.953  | 0.329   | 1.276| 0.782 to 2.081|
| Health satisfaction                           | 2.078 | 0.285 | 53.169 | < 0.001 | 7.986| 4.569 to 13.959|
| Diabetes                                      | −0.150| 0.212 | 0.479  | 0.494   | 0.860| 0.568 to 1.304|
| Chronic lung diseases                         | −0.216| 0.227 | 0.340  | 0.505   | 0.805| 0.517 to 1.256|
| Fall down                                     | −0.182| 0.199 | 0.838  | 0.360   | 0.834| 0.565 to 1.230|
| Pain                                          | −0.852| 0.262 | 10.581 | 0.001   | 0.427| 0.255 to 0.713|
| Ability to work‡                              |       |       |        |         |      |               |
| Unable to work for a long time                | 0.481 | 0.233 | 4.266  | 0.039   | 1.618| 1.025 to 2.556|
| Works properly                                | 0.192 | 0.266 | 0.521  | 0.470   | 1.212| 0.719 to 2.044|
| **Lifestyles**                                |       |       |        |         |      |               |
| Drink                                         | 0.013 | 0.245 | 0.003  | 0.959   | 1.013| 0.627 to 1.636|
| Physical activity                             | 0.126 | 0.253 | 0.246  | 0.620   | 1.134| 0.690 to 1.863|
| Social activity                               | 0.264 | 0.200 | 1.747  | 0.186   | 1.303| 0.880 to 1.928|
| **Family relationship**                       |       |       |        |         |      |               |
| No of children§                               |       |       |        |         |      |               |
| 0                                             | 0.683 | 2.255 | 0.092  | 0.762   | 1.980| 0.024 to 164.381|
| ≤3                                            | −0.064| 0.217 | 0.087  | 0.768   | 0.938| 0.614 to 1.434|
| Relationships with spouses¶                   |       |       |        |         |      |               |
| Satisfied                                     | 1.633 | 0.252 | 42.115 | < 0.001 | 5.120| 3.126 to 8.384|
| No spouse                                     | 0.654 | 0.417 | 2.460  | 0.117   | 1.923| 0.849 to 4.355|
| Relationships with children**                 |       |       |        |         |      |               |
| Satisfied                                     | 1.361 | 0.314 | 18.786 | < 0.001 | 3.900| 2.108 to 7.217|
| No children                                   | −0.029| 2.153 | 0.000  | 0.989   | 0.972| 0.014 to 66.117|

*Comparison with ‘high school and above’.  
†Comparison with ‘poor’.  
‡Comparison with ‘unable to work’.  
§Comparison with ‘> 3’.  
¶Comparison with ‘not satisfied’.  
**Comparison with ‘not satisfied’.
higher life satisfaction than those who were ‘not satisfied’ with their children (OR 3.900, 95% CI 2.108 to 7.217).

**DISCUSSION**

Overall, 83.1% of patients who had a stroke report satisfaction with their lives, although only 8.7% rated their own health as being good and nearly 80% of patients who had a stroke had two or more other chronic diseases and only half had social activities. Our study shows that the sociodemographic characteristics, health status, lifestyles and social activity and family relationships of patients who had a stroke had significant impacts on their life satisfaction.

Consistent with other studies, we found that about 71% of the patients in this study had pain symptoms. We also found that patients who had a stroke had poor self-reported health status, low health satisfaction and decreased ability to work, which was consistent with other related studies. Our study found that the proportion of patients who had a stroke who smoked and drank were 23.8% and 26.9%, respectively, lower than that of the middle-aged and elderly Chinese population (using 2015 CHARLS samples, 45.7%, 46.2%). This may be because after diagnosis of stroke, patients will follow the doctor’s advice or quit smoking and drinking to seek a better health condition. Consistent with other studies, we also found limited physical and social activities in middle-aged and older patients who had a stroke, probably due to a series of physical, psychological and cognitive impairments after a stroke. In our study, the majority of patients who had a stroke were satisfied with their relationships with their spouses and children, which may be due to the fact that the patients were well taken care of in the family, thanks to the Confucian and filial piety culture in China.

Our univariate analysis showed that male had higher life satisfaction than female, consistent with other studies in China, but inconsistent with studies from other countries. Consistent with other studies, our study also found that older adults had significantly higher levels of life satisfaction among patients who had a stroke than middle-aged people. The ‘happiness paradox’ theory may partly explain, which holds that older people tend to maintain high levels of subjective well-being in the face of different challenges. Consistent with other studies, our univariate analysis found that married patients reported higher life satisfaction than unmarried, divorced or widowed patients. Patients with pension insurance had better life satisfaction than unmarried, divorced or widowed patients. Patients with pension insurance had better life satisfaction than those who were ‘not satisfied’

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of patients who had a stroke) were excluded from analysis due to the lack of data on life satisfaction, which may cause the deviation of our results. In order to estimate any potential bias arising from this, we conducted a sensitivity analysis. We compared the sociodemographic characteristics between the 218 patients who had a stroke missing from the study (group 1) and 1154 patients who had a stroke included into this study (group 2). Compared with group 2, group 1 accounted for a higher proportion of women (54.6% vs 47.2%), the elderly (88.1% vs 76.6%), those who were married but not living with spouse, divorced, widowed or never married (38.1% vs 23.1%), illiterate (39.4% vs 23.3%) and had higher personal income (85.8% vs 76.3%) (p<0.05) (online supplemental table S1). These differences may lead to the bias of the estimated life satisfaction of patients who had a stroke. Although the effect size of its impact is uncertain, the influence of these factors on life satisfaction has been well documented. In addition, the sex ratio of 1154 patients who had a stroke (52.8% vs 47.2%) were consistent with those of patients who had a stroke in China (55% vs 45%). This may indicate the reduced bias due to exclusion of the patients who had a stroke with missing data, in addition to the relatively larger sample size include into this study. Despite these limitations, our study provides a general picture of the life satisfaction of the patients who had a stroke, and their potential corelationships with sociodemographic characteristics, health status, lifestyles and family relationships.

In conclusion, although we found a generally high satisfaction about life among the middle-aged and elderly patients who had a stroke, this is not consistent with their poorly perceived health status, poor health conditions and lower level of physical and social activities. While our study suggests the increased attention should be paid to improve the overall health of the patients after a stroke, it specially indicates the importance of mediating factors like health satisfaction, pain management, work ability and spouse and children relationship in improving and maintaining the life satisfaction of patients in the post-stroke rehabilitation.

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Contributors GZ and YL conceived the study, YL conducted the data acquisition, YL and YY analysed the data, GZ and XX interpreted the data, YL and GZ drafted the manuscript, SZ, YC and JL critically revised the paper. All authors reviewed and approved the final draft. GZ is the guarantor of this work.

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Patient consent for publication Not applicable.

Ethics approval Ethical approval for all the CHARLS waves was granted from the Institutional Review Board at Peking University. The IRB approval number for the main household survey, including anthropometrics, is IRB00001052-11015; the IRB approval number for biomarker collection, was IRB00001052-11014. During the fieldwork, each respondent who agreed to participate in the survey was asked to sign two copies of the informed consent. Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available in a public, open access repository. Data are available in a public, open access repository. All of the data are accessible to researchers around the world at the CHARLS project website: http://charsl.pku.edu.cn/en/

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