Association of empty nest with depressive symptom among Chinese elderly population

The China Longitudinal Aging Social Survey

Pianpian Zheng, PhD Candidate, Hanmo Yang, PhD, Zhenjie Wang, PhD*

Abstract
Currently, empty nest has become one type of the family pattern among the old population and it influences the old population’s mental health. The current study aimed to explore the association between the empty nest and depressive symptoms (DSs) among the elderly population in China. Data were obtained from baseline of the China Longitudinal Aging Social Survey. Logistic regression was used to examine the association between the empty nest and DS among Chinese older adults. In the current study, 48% of the subjects were empty-nest elderly. The prevalence of DS was 43.7% among the empty-nest old population, which was higher than the nonempty nesters. A positive association was found between the empty nest and DS; the odds ratio (95% confidence interval) was 1.28 (1.16–1.42). No matter living with a spouse or living alone, empty nesters were more likely to have DS than nonempty nesters. Empty nest is a risk factor for having DS among the old population in China, especially among those who live without a spouse. Our result is valuable for the development of special family support DS prevention programs for those who were empty nest.

Abbreviations: CLASS = China Longitudinal Aging Social Survey, CES-D = Center for Epidemiological Studies Depression Scale, OR = odds ratio.

Keywords: China, depressive symptoms, empty nest, older adults

1. Introduction
The characteristics of depressive symptoms (DSs) are symptoms of sadness, depressed mood, and loss of interest, especially for the old population. People with DS are more likely to have a low quality of life, chronic diseases, and engage in suicide. DS brings a heavy burden on families, communities, and health care services across the world. The prevalence rate of DS varied widely from 1% to 16% in developed countries. Recently, the prevalence rate of DS has been increasing rapidly among elderly people in China. Empty nest has become one of the main family patterns in China. Nearly half of the entire older population was empty-nest older adults in 2010. The estimated percentage of empty nest among the old population can research by Chinese older people usually have a strong connection with their adult children through emotional dependence. Old adults will become frustrated, lonely, depressed, and anxious when their children live without their parents. Few epidemiologic studies provide evidence on the empty nest with DS risk among the Chinese older population. Therefore, we investigated the association between the empty nest and DS risk using data from the Chinese Longitudinal Aging Social Survey (CLASS) in China.

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Informed consent was obtained in the study from the research participants. The authors have no conflicts of interest to disclose.

All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The survey was also conducted within Articles 38, 39, and 40 of the Constitution of the People’s Republic of China and the legal framework governed by Chapter I, Article 9 from the Statistics Law of the People’s Republic of China. Therefore, the study was not reviewed by an ethics committee. Verbal informed consent was obtained from all individual participants included in the study. The design of this survey was adhered to Articles 38, 39, and 40 of the Constitution of the People’s Republic of China and the legal framework governed by Chapter I, Article 9 from the Statistics Law of the People’s Republic of China. Verbal informed consent was considered acceptable and this was not reviewed by an ethics committee. Moreover, the interviewer also had documented more detailed information on the process of obtaining informed consent, which included whether participants agreed to attend this study, the time of agreement, the reasons for not agreeing, etc. Details of informed consent were stored by the Institute of Gerontology and the National Survey Research Center at Renmin University of China.

*Correspondence: Zhenjie Wang, Institute of Population Research, Peking University, Haidian District, Beijing, People’s Republic of China. (e-mail: zhenjie.wang@pku.edu.cn).
2. Methods

2.1. Study sample

Details of the CLASS design and conduct were described elsewhere.[21] In the present study, the sample comprised 7496 subjects aged ≥60 years who completed the survey on DS and other independent variables of interest, including demographic variables, health, health care services, socioeconomic variables, and social support. All of the participants were interviewed face-to-face by trained interviewers. During the interview, interviewers were asked to choose a neutral and quiet environment and avoid the presence of people or other distractions.

2.2. Measurement

DSs were assessed using the 9-item Center for Epidemiological Studies Depression Scale (CES-D), which includes 3 items assessing positive feelings, 2 items assessing negative emotions, 2 items assessing somatic symptoms, and 2 items assessing the sense of marginalization. The 9-item CES-D is reliable and valid for detecting nonpsychotic mental disorders among older Chinese adults.[22] Each item either had a score of 0 (rarely or never) or 1 (some of the time), or 2 (most of the time), with the total score ranging from 0 to 18. By reversing the coding of the positive effect items, the result was that higher scores indicated a higher level of DSs. The total score of 18 was divided by 60 (the total possible score on the full 20-item CES-D), which equals 0.3.[23] This result was then multiplied by 16, resulting in a standardized cut score of 4.8 for the 9-item form of the CES-D. In this study, the internal Cronbach alpha for the 9 items was 0.75.

Whether or not a participant had an “empty nest” was determined by responses to the following questions: how many people lived with you in your house in the past year? If the answer was not 0, the participants were then asked whether they were the spouse, a child, or “other.” Older adults who lived alone or with a spouse only were defined as empty-nest older adults; otherwise, they were defined as nonempty nest older adults. In the current study, living arrangements were categorized into nonempty nest, empty nest-living with a spouse, and empty nest-living alone.

The following socioeconomic characteristics were included in our study: age (60–64, 65–69, 70–74, 75–79, ≥80), gender (male, female), residence (rural, urban), marital status (married, widowed/divorced/never-married), education level (junior high school and above, primary school, never attended school), and ethnicity (Han, other). Income was categorized into 5 levels using the quintiles of household income (Yuan) (Q1: ≤3000, Q2: >3000 and ≤10,000, Q3: >10,000 and ≤24,000, Q4: >24,000 and ≤36,000, Q5: >36,000). We dichotomized physical disability status, which was assessed by using the 10-item version of the activities of daily living scale, into 2 groups (no functional problems = 0, has at least 1 limitation = 1).[24] The participants were also asked whether they had any of the 23 chronic diseases (yes, no), including hypertension, diabetes mellitus, arthritis, cerebrovascular disease, liver disease, and so on. The number of comorbid chronic diseases was further categorized into 0, 1, and ≥2.

2.3. Statistical analysis

All data were shown as numbers (percentage). The difference between with/without DSs was tested by the χ² test and Fisher’s χ² test with proportions. Logistic regression was used to evaluate the association between having an empty nest and DSs. Odds ratios (ORs), 95% confidence intervals (95% CIs), and corresponding P values for risk of having DSs were calculated. Covariates in logistic regressions were age groups, gender, residence, marital status, education level, ethnicity, wealth quantile, physical disability, and number of comorbid chronic diseases.

3. Results

Selected characteristics of subjects with/without DSs stratified by empty-nest status are presented in Table 1. Around 48% of the current subjects were empty nesters. The prevalence of DS among the empty nest Chinese old population was higher than those who were nonempty nest Chinese old population (P = .049). As compared with the without DS, the old population with DS were significantly different among men, not among empty nest or nonempty nest. Intake of n-3 PUFA was slightly lower in the cases than in the controls in men, and intake of retinol was lower in the cases than in the controls in women. In the current study, male subjects, urban residents, people living with others, and Han nationality accounted for the majority of the old Chinese population.

The associations of the empty nest with DS risk are presented in Table 2. Empty nest was a risk factor for DS among the old Chinese population after adjustment for the confounding factors (P < .001). Age and gender (interaction P = .98) did not modify the association with DS. We further analyzed the association between the different living arrangements of the empty nest and DS risks (Table 3). After controlling for confounding factors, empty nest-living with a spouse (OR: 1.14, 95% CI: 1.02–1.29) and empty nest-living alone (OR: 1.65, 95% CI: 1.39–1.95) were associated with having DSs.

4. Discussion

Overall, the percentage of empty nesters was 48% in the current study. The prevalence of DSs was 43.7% among the empty-nest old population, which was higher than the prevalence of DS among nonempty-nest old population. The result shows that living arrangement is a determinant of having DS among the old Chinese population.

Due to the inconsistent criteria of the measuring tools used and differences in sample sizes, previous studies suggested that the prevalence rate of DS among older adults varied from 6.4% to 60.3%.[25,26] A meta-analysis estimated the prevalence of DS to be 23.6% in the older adult Chinese population and it has been increasing significantly.[13] The prevalence found in our study was higher than in an observational study among the empty-nest old population in China.[19] Currently, more and more adult children choose to leave their parents’ homes; thus empty-nest family is becoming the main family pattern in China, which is weakening family ties and influencing the traditional family patterns. In the current study, we found a significantly positive association between the empty nest and DS, which hinted that the empty nest might trigger DSs among elderly.

Family members play an important role in maintaining mental health among the old population by providing emotional support.[27] Elderly who live with their children can receive more instrumental help, thus in turn, better health.[28] Empty nest elderly experienced deteriorated health problems and economic difficulties,[29] poor health-related quality of life,[30,31] and subjective well-being.[32] A case indicated that empty-nest elderly faced social exclusion risk, weakened social relationships, limited participation in social activities, restricted basic services, and so on.[33] Because Chinese people put a high value on the notion of raising children for the purpose of being looked after in old age, older people have a strong emotional dependence and high expectations from their adult children.[34] After children left home, many elderly parents would feel lonely, while loneliness was found to be associated with depression in many studies.[17,35]

Empty nesters were more likely to have DS in the current study, whether those living with a spouse or living alone. After children leave home, the traditional and primary support for the aged would be weakened. Compared with empty-nest elderly who lived with a spouse, the empty-nest elderly who lived without spouse had increased risk of DS by 45%. It
Table 1
Subjects’ characteristics by their depression status according to the 9-item CES-D among elder population in China.

| Characteristics                      | Empty nest Without depressive symptoms (n = 2021) | Empty nest With depressive symptoms (n= 1568) | P value | Nonempty nest Without depressive symptoms (n = 2288) | Nonempty nest With depressive symptoms (n = 1619) | P value |
|--------------------------------------|--------------------------------------------------|---------------------------------------------|---------|---------------------------------------------------|--------------------------------------------------|---------|
| Age groups (yr), n (%)               | 648 (58.3)                                       | 464 (41.7)                                  | .01     | 955 (61.3)                                        | 604 (38.7)                                      | <.001   |
|                                      | 65–69                                            | 458 (55.3)                                  |         | 530 (61.4)                                        | 333 (38.6)                                      |         |
|                                      | 70–74                                            | 430 (60.1)                                  |         | 336 (60.3)                                        | 261 (43.7)                                      |         |
|                                      | 75–79                                            | 278 (62.3)                                  |         | 254 (47.7)                                        | 217 (46.3)                                      |         |
|                                      | ≥80                                              | 207 (51.8)                                  |         | 193 (48.3)                                        | 204 (48.7)                                      |         |
| Gender, n (%)                        |                                                 |                                             | .01     |                                                  |                                                 | <.001   |
| Male                                 | 1159 (58.1)                                      | 835 (41.9)                                  |         | 1265 (61.5)                                      | 791 (38.5)                                      |         |
| Female                               | 862 (54.0)                                       | 733 (46.0)                                  |         | 1023 (55.3)                                      | 828 (44.7)                                      |         |
| Residence, n (%)                     |                                                 |                                             | <.001   |                                                  |                                                 | <.001   |
| Rural                                | 526 (44.6)                                       | 653 (55.4)                                  |         | 681 (50.7)                                        | 662 (49.3)                                      |         |
| Urban                                | 1495 (62.0)                                      | 915 (38.0)                                  |         | 1607 (62.7)                                      | 957 (37.3)                                      |         |
| Marital status, n (%)                |                                                 |                                             | <.001   |                                                  |                                                 | <.001   |
| Married                              | 1677 (60.3)                                      | 1103 (39.7)                                 |         | 1639 (63.7)                                      | 935 (36.3)                                      |         |
| Widowed/divorced/unmarried           | 344 (42.5)                                       | 465 (57.5)                                  |         | 649 (48.7)                                        | 684 (51.3)                                      |         |
| Education level, n (%)              |                                                 |                                             | <.001   |                                                  |                                                 | <.001   |
| Never attended school                | 279 (42.0)                                       | 385 (58.0)                                  |         | 372 (46.3)                                        | 431 (53.7)                                      |         |
| Primary school                       | 579 (49.6)                                       | 589 (50.4)                                  |         | 830 (55.1)                                        | 677 (44.9)                                      |         |
| Junior high school and above         | 1163 (66.2)                                      | 594 (33.8)                                  |         | 1086 (68.0)                                      | 511 (32.0)                                      |         |
| Ethnicity, n (%)                     |                                                 |                                             | .77     |                                                  |                                                 | .18     |
| Han                                  | 1941 (56.4)                                      | 1499 (43.6)                                 |         | 2133 (58.9)                                      | 1491 (41.1)                                     |         |
| Others                               | 80 (53.7)                                        | 69 (46.3)                                   |         | 155 (54.8)                                        | 126 (45.2)                                      |         |
| Physical disability, n (%)           |                                                 |                                             | <.001   |                                                  |                                                 | <.001*  |
| No function problems                 | 1931 (58.4)                                      | 1374 (41.6)                                 |         | 2176 (61.2)                                      | 1377 (38.8)                                     |         |
| One and more functioning limitations  | 90 (31.7)                                        | 194 (68.3)                                  |         | 112 (31.6)                                        | 242 (68.4)                                      |         |
| Wealth quantile, n (%)               |                                                 |                                             | <.001   |                                                  |                                                 | <.001   |
| Q1 (lowest)                         | 241 (36.7)                                       | 415 (63.3)                                  |         | 450 (46.9)                                        | 510 (53.1)                                      |         |
| Q2                                   | 333 (47.2)                                       | 373 (52.8)                                  |         | 361 (51.2)                                        | 344 (48.8)                                      |         |
| Q3                                   | 466 (59.4)                                       | 318 (40.6)                                  |         | 600 (60.8)                                        | 397 (39.2)                                      |         |
| Q4                                   | 508 (64.9)                                       | 275 (35.1)                                  |         | 494 (66.9)                                        | 245 (33.2)                                      |         |
| Q5 (highest)                        | 473 (71.7)                                       | 187 (28.3)                                  |         | 383 (74.2)                                        | 133 (25.8)                                      |         |
| No. of comorbid chronic disease, n (%)|                                                 |                                             | <.001   |                                                  |                                                 | <.001   |
| 0                                    | 692 (72.5)                                       | 262 (27.5)                                  |         | 771 (72.7)                                        | 289 (27.3)                                      |         |
| 1                                    | 593 (57.8)                                       | 433 (42.2)                                  |         | 714 (59.6)                                        | 484 (40.4)                                      |         |
| ≥2                                   | 736 (45.7)                                       | 873 (54.3)                                  |         | 803 (48.7)                                        | 846 (51.3)                                      |         |

CES-D = Center for Epidemiological Studies Depression Scale.
*Fisher exact test.
Table 2

Association between empty nest and depressive symptom in all participants.

| Model   | OR     | 95% CI       | P value |
|---------|--------|--------------|---------|
| Model A | 1.10   | 1.00–1.20    | 0.049   |
| Model B | 1.09   | 0.99–1.20    | 0.056   |
| Model C | 1.28   | 1.16–1.41    | <.001   |
| Model D | 1.28   | 1.16–1.42    | <.001   |

Model A was the basic model and did not adjust any variable. Model B was adjusted for age groups and gender. Model C was adjusted for variables in model B plus residence, marital status, education level, ethnicity, and wealth quintile. Model D was adjusted for variables in model C plus physical disability and number of comorbid chronic disease.

CI = confidence interval; OR = odds ratio.

Table 3

Association of empty nest in different living arrangement with depressive symptom.

| Nonempty nest | Crude OR (95% CI) | Adjusted OR (95% CI) | P value |
|---------------|-------------------|----------------------|---------|
| Empty nest living with spouse | 0.90 (0.82–0.996) | 1.14 (1.02–1.29) | <.001 |
| Empty nest living alone | 1.91 (1.65–2.21) | 1.65 (1.39–1.95) | <.001 |

Adjusted for age groups, gender, residence, marital status, education level, ethnicity, wealth quintile, physical disability, and number of comorbid chronic disease.

CI = confidence interval; OR = odds ratio.

suggested that to prevent the consequences of mental disorders and to improve the quality of life for the elderly, the screening and treatment of DS should be strengthened in empty-nest elderly.

Our study has many strengths, including large sample size, a population-based design, and adjustment for a wide range of socioeconomic characteristics. Another noticeable strength is that the measure of all physical illnesses took place prior to the CES-D measurement, minimizing the risk of reverse causation. However, our study also has several limitations, which should be a consideration for future research. The cross-sectional design of the baseline of the CLASS does not provide sufficient information on evaluating interpersonal relationships, which should be cautioned for further study.

5. Conclusions

In this large population-based study among older Chinese population, we found that 43.7% of the empty-nest elderly have DS. Family members should be encouraged to care more about their parents and keep in contact with the empty-nest elderly as much as possible to improve their mental health.\(^{(18)}\) In addition, developing healthy lifestyle is essential for easing depression. In this way, depression in empty nesters will be relieved and their mental health will improve. The findings of our study are valuable for the development of prevention programs, especially for those who were empty-nest older adults.

Author contributions

Conceptualization: Zhenjie Wang.

Formal analysis: Zhenjie Wang, Pianpian Zheng.

Methodology: Zhenjie Wang, Pianpian Zheng, Hanmo Yang.

Supervision: Zhenjie Wang.

Writing – original draft: Zhenjie Wang, Pianpian Zheng.

Writing – review & editing: Pianpian Zheng, Hanmo Yang.

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References

[1] Whiteford HA, Ferrari AJ, Degenhardt L, et al. Global Burden of Mental, Neurological, and Substance Use Disorders: an Analysis from the Global Burden of Disease Study 2010. PLoS One. 2015;10:e0116820.

[2] Hyman S, Chisholm D, Kessler R, Patel V, Whiteford, H. Mental disorders. Disease Control Priorities Related to Mental, Neurological, Developmental and Substance Abuse Disorders. New York; Oxford University Press: 2006.

[3] Smith K. Mental health: a world of depression. Nature. 2014;515:180;181–181.

[4] Hsu YT, Liao GC, Chang SN, et al. Increased risk of depression in patients with Parkinson disease: a nationwide cohort study. Am J Geriatr Psychiatry. 2015;23:934–40.

[5] Ayerbe L, Ayis S, Wolfe CD, et al. Natural history, Predictors and outcomes of depression after stroke: systematic review and meta-analysis. Br J Psychiatry. 2013;202:14–21.

[6] Cuijpers P, Vogelzangs N, Twisk J, et al. Comprehensive meta-analysis of excess mortality of depression in the general community versus patients with specific illnesses. Am J Psychiatry. 2014;171:453–62.

[7] World Health Organization. Depression—a global public health concern. Published 2012. https://www.researchgate.net/publication/285075782_Depression_A_global_public_health_concern [access date June 14, 2018].

[8] Walker ER, McGee RE, Druss BG. Mortality in mental disorders and global disease burden implications: a systematic review and meta-analysis. JAMA Psychiatry. 2015;72:334–41.

[9] Wilhelm K, Mitchell P, Slade T, et al. Prevalence and correlates of DSM-IV major depression in an Australian national survey. J Affect Disord. 2003;75:153–62.

[10] Wäräich P, Goldner EM, Somers JM, et al. Prevalence and incidence studies of mood disorders: a systematic review of the literature. Can J Psychiatry. 2004;49:124–38.

[11] Djernes JK. Prevalence and predictors of major depression in empty nest elderly: a review. Acta Psychiatr Scand. 2006;113:372–87.

[12] Chen R, Copeland JR, Wei L. A meta-analysis of epidemiological studies in depression of older people in the People’s Republic of China. Int J Geriatr Psychiatry. 1999;14:821–30.

[13] Li D, Zhang DJ, Shao JF, et al. A meta-analysis of the prevalence of depressive symptoms in Chinese older adults. Arch Gerontol Geriatr. 2014;58:1–9.

[14] Zhang L, Xu Y, Nie H, et al. The prevalence of depressive symptoms among the older in China: a meta-analysis. Int J Geriatr Psychiatry. 2012;27:900–6.

[15] Wu QZ, Sun L, Sun YH, et al. Correlation between loneliness and social relationship among empty nest elderly in Anhui rural area, China. Aging Ment Health. 2010;14:108–12.

[16] Xie LQ, Zhang J, Peng F, et al. Prevalence and related influencing factors of depressive symptoms for empty-nest elderly living in the rural area of Yong Zhou, China. Arch Gerontol Geriatr. 2010;50:24–9.

[17] Lu IJ, Guo Q. Loneliness and health-related quality of life for the empty nest elderly in the rural area of a mountainous county in China. Qual Life Res. 2007;16:1275–80.

[18] Wang Z, Shu D, Dong B, et al. Anxiety disorders and its risk factors among the Sichuan empty-nest older adults: a cross-sectional study. Arch Gerontol Geriatr. 2013;56:298–302.

[19] Zhai Y, Yi H, Shen W, Xiao Y, Fan H. Association of empty nest with depressive symptom in a Chinese elderly population: a cross-sectional study. J Affect Disord. 2015;187:218–23.
[20] Wang J, Chen T, Han B. Does co-residence with adult children associate with better psychological well-being among the oldest old in China? Aging Ment Health. 2014;18:232–9.
[21] Guo Q, Bai X, Feng N. Social participation and depressive symptoms among Chinese older adults: a study on rural-urban differences. J Affect Disord. 2018;239:124–30.
[22] Merril S, Zhen C, Li S. Intergenerational transfers and living arrangements of older people in rural China: consequences for psychological wellbeing. J Gerontol. 2006;61:S256–66.
[23] Kobouh EFJ, Berkman LF, Evans DA, et al. Two shorter forms of the CES-D depression symptoms index. J Aging Health. 1993;5:179–93.
[24] Feng Q, Zhen Z, Gu D, et al. Trends in ADL and IADL disability in community-dwelling older adults in Shanghai, China, 1998–2008. J Gerontol. 2013;68:476–83.
[25] Chen J, Zhang LM, Gao L. Depressive symptom and its influence factor in urban old adults in Wuhan. Chinese J Gerontol. 2007;27:275–6.
[26] Jia LN, Zhuang HL, Wang XY, et al. Depression status of the elderly and its relationship with quality of life in community of Fuzhou city. Chinese J Gerontol. 2011;30:970–3.
[27] Su D, Wu XN, Zhang YX, et al. Depression and social support between China rural and urban emptynest elderly. Arch Gerontol Geriatr. 2012;55:564–9.
[28] Zunzunegui MV, Beland F, Otero A. Support from children, living arrangements, self-rated health and depressive symptoms of older people in Spain. Int J Epidemiol. 2001;30:1090–9.
[29] Ma Y, Fu H, Wang JJ, et al. Study on the prevalence and risk factors of depressive symptoms among ‘empty-nest’ and ‘non-empty-nest’ elderly in four provinces and cities in China. Zhonghua Liu Xing Bing Xue Za Zhi. 2012;33:478–82.
[30] Lv XL, Jiang YH, Sun YH, et al. Short Form 36-Item Health Survey test result on the empty nest elderly in China: a meta-analysis. Arch Gerontol Geriatr. 2013;56:291–7.
[31] Wang H, Chen K, Zhou B, et al. Study on social determinants and health-related quality of life among the “empty nest” (lonely) elderly Chinese people. Zhonghua Liu Xing Bing Xue Za Zhi. 2010;31:400–4.
[32] Zhou Y, Zhou L, Fu C, et al. Socioeconomic factors related with the subjective well-being of the rural elderly people living in dependently in China. Int J Equity Health. 2015;14:5.
[33] Yuan R, Ngai SS. Social exclusion and neighborhood support: a case study of empty-nest elderly in urban Shanghai. J Gerontol Social Work. 2012;55:587–608.
[34] Zehbhauser A, Baumert J, Emeny RT, et al. What prevents old people living alone from feeling lonely? Findings from the KORA-age-study. Aging Mental Health. 2015;19:773–80.
[35] Wang JK, Zhao XD. Family functioning, social support, and quality of life for Chinese empty nest older people with depression. Int J Geriatr Psychiatry. 2012;27:1204–6.
[36] Xie LQ, Zhang P, Peng F, et al. Prevalence and related influencing factors of depressive symptoms for empty-nest elderly living in the rural area of Yong Zhou, China. Arch Gerontol Geriatr. 2010;50:24–9.