# BMJ Open

# Rural–urban and age differences in association between depression and suicidal attempt: a large retrospective clinical sample study in China

Dandan Ge [iD],[1] Yong Xia,[2] Zhonghua Zhang[3]

[1]Department of Evidence-Based Medicine, The First Affiliated Hospital of Wannan Medical College, Wuhu, Anhui, China
[2]Department of Education Management, The First Affiliated Hospital of Wannan Medical College, Wuhu, Anhui, China
[3]Department of Medical Record Management, The First Affiliated Hospital of Wannan Medical College, Wuhu, Anhui, China

**Correspondence to**
Yong Xia;
forzamilan_xy@163.com

## ABSTRACT

**Objectives** To assess the association between depression and suicide attempt (SA) by age and region.
**Design** Cross-sectional study.
**Setting** First Affiliated Hospital of Wannan Medical College from January 2021 to January 2022.
**Participants** Hospitalised patients.
**Primary outcome measures** SA was the primary outcome and data on SA was obtained from the electronic medical records of hospitalised patients.
**Methods and analysis** In this study, data on inpatients of the First Affiliated Hospital of Wannan Medical College from January 2021 to January 2022 were extracted from the medical record system using the convenience sampling method. According to the exclusion criteria, 7593 eligible research subjects were obtained. Logistic regression analysis was used to assess the association between depression and SA, combining age and region. Subgroup analyses were carried out to assess the relationship between age, region and SA in depressed patients, after excluding non-depressed patients, and to inspect the interaction of age and region. Finally, further comparisons of the disparities in suicide patterns among different age groups and regional groups were made.
**Results** Among 7593 patients (3630 males), 655 (8.6%) patients with SA were observed. We found that depression was significantly associated with SA by age and region (all p<0.05). Specifically, depressed juveniles and adults had a higher risk of SA compared with non-depressed adults, and ORs (95% CIs) were 2.62 (1.59 to 4.30) and 1.67 (1.30 to 2.13), respectively. Furthermore, rural individuals with depression, urban individuals without depression and urban individuals with depression had a higher risk of SA compared with rural participants without depression, and ORs (95% CIs) were 1.60 (1.22 to 2.12), 1.29 (1.04 to 1.61) and 2.53 (1.83 to 3.49), respectively. In subgroup analyses, we further found that depression was strongly associated with SA in juveniles (OR 2.84, 95% CI 1.19 to 6.76, p=0.018) and urban patients (OR 1.67, 95% CI 1.15 to 2.40, p=0.006). Notably, the predominant methods of suicide among individuals with depression were the utilisation of sleeping pills or antidepressants.
**Conclusion** Our study found individuals with depression are at higher risk of SA, especially juveniles and urban individuals. Effective integration of mental health and urban–rural services could mitigate the risk of suicide and contribute to better outcomes.

### STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study used subgroup analysis and logistic regression analysis to investigate the relationship between depression and attempted suicide.
⇒ This study was conducted in a single province and city in China; therefore, the results should be extrapolated to other provinces and cities with caution.
⇒ This study did not include several potentially important covariates, such as education and parental information.

## INTRODUCTION

Suicide represents a significant global public health issue. The prevalence of suicide deaths has witnessed a concerning rise worldwide, with a 6.7% increase between 1990 and 2016.[1] The WHO reports that over 700 000 people lose their lives to suicide each year, and more than 10 million individuals attempt suicide, ranking as the fourth leading cause of death among individuals aged 15–29 years old.[2] Depression is one of the most common mental diseases associated with suicide.[3–5] In 2015, the WHO reported that over 3.22 million individuals worldwide experienced depression, with more than half of suicides or suicide attempts (SA) preceded during periods of depression.[6] Although extensive studies have been conducted on the correlation between depression and suicide rates worldwide,[7–12] given the grim form of SA, the relationship still needs further study.

Previous studies regarding depression and SA have mainly concentrated on the risk factors of SA among patients with depression, such as sleep quality,[13 14] negative emotions,[15] anxiety[5 14 16] and social support.[17] Studies have also explored the relationship between depression and SA within specific groups, such as adolescents,[18 19] university students,[20] high school students,[21] the elderly[22] and military personnel.[9] In China,

while the suicide rate among individuals over 25 years old has been decreasing, the suicide death rate among individuals aged 5–14 has seen an alarming increase from 2010 to 2021.[23] Adolescents, constituting one-sixth of the global population, are particularly vulnerable due to their immaturity and emotional sensitivity, making them more susceptible to suicidal ideation, self-harm and SA.[24] Currently, most studies on SA have focused singularly on either adolescents or adults, with limited evidence regarding the differences between the two populations.[25–27]

Furthermore, the disparity between the SA in urban and rural areas has been a contentious topic. Rural areas often face more challenging social, economic and cultural conditions compared with urban areas, resulting in higher suicide rates.[28 29] This finding has been supported by 24 previous studies conducted in different countries.[28] However, several studies have also indicated that the incidence of SA is higher in urban areas compared with rural areas.[30 31] Given the inconsistent evidence, policy development and social support are limited.

Therefore, this study aimed to use a large-scale clinical sample to explore the association between depression and SA by age and region. By identifying the specific characteristics of suicide within different groups, targeted prevention strategies can be developed to effectively address this pressing public health issue.

## METHODS
### Study design and setting
This study was a large-sample clinical research that used data from patients admitted to the First Affiliated Hospital of Wannan Medical College. It used a convenience sampling method to extract the medical data of inpatients from January 2021 to January 2022 in the medical record homepage system. This approach was based on practical considerations including data stability issues due to a system upgrade and COVID-19 lockdown, as well as resource constraints. The 1year research period allowed for intensive data handling within our limitations, with an extra month added to compensate for reduced patient numbers during lockdown. In the current study, participants aged <11 and >85 years (n=44308), serious physical diseases (n=51812), repeated hospitalisations (n=8642), death records (n=1012), migrant
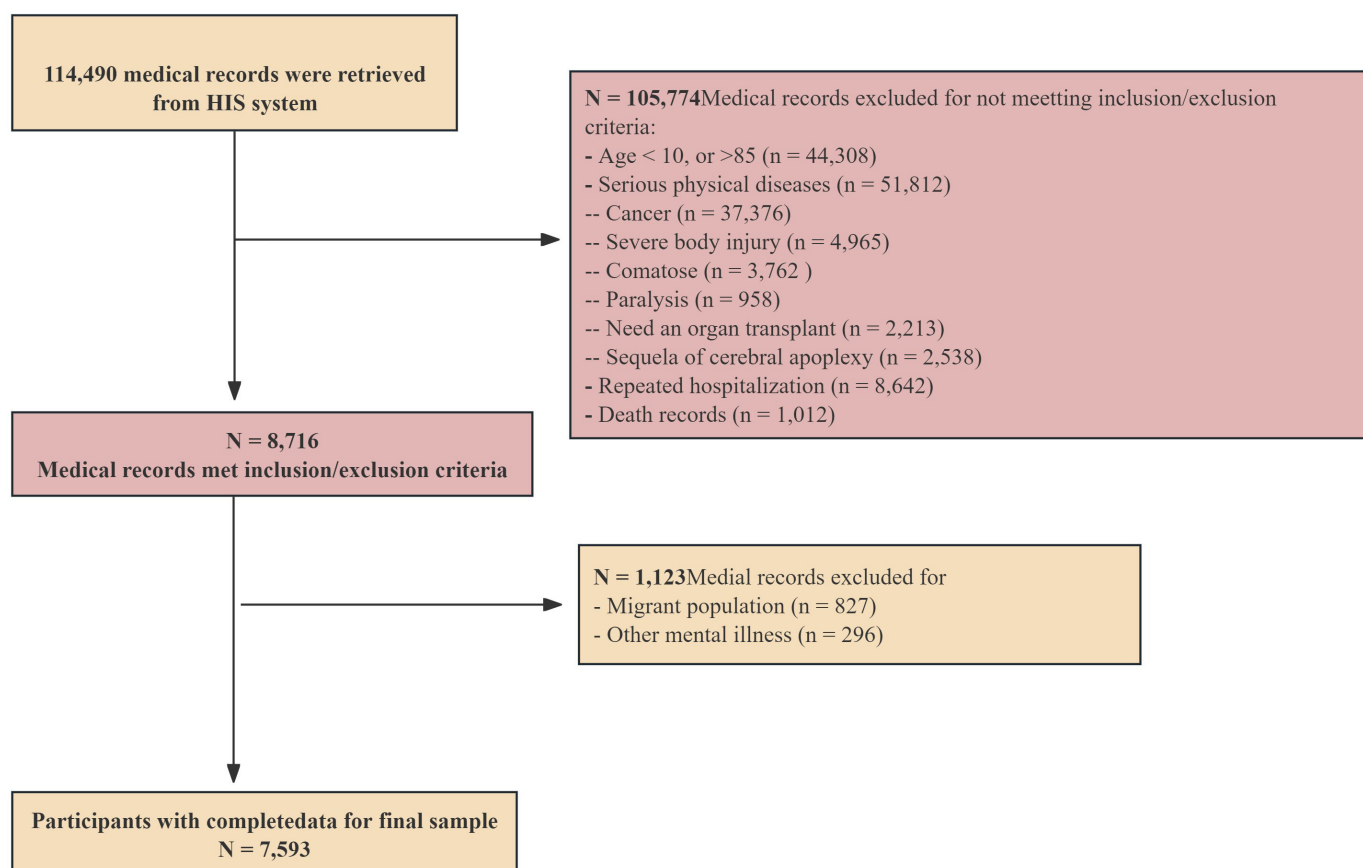
population (n=827) and other serious mental illnesses (n=296) were excluded. Finally, 7593 individuals were included in the final analysis (figure 1).

### Primary outcome
#### Suicide attempt
SA was defined as a form of suicide in which an individual had a will to terminate their own life but did not die.[32] In the current study, SAs were collected from electronic medical records of patients who were hospitalised for



**N = 114,490 medical records were retrieved from HIS system**

**N = 105,774** Medical records excluded for not meeting inclusion/exclusion criteria:
- Age < 10, or >85 (n = 44,308)
- Serious physical diseases (n = 51,812)
-- Cancer (n = 37,376)
-- Severe body injury (n = 4,965)
-- Comatose (n = 3,762 )
-- Paralysis (n = 958)
-- Need an organ transplant (n = 2,213)
-- Sequela of cerebral apoplexy (n = 2,538)
- Repeated hospitalization (n = 8,642)
- Death records (n = 1,012)

**N = 8,716**
**Medical records met inclusion/exclusion criteria**

**N = 1,123** Medial records excluded for
- Migrant population (n = 827)
- Other mental illness (n = 296)

**Participants with completedata for final sample**
**N = 7,593**

**Figure 1** Flowchart of the study.

suicide behaviour, including the use of pesticides, antidepressants, sleeping pills, other medications, cutting tools, carbon monoxide poisoning and other methods.

### Depression
In this study, depressed patients were identified according to the *International Classification of Diseases code ICD-10*[33] from the homepages of the medical record.

### Covariates
Socio-demographic and clinical information included sex (male and female), marriage (single, married and others), occupation (students, farmers, retirees, unemployed and others), taking antidepressants (yes or no) and chronic diseases (diabetes, hypertension, hyperlipidemia, stroke, coronary heart disease, thyroid dysfunction and chronic obstructive pulmonary disease).

### Patient and public involvement
None.

### Statistical analysis
Frequency and percentage were used for categorical variables, and mean and standard deviation (X±SD) were used for continuous variables. Logistic regression analysis was used to examine the association between depression and SA, combining age and region. Bootstrap sampling was performed by randomly sampling 90%, 80% and 70% of the sample size to ensure the robustness of the association between depression and SA. The sizes of the resampled samples were 6834, 6074 and 5315, respectively.

Furthermore, subgroup analyses were performed to assess the association of age and region with SA in depressed patients, excluding non-depressed patients and examined the interaction of age and region. Finally, we further compared the differences in suicide patterns between different age groups and regional groups.

SPSS 27.0 and R 4.3.3 software were used for all analyses. A two-sided $p<0.05$ was considered statistically significant.

### RESULTS
Among 7593 participants, 1290 (17.0%) depressed patients were observed and 655 (8.6%) suicide attempts were recorded. SA patients were more likely to be married females, as well as unemployed farmers. Furthermore, SA patients were more likely to be urban adults. More details are shown in table 1.

In logistic regression analysis, it was found that age, region, depression, sex, occupation and the number of chronic diseases all had statistically significant impacts on SA (online supplemental figure 1). In this study, individuals with depression were more likely to have SA compared with those without depression (OR 1.42, 95% CI 1.16 to 1.74). Urban residents showed a higher risk of SA than rural residents (OR 2.77, 95% CI 2.32 to 3.30), and juveniles were more prone to SA than adults (OR 1.75, 95% CI 1.08 to 2.83).

Furthermore, we found that depression was positively associated with SA by age and region. Specifically, compared with non-depressed adults, depressed juveniles and adults had the higher risks of SA, and ORs (95% CIs) were 2.62 (1.59 to 4.30) and 1.67 (1.30 to 2.13), respectively (figure 2). Furthermore, compared with rural individuals without depression, rural individuals with depression, urban individuals without depression and urban individuals with depression had the higher risks of SA, and ORs (95% CIs) were 1.60 (1.22 to 2.12), 1.29 (1.04 to 1.61) and 2.53 (1.83 to 3.49), respectively. Bootstrap analyses were used to verify the robustness of the association between depression and SA (n=6834 for 90%, n=6074 for 80% and n=5315 for 70%, respectively). Interestingly, the results of bootstrap analyses were consistent with the findings of the total population (online supplemental figures 2 and 3).

In a subgroup analysis, we further discovered that depressed juveniles were more likely to attempt suicide compared with depressed adults (OR 2.84, 95% CI 1.19 to 6.76, p=0.018), and urban patients with depression had the higher risk of SA compared with rural patients with depression (OR 1.67, 95% CI 1.15 to 2.40, p=0.006) (figure 3). Moreover, there was an interaction between region and age on SA (p=0.002) (online supplemental figure 5).

Notably, a total of 188 patients with SA were identified as having a history of depression. Among the depressive patients residing in rural region, the most prevalent method of SA involved the utilisation of antidepressants (35.2%), whereas urban patients frequently resorted to sleeping pills (42.2%). Regarding age groups, antidepressant usage (44.1%) was the predominant method of SA among juveniles, while sleeping pill consumption (40.0%) was more prevalent among adults (figure 4).

### DISCUSSION
This was a large-scale clinical study assessing the association between depression and SA by age and region. Our study revealed a significant association between depression and an increased risk of SA, particularly among juveniles and urban individuals. The predominant methods of suicide among individuals with depression were the utilisation of sleeping pills or antidepressants.

In this study, we found that depression was strongly associated with SA, which was consistent with previous studies.[34–36] Depression, as a mental health condition characterised by persistent feelings of sadness, hopelessness and despair, poses a substantial risk for suicidal ideation and behaviour.[37 38] A reasonable explanation is that the intense emotional distress experienced by individuals with depression can become overwhelming and unbearable, leading them to consider suicide as a means to escape their pain.[39–41] In addition, depression often leads to withdrawal from social interactions and a diminished support network, leaving individuals feeling isolated and disconnected.[42] The absence of a strong

**Table 1** Sociodemographic and clinical characteristics (n = 7593)

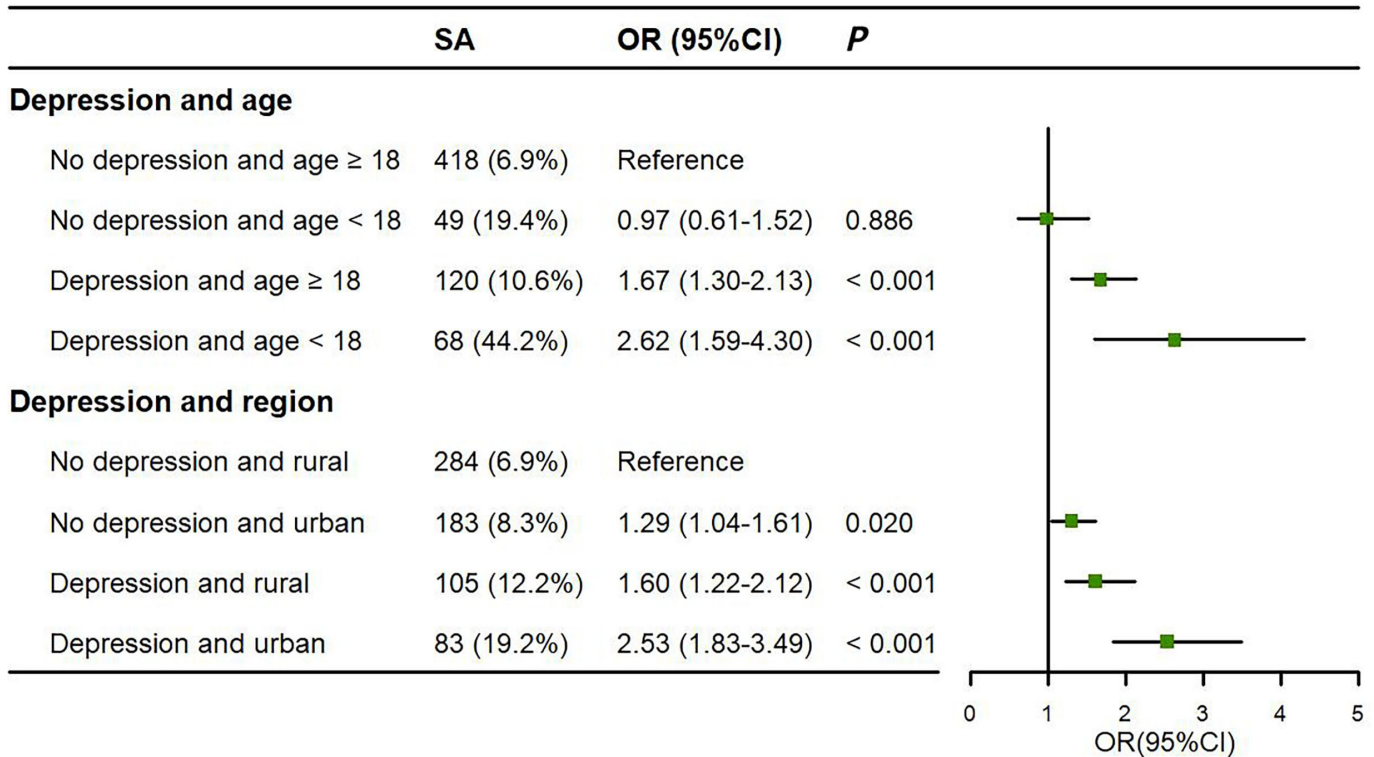| Variables | Total | Suicidal attempt | | p value |
|---|---|---|---|---|
| | N=7593 | No, n=6938 | Yes, n=655 | |
| Sex | | | | <0.001 |
| Male | 3630 (47.8%) | 3377 (48.7%) | 253 (38.6%) | |
| Female | 3963 (52.2%) | 3561 (51.3%) | 402 (61.4%) | |
| Marriage | | | | <0.001 |
| Single | 609 (8.0%) | 460 (6.6%) | 149 (22.7%) | |
| Married | 6589 (86.8%) | 6121 (88.2%) | 468 (71.5%) | |
| Others | 395 (5.2%) | 357 (5.1%) | 38 (5.8%) | |
| Age | | | | <0.001 |
| ≥18 (Adult) | 7186 (94.6%) | 6645 (95.8%) | 541 (82.6%) | |
| <18 (Juvenile) | 407 (5.4%) | 293 (4.2%) | 114 (17.4%) | |
| Region | | | | <0.001 |
| Rural | 4865 (64.1%) | 4564 (65.8%) | 301 (46.0%) | |
| Urban | 2728 (35.9%) | 2374 (34.2%) | 354 (54.0%) | |
| Occupation | | | | <0.001 |
| Students | 286 (3.8%) | 196 (2.8%) | 90 (13.7%) | |
| Farmer | 1837 (24.2%) | 1649 (23.8%) | 188 (28.7%) | |
| Retirees | 1139 (15.0%) | 1107 (16.0%) | 32 (4.9%) | |
| Unemployed | 2804 (36.9%) | 2632 (37.9%) | 172 (26.3%) | |
| Others | 1527 (20.1%) | 1354 (19.5%) | 173 (26.4%) | |
| Number of chronic diseases | | | | <0.001 |
| 0 | 4273 (56.3%) | 3747 (54.0%) | 526 (80.3%) | |
| 1 | 2355 (31.0%) | 2276 (32.8%) | 79 (12.1%) | |
| >1 | 965 (12.7%) | 915 (13.2%) | 50 (7.6%) | |
| Taking antidepressants antidepressants | | | | <0.001 |
| No | 6729 (88.6%) | 6227 (89.8%) | 502 (76.6%) | |
| Yes | 864 (11.4%) | 711 (10.2%) | 153 (100.0%) | |
| Depression | | | | <0.001 |
| No | 6303 (83.0%) | 5836 (84.1%) | 467 (71.3%) | |
| Yes | 1290 (17.0%) | 1102 (15.9%) | 188 (28.7%) | |

support system can exacerbate the feelings of despair and increase vulnerability to suicidal thoughts and attempts.

Furthermore, the current study demonstrated the higher risk of SA among juveniles compared with adults. Depression is a prominent contributing factor to suicidal behaviour, especially among children and adolescents worldwide, with an estimated prevalence of mild to severe depression at approximately 21.3%.[43] Children under the age of 15 diagnosed with depression are more susceptible to experiencing suicidal ideation and engaging in self-harming actions[24]. Adolescents, with their heightened emotional sensitivity and ongoing physiological changes, are prone to psychological and behavioural issues. The underdeveloped prefrontal cortex, responsible for emotional regulation, further impedes their ability to cope with negative emotions.[24] Academic pressure, particularly p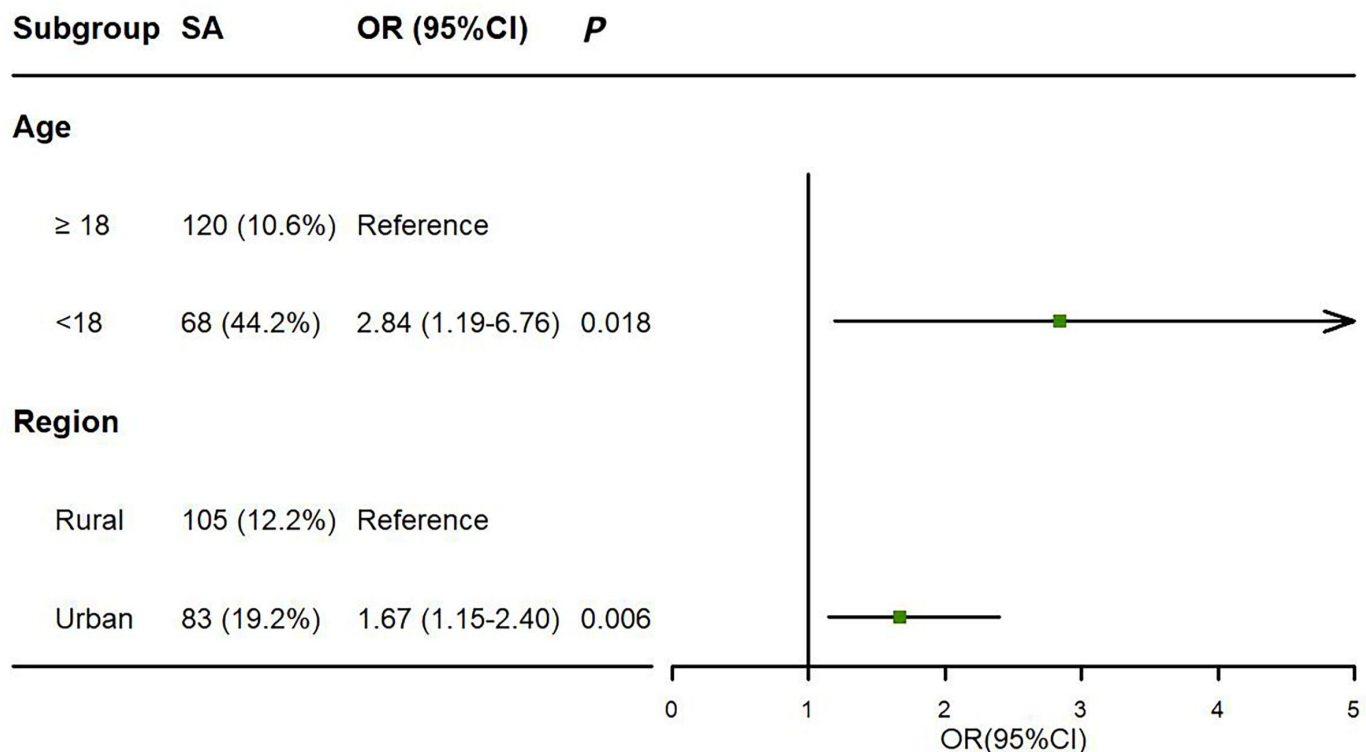revalent in Chinese youth, has also been identified as a significant contributing factor to juvenile suicide.[24–44] Notably, the COVID-19 pandemic has likely influenced the observed suicide rates, as it has had a profound impact on the lives, employment and studies of individuals in this study.[45 46]

Notably, urban patients with depression had a higher SA risk compared with rural those with depression, which was inconsistent with previous studies.[28 29 47] Rapid urbanisation has spurred the intensification of population mobility and increased pressures in work, housing and social integration, jointly exacerbating the mental health challenges faced by urban residents, all of which are key factors driving the higher suicide risk in urban areas compared with rural areas.[48–50] Moreover, it is important to note that mental healthcare accessibility in rural areas is limited, leading to the underestimation of suicide prevalence in these regions.[51] Stigmatisation

| | SA | OR (95%CI) | P | |
|---|---|---|---|---|
| **Depression and age** | | | | |
| No depression and age ≥ 18 | 418 (6.9%) | Reference | | |
| No depression and age < 18 | 49 (19.4%) | 0.97 (0.61-1.52) | 0.886 | |
| Depression and age ≥ 18 | 120 (10.6%) | 1.67 (1.30-2.13) | < 0.001 | |
| Depression and age < 18 | 68 (44.2%) | 2.62 (1.59-4.30) | < 0.001 | |
| **Depression and region** | | | | |
| No depression and rural | 284 (6.9%) | Reference | | |
| No depression and urban | 183 (8.3%) | 1.29 (1.04-1.61) | 0.020 | |
| Depression and rural | 105 (12.2%) | 1.60 (1.22-2.12) | < 0.001 | |
| Depression and urban | 83 (19.2%) | 2.53 (1.83-3.49) | < 0.001 | |

**Figure 2** Association between depression and SA varied in age and region (n=7593). Note: confounding factors such as sex, occupation and chronic diseases were adjusted. SA, suicidal attempt.

| Subgroup | SA | OR (95%CI) | P |
|---|---|---|---|
| **Age** | | | |
| ≥ 18 | 120 (10.6%) | Reference | |
| <18 | 68 (44.2%) | 2.84 (1.19-6.76) | 0.018 |
| **Region** | | | |
| Rural | 105 (12.2%) | Reference | |
| Urban | 83 (19.2%) | 1.67 (1.15-2.40) | 0.006 |

**Figure 3** Association of age and region with SA in depressed patients (n=1290). Note: confounding factors such as sex, occupation and chronic diseases were adjusted. SA, suicidal attempt.
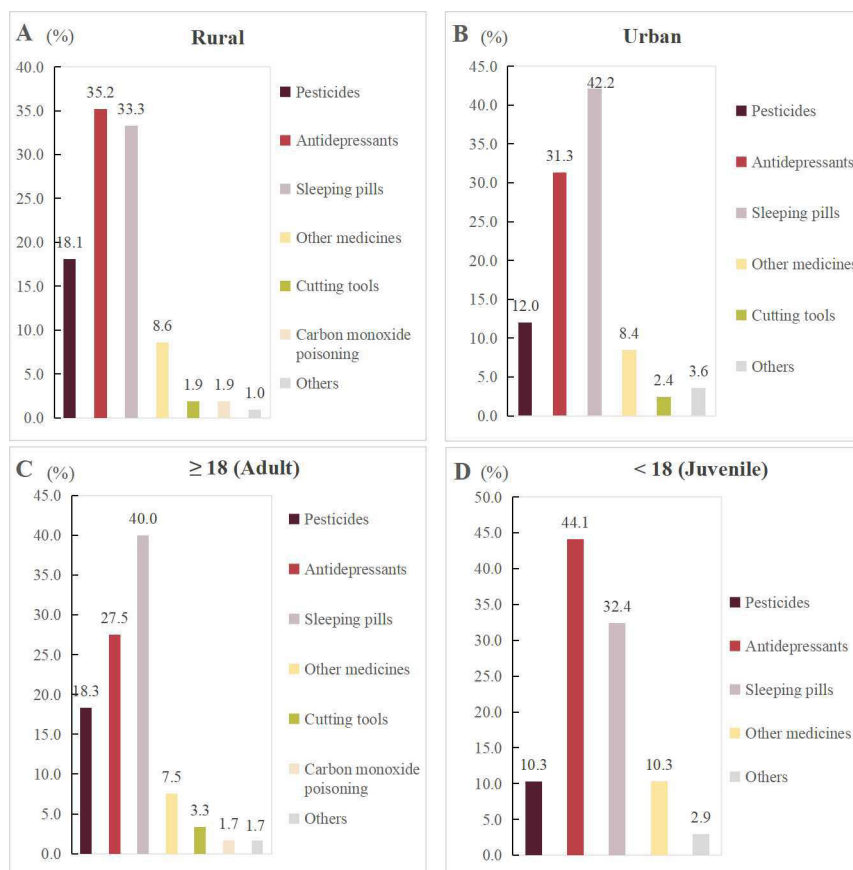
**Figure 4** Age and region differences in suicide methods among depressed patients.

surrounding mental illness and suicide is particularly pronounced in rural areas, resulting in the concealment of such issues as accidental deaths by relatives of affected individuals. We also discovered that there was an interaction between region and age on SA. This interaction disclosed the complexity and specificity of the risk of SA among different urban–rural environments and age groups. For instance, urban adolescents, being in an environment with more abundant and diverse information, have easier access to various social phenomena, cultural concepts and value systems.[19 52] This extensive exposure enables them to understand the complexity and diversity of society more comprehensively, but it might also cause them to perceive social pressure and competition earlier compared with their rural counterparts, thus increasing the risk of SA.

Interestingly, our study found that sleeping pills and antidepressants were the most common suicide methods used by individuals with depression. This finding is noteworthy, particularly considering the reduction in pesticide suicides observed in China.[31] Discrepancies in suicide methods across nations can be attributed to social, economic and cultural disparities, as well as the availability of means for suicide.[53 54] Additionally, the prolonged use of medication among individuals with depression, stemming from policies extending prescription periods, may contribute to the preference for sleeping pills and antidepressants as suicide methods.[55]

This study found several points worthy of consideration. First, urban healthcare providers should prioritise early screening and intervention for depressed adolescents to mitigate SA risks. Second, mental health caregivers should closely monitor medication use, especially sleeping pills and antidepressants, to prevent misuse and overdose. Finally, there is a need to strengthen collaboration among medical, school, community and family sectors to provide comprehensive mental healthcare for urban adolescents.

In summary, our large-scale clinical study highlights the significant association between depression and SA, emphasising the heightened risk among urban areas and juveniles. Sleeping pills and antidepressants emerged as the most prevalent methods of suicide among individuals with depression. These findings provide valuable insights for comprehending and addressing the complex dynamics surrounding depression and suicidal behaviour.

### Limitations

There were some limitations to this investigation. First, because the study was retrospective, it was unable to determine the causal association between SA and depression, as well as region and age. Second, the study did not investigate the impacts of education and parental information on SA. Third, the study only collected data from one general hospital, not from others. Fourth, this study was carried out in a single province and city in China.

Because of disparities in economy, geographical location and customs of culture, it is unclear whether the findings may be generalised to other provinces and cities. In future work, we will extend the duration of the study, enrich the variables, expand the research area and conduct longitudinal multi-centre studies to comprehensively understand suicide attempts in different contexts and ensure the extensive applicability of research findings.

## CONCLUSION

This study found that high risk for SA in depressed populations include juveniles and urban participants, and revealed that the primary ways of suicide among depressed individuals are the use of sleeping medications and antidepressants, highlighting the importance of strengthening drug control and surveillance. Overall, our findings provide valuable insights into the relationship between depression and SA, offering implications for targeted interventions, mental healthcare improvements and suicide prevention strategies to mitigate the burden of depression-related SA.

**ORCID iD**
Dandan Ge http://orcid.org/0000-0002-0368-5274

## REFERENCES

1 Naghavi M, Global Burden of Disease Self-Harm Collaborators. Global, regional, and national burden of suicide mortality 1990 to 2016: systematic analysis for the Global Burden of Disease Study 2016. *BMJ* 2019;364:l94.
2 WHO. Suicide. 2023. Available: https://www.who.int/news-room/fact-sheets/detail/suicide
3 Beghi M, Butera E, Cerri CG, et al. Suicidal behaviour in older age: A systematic review of risk factors associated to suicide attempts and completed suicides. *Neurosci Biobehav Rev* 2021;127:193–211.
4 Solmi M, Radua J, Olivola M, et al. Age at onset of mental disorders worldwide: large-scale meta-analysis of 192 epidemiological studies. *Mol Psychiatry* 2022;27:281–95.
5 Li X-Y, Tabarak S, Su X-R, et al. Identifying clinical risk factors correlate with suicide attempts in patients with first episode major depressive disorder. *J Affect Disord* 2021;295:264–70.
6 WHO. Depression and other common mental disorders. 2024. Available: https://wwwafrowhoint/sites/default/files/2017-05/who-msd-mer-20172-engpdf
7 Kang J, Park J, Lee H, et al. National trends in depression and suicide attempts and COVID-19 pandemic-related factors, 1998-2021: a nationwide study in South Korea. *Asian J Psychiatr* 2023;88:103727.
8 Liu J, Yang L, Zheng Y, et al. Rural-urban differences in prevalence and correlates of suicidal ideation in adolescent patients with depression in a large sample of Chinese. *J Affect Disord* 2023;322:118–24.
9 Mash HBH, Ursano RJ, Kessler RC, et al. Predictors of suicide attempt within 30 days of first medically documented major depression diagnosis in U.S. army soldiers with no prior suicidal ideation. *BMC Psychiatry* 2023;23:392.
10 Oyama H, Sakashita T. Long-Term Effects of a Screening Intervention for Depression on Suicide Rates among Japanese Community-Dwelling Older Adults. *Am J Geriatr Psychiatry* 2016;24:287–96.
11 Frajerman A, Chevance A, Chaumette B, et al. Prevalence and factors associated with depression and suicidal ideation among French students in 2016: A national study. *Psychiatry Res* 2023;326:115263.
12 Aaltonen K, Sund R, Hakulinen C, et al. Variations in Suicide Risk and Risk Factors After Hospitalization for Depression in Finland, 1996-2017. *JAMA Psychiatry* 2024;81:506.
13 Tubbs AS, Taneja K, Ghani SB, et al. Sleep continuity, timing, quality, and disorder are associated with suicidal ideation and suicide attempts among college students. *J Am Coll Health* 2023;1–9.
14 Liao J, Rosenheck R, Sun B, et al. Prevalence and correlates of suicide risk among non-psychiatric inpatients in a general hospital in China. *J Affect Disord* 2024;347:509–14.
15 Colmenero-Navarrete L, García-Sancho E, Salguero JM. Relationship Between Emotion Regulation and Suicide Ideation and Attempt in Adults and Adolescents: A Systematic Review. *Arch Suicide Res* 2022;26:1702–35.
16 Bukenya B, Kasirye R, Lunkuse J, et al. Depression, Anxiety, and Suicide Risk among Ugandan Youth in Vocational Training. *Psychiatr Q* 2022;93:513–26.
17 Silva C, McGovern C, Gomez S, et al. Can I count on you? Social support, depression and suicide risk. *Clin Psychol Psychoth* 2023;30:1407–15.
18 Kim CW, Jeong SC, KimJY, et al. Associated factors for depression, suicidal ideation and suicide attempt among asthmatic adolescents with experience of electronic cigarette use. *Tob Induc Dis* 2022;85.
19 O'Brien KHM, Nicolopoulos A, Almeida J, et al. Why Adolescents Attempt Suicide: A Qualitative Study of the Transition from Ideation to Action. *Arch Suicide Res* 2021;25:269–86.
20 Casey SM, Varela A, Marriott JP, et al. The influence of diagnosed mental health conditions and symptoms of depression and/or anxiety on suicide ideation, plan, and attempt among college students: Findings from the Healthy Minds Study, 2018-2019. *J Affect Disord* 2022;298:464–71.
21 Bete T, Birhanu A, Negash A, et al. Suicidal ideation, attempt and associated factor among secondary school students in harari regional state, eastern ethiopia. A multi-center cross-sectional study. *Front Psychiatry* 2023;14:1069910.
22 Mohd Salleh Sahimi H, Midin M, Lim JTY, et al. An elderly patient with depression and a suicide attempt during the COVID-19 pandemic: a case report. *Front Psychiatry* 2023;14:1151482.

23 Zhao M, Li L, Rao Z, *et al*. Suicide Mortality by Place, Gender, and Age Group - China, 2010-2021. *China CDC Wkly* 2023;5:559–64.

24 Wang Y, Liu J, Chen S, *et al*. Exploring risk factors and their differences on suicidal ideation and suicide attempts among depressed adolescents based on decision tree model. *J Affect Disord* 2024;352:87–100.

25 Wang W, Wu M, Zhu Z, *et al*. n.d. Associations of mobile phone addiction with suicide ideation and suicide attempt: findings from six universities in China. *Front Public Health*11:133804.

26 Welty CW, Bingham L, Morales M, *et al*. School Connectedness and Suicide Among High School Youth: A Systematic Review. *J Sch Health* 2024;94:469–80.

27 Lear MK, Perry KM, Stacy SE, *et al*. Differential suicide risk factors in rural middle and high school students. *Psychiatry Res* 2020;284:112773.

28 Casant J, Helbich M. Inequalities of Suicide Mortality across Urban and Rural Areas: A Literature Review. *Int J Environ Res Public Health* 2022;19:2669.

29 Onie S, Usman Y, Widyastuti R, *et al*. Indonesia's first suicide statistics profile: an analysis of suicide and attempt rates, underreporting, geographic distribution, gender, method, and rurality. *Lancet Reg Health Southeast Asia* 2024;22:100368.

30 Sahraian A, Sepehrtaj SN, Sepehrtaj SS, *et al*. Characteristics and related factors of suicide attempts among patients admitted to an Iranian poisoning center: Implications for suicide prevention. *Heliyon* 2023;9:e20083.

31 Xiaobo L, Xiaoyi L, Ling L, *et al*. Analysis on epidemiological characteristics and disease burden of suicide in different populations in china, 2010–2021. *Dis Surv* 2023;38:1391–7.

32 Adam KS. Attempted Suicide. *Psychiatr Clin N Am* 1985;8:183–201.

33 WHO. The international statistical classification of diseases and related health problems 10th revision. WHO; 1992.

34 Brown KW, Harris TO, Joiner TE. Depression and suicidality: a review and meta-analysis of longitudinal studies. 101872. 2024.

35 Smith AB, Jones CM, Williams JM. The association between depression and suicide attempts: a systematic review and meta-analysis. *J Affect Disord* 2022;123–35.

36 Johnson RW, Michaels EK, Davis CG. Understanding the link between depression and suicide: a comprehensive review. *Suicide Life-Threat Behav* 2023;53:187–205.

37 Hawton K, Casañas I Comabella C, Haw C, *et al*. Risk factors for suicide in individuals with depression: a systematic review. *J Affect Disord* 2021;165–83.

38 O'Connor RC, Pirkis J, Cox GR. The international covid-19 suicide prevention research collaboration: exploring the determinants and distribution of mental health and suicidality during the pandemic. *Bull World Health Organ* 2022;100:222–9.

39 Chiu C-C, Liu H-C, Li W-H, *et al*. Incidence, risk and protective factors for suicide mortality among patients with major depressive disorder. *Asian J Psychiatr* 2023;80:103399.

40 Li X, Mu F, Liu D, *et al*. Predictors of suicidal ideation, suicide attempt and suicide death among people with major depressive disorder: A systematic review and meta-analysis of cohort studies. *J Affect Disord* 2022;302:332–51.

41 Gurland BJ, Katz S, Chen J. Index of affective suffering. Linking a classification of depressed mood to impairment in quality of life. *Am J Geriatr Psychiatry* 1997;5:192–210.

42 Jia H, Min Z, Yiyun C, *et al*. Association between social withdrawal and suicidal ideation in patients with major depressive disorder: The mediational role of emotional symptoms. *J Affect Disord* 2024;347:69–76.

43 Lu B, Lin L, Su X. Global burden of depression or depressive symptoms in children and adolescents: a systematic review and meta-analysis. *J Affect Disord* 2024;354:553–62.

44 Castellví P, Miranda-Mendizábal A, Alayo I, *et al*. Assessing the Relationship Between School Failure and Suicidal Behavior in Adolescents and Young Adults: A Systematic Review and Meta-analysis of Longitudinal Studies. *School Ment Health* 2020;12:429–41.

45 Cha EJ, Suh S, Jeon HJ, *et al*. Identifying the Bridge Between Anxiety Response to COVID-19 and Depression Symptoms in General Population: A Network Analysis. *J Acad Consult Liaison Psychiatry* 2023;64:492–500.

46 McPherson KE, McAloney-Kocaman K, McGlinchey E, *et al*. Longitudinal analysis of the UK COVID-19 Psychological Wellbeing Study: Trajectories of anxiety, depression and COVID-19-related stress symptomology. *Psychiatry Res* 2021;304:114138.

47 Hu Y, Pan J, Luo R, *et al*. Trends of suicide rates by gender and residence in China from 2002 to 2019. *SSM Popul Health* 2023;21:101342.

48 Ventriglio A, Torales J, Castaldelli-Maia JM, *et al*. Urbanization and emerging mental health issues. *CNS Spectr* 2021;26:43–50.

49 Almeida-Filho N. Urbanization and mental health as a research problem in Latin America (with a focus on Brazil). *Curr Opin Psychiatry* 2021;34:293–8.

50 Lj R. The impact of urbanization on mental health service provision: a brazil, russia, india, china, south africa and africa focus. *Curr Opin Psychiatry* 2019;32:224–31.

51 Lu J, Xu X, Huang Y, *et al*. Prevalence of depressive disorders and treatment in China: a cross-sectional epidemiological study. *Lancet Psychiatry* 2021;8:981–90.

52 Ong M, Lakoma M, Gees Bhosrekar S, *et al*. Risk factors for suicide attempt in children, adolescents, and young adults hospitalized for mental health disorders. *Child Adoles Ment Health* 2021;26:134–42.

53 Park S. Brief report: Sex differences in suicide rates and suicide methods among adolescents in South Korea, Japan, Finland, and the US. *J Adolesc* 2015;40:74–7.

54 Värnik A, Kõlves K, Allik J, *et al*. Gender issues in suicide rates, trends and methods among youths aged 15-24 in 15 European countries. *J Affect Disord* 2009;113:216–26.

55 China TPRO. On strengthening the management of medical services during the epidemic. 2020. Available: https://www.gov.cn/zhengce/zhengceku/2020-02/17/content_5480176.htm