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Depressive disorders in Chinese left-behind children and adolescents from Yunnan province: prevalence and association with self-harm behaviors

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Abstract

Background The prevalence of clinically diagnosed depressive disorders (DD) in Chinese left-behind children (LBC) remains unknown. We aim to estimate the prevalence of DD, discuss the associations between DD and self-harm (SH) behaviors in a large representative sample of Chinese LBCs chosen from Yunnan province.

Methods A total of 5462 LBCs were selected from the most recent datasets of the Mental Health Survey for Children and Adolescents in Yunnan (MHSCAY), a mega population-based two-phase cross-sectional survey. Weighted prevalence rates and designed Logistic regression were adopted to estimate the prevalence of DD and the association between DD and SH.

Results The weighted prevalence of lifetime and current DD were 4.22% (95% CI: 3.13-6.00%) and 3.84% (95% CI: 2.85-5.00%) in Chinese LBCs. Higher lifetime and current DD prevalence rates were observed in girls and those reported adverse parental marital status and SH behaviors. The absence of DD was associated with significantly decreased odds of SH behavior (OR=0.06), repetitive SH (OR=0.09), using multiple SH methods (OR=0.09), and severe SH (OR=0.15). Subsequently performed stratified analyses identified prominent effect modification by sex and age, as a stronger association between DD and SH was found in girls (OR=0.02 versus OR=0.07 in boys) and younger adolescents (OR=0.08 versus OR=0.22 in older adolescents).

Conclusion The prevalence of DD was high in Chinese LBCs. DD was associated with prominently increased risk of SH behaviors in LBCs. Attention and intervention are needed in this vulnerable population.

Keywords Depressive disorders, Self-harm, Children and adolescents, Effect modification, Prevalence

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Text box 1. Contributions to the literature

- Our study revealed a 4.22% lifetime and 3.84% current prevalence of depressive disorders among left-behind children in Yunnan province, China.
 - Depressive disorders are strongly linked to self-harm behaviors, with the association being more pronounced in girls and younger children, indicating the need for tailored interventions.
 - By identifying specific at-risk subgroups, our research adds to the understanding of mental health dynamics among left-behind children, guiding the development of effective interventions.
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Introduction

Depressive disorders are major public health concerns [1]. In China, depressive disorders are primary causes of disease burden [2]. Although several newly published studies have estimated the prevalence of depressive disorders (DD) in Chinese adults [3–5], for children and adolescents who have already entered the period of depression onset, the severity of the problem remains unknown due to the lack of nationally representative data, either from surveillance systems or from population-based probability sampling surveys, especially for socially disadvantaged youths, who are at even higher risk of depression [6, 7].

In the past three decades, China has experienced rapid economic development, leading to unprecedented internal migration of the rural workforce [4, 8]. In 2020, there were an estimated 280 million migrant workers in China [9]. Due to living cost considerations, the children of migrant workers are often left behind. Based on 2013 survey data, there were over 60 million left-behind children (LBC) in China, accounted for 21.9% of the entire child population [10]. Compared with their non-left-behind counterparts, LBCs were observed a higher risk of mental health issues, particularly depression [7]. However, most published studies have focused on depressive symptoms rather than clinically diagnosed DD. Therefore, there is an urgent need to understand the severity and characteristics of DD in Chinese LBCs.

In children and adolescents, the association between depression and self-harm (SH) has been well-established [11, 12]. A birth cohort indicated that SH was associated with a 2.21 to 3.94 folds of depression risk [12]. SH is common in Chinese LBCs, with a reported lifetime prevalence of 48% [13]. Previously published studies also revealed a strong association between SH and depression in Chinese LBCs, with an odds ratio of 3.47 [14]. However, nearly all currently available studies on the depression-SH association in Chinese LBCs measured depressive symptoms rather than clinically diagnosed DD.

The present study aims to provide an elaborate analysis of DD and SH by using a large representative sample of Chinese LBCs. We not only estimated the prevalence of DD in LBCs, but also evaluated the associations between DD and SH behaviors.

Methods**Data source**

We performed an analysis using the most recent database from the Mental Health Survey for Children and Adolescents in Yunnan (MHSCAY), a massive ongoing epidemiological project. The primary mission of the MHSCAY is to understand the mental health status of children and adolescents in Yunnan, an inland underdeveloped province characterized by multi-ethnic aggregation in southwest China, and to develop targeted intervention policies and measures for mental health promotion among the youths in Yunnan. The MHSCAY was launched in June 2018. By the end of 2021, over 35,000 children and adolescents (including over 10,000 LBCs) from six sites in Yunnan had been surveyed using a population-based probability sampling design.

The LBCs that we analyzed in this study were drawn from Zhenxiong county, which completed the survey in 2021. A two-stage simple random clustering sampling with probability proportionate to sample size (PPS) was performed: (1) several schools were randomly selected from all schools within Zhenxiong; (2) for chosen schools, 2–4 classes in each grade were further randomly chosen based on pre-calculated required sample size; (3) eligible students within each chosen class were all surveyed.

LBCs are defined as children or adolescents with one or both parents migrated to other places for work and the separation exceeded six consecutive months in the last year [7]. Considering children less than 10 years cannot fully understand the definition and consequence of suicide [15], and this part of information will be collected during the questionnaire survey, eligible subjects were those aged no less than 10 and below 18. Other detailed inclusion and exclusion criteria were described in our previous publication [16]. Study protocol of the MHSCAY was reviewed and approved by the Ethics Review Board of Kunming Medical University. Informed consents were obtained from both the participants and their legal guardians prior to the survey.

Study design

A two-phase survey was conducted at the study site. In phase I, relevant information of eligible subjects was collected using a self-administered questionnaire. The questionnaire was comprehensive, measuring general characteristics, symptoms of depression and anxiety, SH, suicidal ideation and behaviors, social support,

psychological resilience, etc. Upon completion, staff deployed at the site, who were graduate students majoring in public health or psychiatry and had received standardized training before the survey, checked the completeness and quality of the finished questionnaires, and simultaneously screened for individuals at elevated mental health risk. In phase II, the screened positive individuals from phase I were interviewed face-to-face by professional pediatric psychiatrists using the Kidie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL) to ascertain whether subjects satisfied the diagnostic criteria for current (in the last 30 days) or lifetime DD according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). The whole process for this two-phase survey is illustrated in Fig. 1.

Measurement of SH behaviors

Lifetime SH behaviors were measured by the Modified version of the Adolescents Self-Harm Scale (MASHS) [17]. The MASHS surveyed the most frequently reported SH behaviors among Chinese youths. Both the frequency (never, once, two to four times, five times and above) and severity (non-observable injury, slight injury, medium injury, severe injury, and critical injury) of SH were measured. Participants who committed any type of SH once or above were defined as positive. Students who reported SH two times or above were classified as committed repetitive SH. Students who reported medium or above severity in any type of SH were regarded as committed severe SH.

Statistical analysis

Weighted prevalence rates for DD in LBCs were calculated incorporating unequal sampling probability introduced by multi-stage clustering sampling design. The weight ($W=W1 \times W2$) was calculated as the reciprocal of the sampling probability for each selected school ($W1$) and each selected classroom ($W2$). The crude and adjusted associations between DD and SH were analyzed using logistic regression. Except for univariate logistic regression (significance level set at $p < 0.10$), the significance level for the rest of the analyses was set at $p < 0.05$, two-tailed. All statistical analyses were performed using the R software (Version 4.1.2, The R Foundation for Statistical Computing, Vienna, Austria).

Results

Features of the participants

A total of 5,462 subjects were surveyed, 5,335 met the inclusion criteria and provided complete information, 127 were excluded (62 for not meeting age criteria and 65 for incomplete questionnaires). The effective response rate was 98.80%. The demographics of excluded subjects

were comparable to those included. General characteristics of the surveyed subjects are summarized in Table 1: 2,736 (51.3%) were girls, the mean age was 13.58 years with a standard deviation of 1.96; the ethnic majority (Han) accounted for 93.9% (5,007); over half of LBCs (51.2%) had both parents migrated; 2,275 LBCs reported SH behaviors, with a calculated prevalence of 42.6% (95% CI: 37.7–47.5%).

The prevalence of DD among LBCs

Altogether, 890 respondents were screened positive and entered the subsequent K-SADS-PL interview, with 208 diagnosed with DD. The weighted prevalence rates of lifetime and current DD were 4.22% (95% CI: 3.13–6.00%) and 3.84% (95% CI: 2.85–5.00%), respectively. Higher rates were observed in girls (lifetime: 6.20%, 95% CI: 4.58–8.34%; current: 5.51%, 95% CI: 4.12–7.33%) compared to boys (lifetime: 2.18%, 95% CI: 1.53–3.09%; current: 2.10%, 95% CI: 1.48–2.99%). LBCs with negative parental marital relationships had higher prevalence rates: divorced (lifetime: 5.81%, 95% CI: 4.08–8.20%; current: 5.36%, 95% CI: 3.62–7.87%) and widowed (lifetime: 7.78%, 95% CI: 5.20–11.49%; current: 7.03%, 95% CI: 4.70–10.40%). Subjects with SH behaviors also showed higher rates: lifetime SH (10.93%, 95% CI: 8.51–13.93%), repetitive SH (17.87%, 95% CI: 13.90–22.67%), multiple SH methods (11.82%, 95% CI: 8.75–15.78%), and severe SH (23.01%, 95% CI: 17.08–30.23%) (Table 2).

Association between DD and SH among LBCs

We depicted the distribution of SH methods in depressive LBCs by sex, as shown in Fig. 2: “Hitting hard objects with hands,” “Cutting oneself,” and “Scraping oneself” were the most frequently adopted SH behaviors in both sexes. After adjusted for covariates, multiple logistic regression models revealed that lifetime and current DD were prominently related to SH, repetitive SH, multiple SH methods, and severe SH. LBCs without lifetime DD had a lower risk of SH (Adjusted OR: 0.06, 95% CI: 0.03–0.12), repetitive SH (Adjusted OR: 0.09, 95% CI: 0.05–0.18), multiple SH methods (Adjusted OR: 0.09, 95% CI: 0.03–0.29), and severe SH (Adjusted OR: 0.15, 95% CI: 0.10–0.23) (Fig. 3, Table S1). Similarly, the absence of current DD was related to a 94% (Adjusted OR: 0.06, 95% CI: 0.03–0.13), 90% (Adjusted OR: 0.10, 95% CI: 0.05–0.19), 92% (Adjusted OR: 0.08, 95% CI: 0.02–0.33), and 84% (Adjusted OR: 0.14, 95% CI: 0.09–0.20) reduction in odds of SH, repetitive SH, multiple SH methods, and severe SH, respectively (Table S2).

Stratified analysis by important demographic factors

Noticeable differences were observed in the association between DD and SH between sex and age subgroups. Sex showed the strongest effect modification: for boys, the

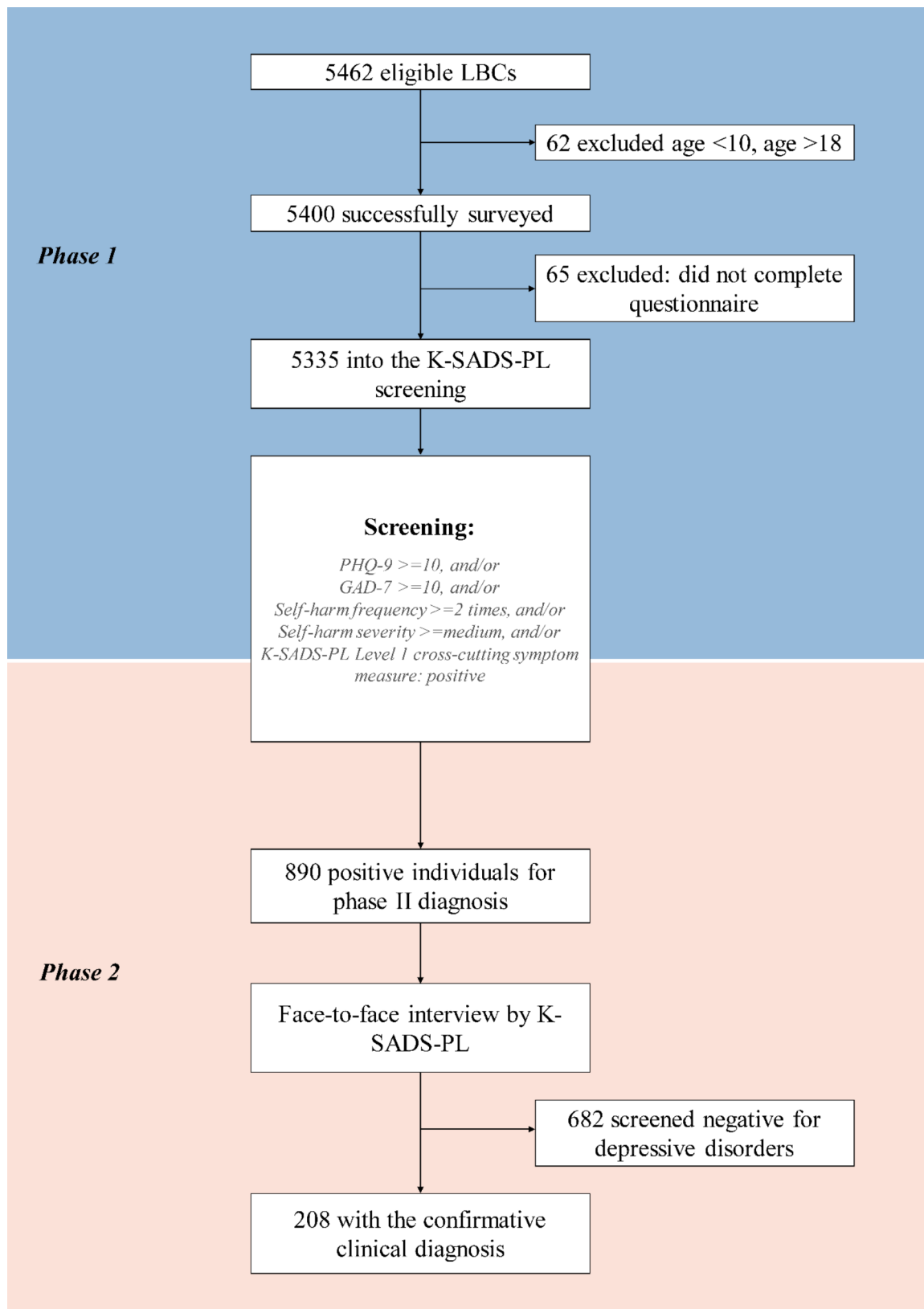


Fig. 1 The flowchart for two-stage survey. K-SADS-PL: the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version; PHQ-9: the patient health questionnaire; GAD-7: the generalized anxiety disorder questionnaire

Table 1 Characteristics of the LBCs ($n = 5335$)

Features	Frequency, n (%)	Mean (SD)
Age group		
10–12	1581 (29.6)	
13–15	2760 (51.7)	
16–17	994 (18.6)	
Age		13.58 (1.96)
Sex		
Boys	2599 (48.7)	
Girls	2736 (51.3)	
Education level		
Primary school	1529 (28.7)	
Junior high school	3164 (59.3)	
Senior high school	642 (12.0)	
Ethnicity		
Han majority	5007 (93.9)	
Any minority	328 (6.1)	
Place of residence		
Urban	1043 (19.6)	
Rural	4292 (80.4)	
Boarding student		
No	3330 (62.4)	
Yes	2004 (37.6)	
Father's education level		
Primary school and below	2575 (48.3)	
Junior high school and above	2192 (41.1)	
Missing or unknown	568 (10.6)	
Mother's education level		
Primary school and below	3213 (60.2)	
Junior high school and above	1365 (25.6)	
Missing or unknown	757 (14.2)	
Parental marital status		
In marriage	4076 (76.4)	
Divorced	747 (14.0)	
Remarried	358 (6.7)	
Widowed	154 (2.9)	
Left-behind status		
Only mother migrated	626 (11.7)	
Only father migrated	1977 (37.1)	
Both parents migrated	2732 (51.2)	
Self-harm behavior (Lifetime)		
No	3060 (57.4)	
Yes	2275 (42.6)	

absence of lifetime DD was related to an adjusted OR of 0.07 (95% CI: 0.03–0.16), whereas for girls, the adjusted OR was 0.02 (95% CI: 0.005–0.09) (Fig. 4). Sex and age also showed non-negligible influence on the association between DD and severe SH: a stronger association was found in girls (adjusted OR=0.06 versus adjusted OR=0.19 for boys) and younger adolescents (adjusted OR=0.08 versus adjusted OR=0.22 for older adolescents) (Fig. 4). Detailed fitting results were summarized in the supplementary material, Figure S1.

Discussion

In this cross-sectional study, we estimated the prevalence of current and lifetime DD in Chinese LBCs. We found that the prevalence of DD was high in this vulnerable population, with a lifetime prevalence of 4.21% and a current prevalence of 3.83%. In general Chinese and Western adolescent populations, the prevalence rates of clinically diagnosed depression were 3.0% [18] and 3.2% [19]. Although we have not identified any other population-based surveys that reported the prevalence of DD in Chinese LBCs, a cross-sectional study of Chinese college

Table 2 Weighted lifetime and current prevalence of depressive disorders in LBCs

Features	Lifetime (Depressive disorders, n = 208)					Current (Depressive disorders, n = 186)			
	N	n	Weighted prevalence	95% confidence interval		n	Weighted prevalence	95% confidence interval	
				Lower limit	Upper limit			Lower limit	Upper limit
Overall	5335	208	4.22%	3.13%	6.00%	186	3.84%	2.85%	5.00%
Age									
10–13	2561	84	3.44%	2.39%	4.92%	76	3.16%	2.23%	4.45%
14–17	2774	124	5.11%	3.65%	7.10%	110	4.60%	3.23%	6.51%
Sex									
Boy	2599	52	2.18%	1.53%	3.09%	50	2.11%	1.48%	2.99%
Girl	2736	156	6.20%	4.58%	8.34%	136	5.51%	4.12%	7.33%
Education level									
Primary school	1529	35	2.10%	1.26%	3.50%	35	2.10%	1.26%	3.50%
Junior high school	3164	148	5.09%	3.47%	7.40%	130	4.59%	3.09%	6.77%
Senior high school	642	25	4.23%	2.07%	8.44%	21	3.52%	1.55%	7.76%
Ethnicity									
Any minority	328	22	7.51%	4.50%	12.28%	18	6.57%	3.57%	11.77%
Han majority	5007	186	4.00%	2.98%	5.35%	168	3.65%	2.72%	4.90%
Place of residence									
Urban	1043	64	6.00%	3.63%	9.78%	56	5.34%	3.24%	8.68%
Rural	4292	144	3.61%	2.82%	4.61%	130	3.32%	2.61%	4.20%
Boarding student									
No	3330	126	3.84%	2.60%	5.63%	114	3.50%	2.50%	4.89%
Yes	2004	82	4.70%	3.30%	6.64%	72	4.25%	2.86%	6.28%
Father's education level									
Primary school and below	2575	106	4.19%	3.11%	5.62%	93	3.71%	2.90%	4.73%
Junior high school and above	2192	82	4.30%	2.98%	6.17%	74	3.96%	2.59%	6.01%
Missing or unknown	568	20	NA	NA	NA	19	NA	NA	NA
Mother's education level									
Primary school and below	3213	114	3.75%	2.86%	4.89%	102	3.43%	2.64%	4.44%
Junior high school and above	1365	57	4.53%	3.47%	5.90%	50	4.00%	2.90%	5.51%
Missing or unknown	757	37	NA	NA	NA	34	NA	NA	NA
Parental marital status									
In marriage	4076	126	3.50%	2.49%	4.90%	111	3.15%	2.20%	4.48%
Divorced	747	43	5.81%	4.08%	8.20%	39	5.36%	3.62%	7.87%
Widowed	358	30	7.78%	5.20%	11.49%	27	7.03%	4.70%	10.40%
Remarried	154	9	7.49%	3.80%	14.25%	9	7.49%	3.80%	14.25%
Left-behind status									
Only mother migrated	626	25	4.41%	2.60%	7.38%	22	3.99%	2.32%	6.78%
Only father migrated	1977	77	4.32%	3.03%	6.12%	70	3.96%	2.76%	5.66%
Both parents migrated	2732	106	4.09%	3.11%	5.36%	94	3.69%	2.86%	4.75%
Self-harm behavior									
No	3060	14	0.65%	0.41%	1.05%	13	0.63%	0.38%	1.04%
Yes	2275	194	10.93%	8.51%	13.93%	173	9.86%	7.57%	12.75%
Repetitive self-harm									
No	1226	22	1.87%	0.90%	3.80%	20	1.78%	1.83%	3.78%
Yes	1049	172	17.87%	13.90%	22.67%	153	16.08%	12.45%	20.51%
Self-harm methods									
Single	507	6	0.84%	0.32%	2.24%	4	0.63%	0.17%	2.30%
Multiple	1768	188	11.82%	8.75%	15.78%	169	10.74%	7.87%	14.49%
Self-harm severity									
Non-observable or slight	1673	65	4.59%	2.79%	7.44%	53	3.85%	2.20%	6.65%
Medium or above	602	129	23.01%	17.08%	30.23%	120	21.68%	16.44%	28.02%

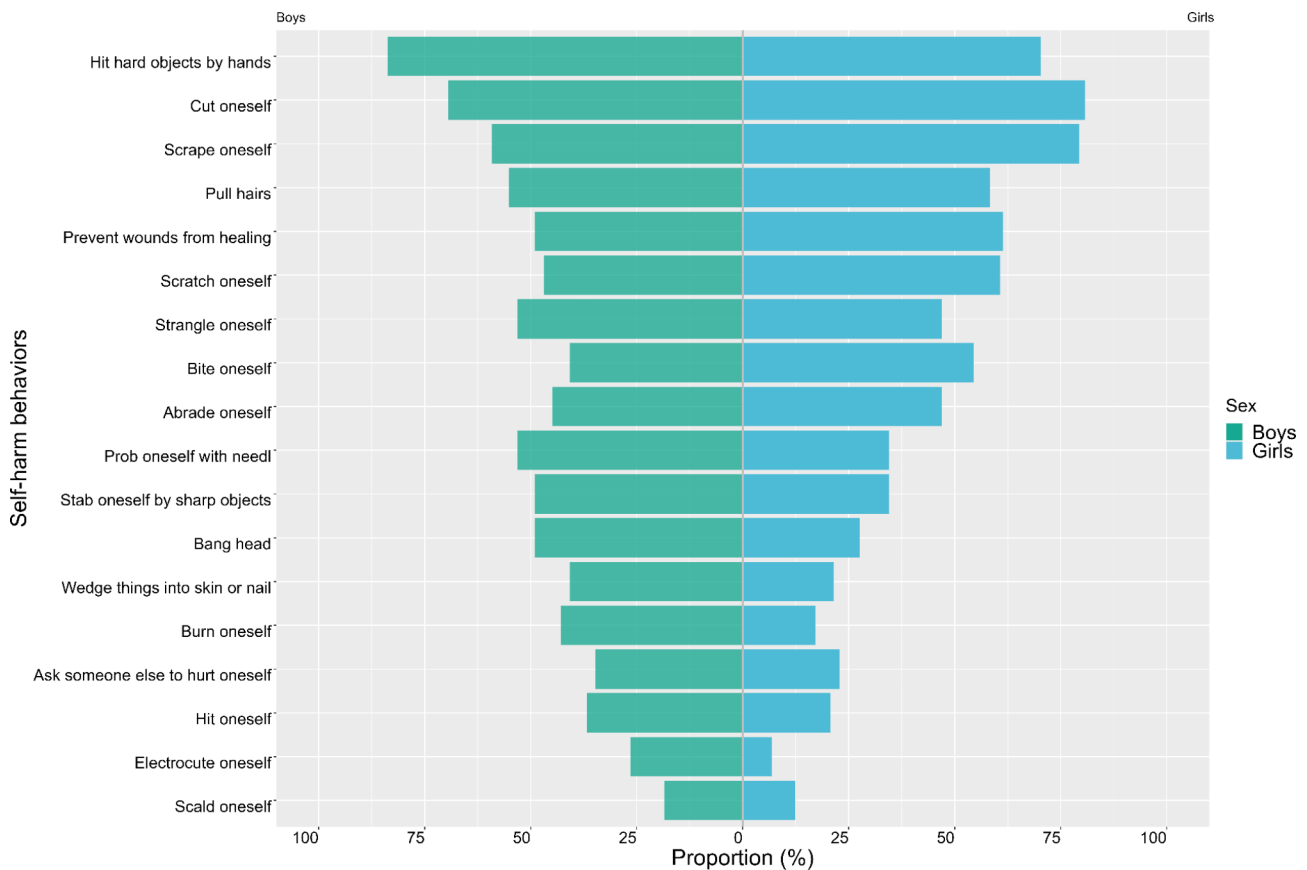


Fig. 2 The pyramid of self-harm behavior in left-behind children with depressive disorders

students observed a higher prevalence of DD in respondents who had experienced parental migration [20]. The high prevalence of DD in LBCs could probably be attributed to separation from parents, lack of communication, and reduced parent-child interactions [21]. Studies have demonstrated that prolonged parental absence significantly increased the risk of depression among LBCs [22, 23], emotional distress, inadequate care and disrupted family dynamics could be the underlying causes [21].

The demographic features associated with DD in Chinese LBCs, such as sex and educational level, were in accordance with previous studies [18, 24]. Moreover, we found that parental marital status was significantly associated with DD in LBCs. Parents play vital roles in the development and maintenance of depression in children and adolescents [25]. A prospective study suggested that children who had experienced parental marital break-up were more likely to report high levels of depression during youth [26]. Another longitudinal survey disclosed that poor quality of marital relationships contributed to adverse parent-adolescent links, which further led to the occurrence of childhood or adolescence depression [27]. Children in families with disrupted marital relationships may experience an emotionally unsupportive and insecure family environment, contributing to an increased

risk of psychological maladjustment [28]. For LBCs, long-term separation from one or both parents already increased the risk of depression [7], those who simultaneously experience impaired parental relationships could face further increased risk of depression.

Another important finding is that DD was strongly associated with SH behavior in LBCs. Although this association was seldom reported, current research has found a significant relationship between depressive symptoms and SH in LBCs [14]. Meanwhile, SH behaviors were more commonly seen in adolescents with any psychiatric disorders, with an estimated 12-month prevalence of 60% [29]. Our findings also revealed that DD was related to repetitive SH, severe SH, and the adoption of multiple SH methods in LBCs, which align with a longitudinal study [30]. The association between depression and severe, repetitive, and multiple methods of SH can possibly be attributed to emotion regulation difficulties [31]. Depression increases emotional distress and impulsivity, leading to SH, a typical maladaptive coping strategy. This dysregulation results in more frequent and varied SH behaviors to temporarily alleviate negative emotions [32]. Therefore, early identification and intervention are necessary to prevent more serious SH in LBCs diagnosed with DD.

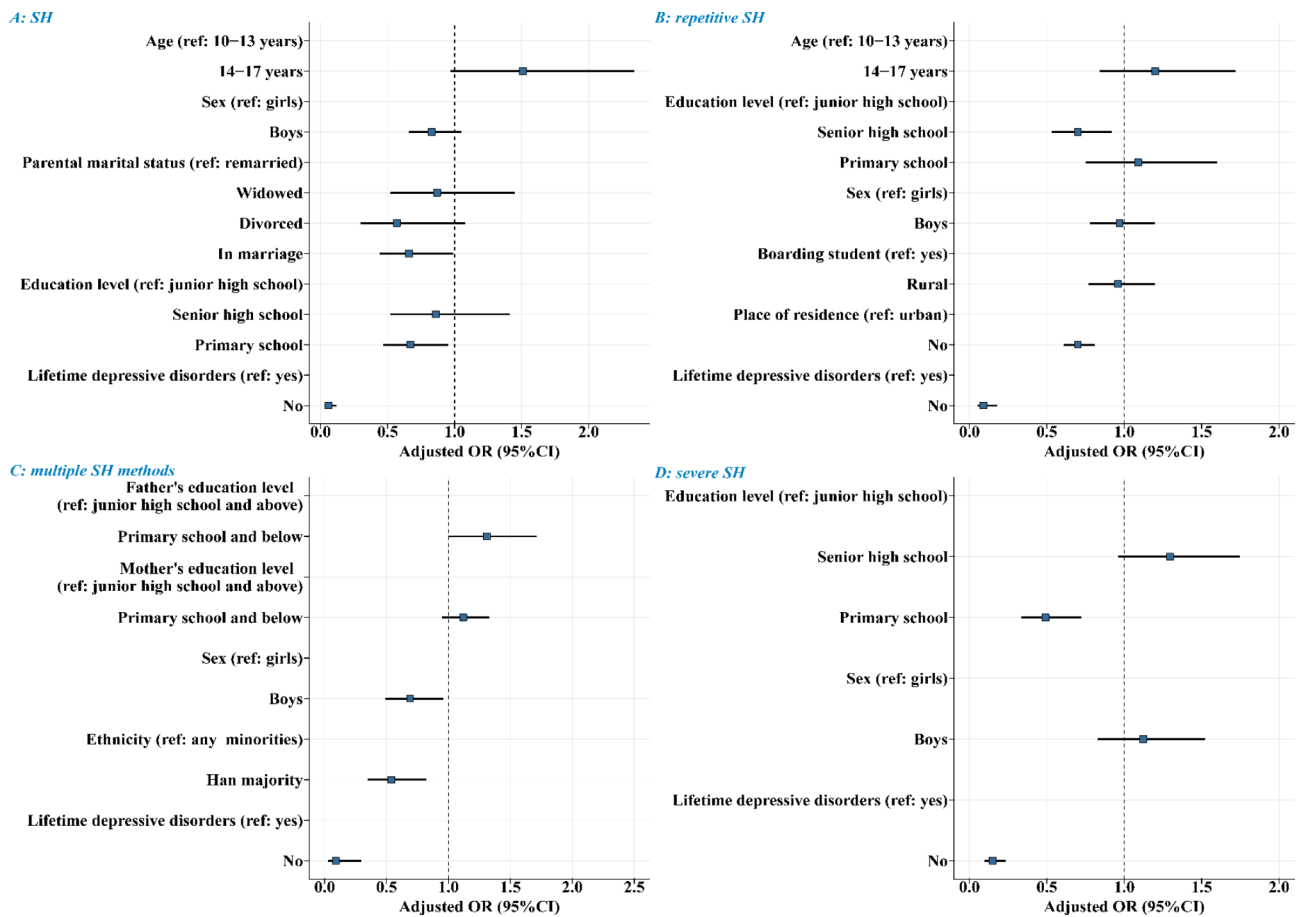


Fig. 3 Multivariate logistic regression model for the adjusted associations between lifetime DD and SH, repetitive SH, multiple SH methods, severe SH. DD: depressive disorders; SH: self-harm

Prominent effect modification by sex and age was found in the DD-SH association. For sex, a stronger association was observed among girls. This finding was supported by existing studies which reported a higher risk of DD and SH in girls [18, 33]. A possible reason for this phenomenon could be that girls reach puberty earlier than boys, and the consequences of puberty, such as hormone changes and transitions in social roles, may collectively put girls at a higher risk of depression [34]. A stronger association between depression and severe SH was identified in younger study subjects. This observation could possibly be attributed to the poorer ability of self-control and cognizance in younger individuals, which may contribute to worse SH [18]. Therefore, for depressive LBCs, girls and younger individuals should be prioritized for SH intervention.

Our findings highlight the importance and urgency of addressing depression in Chinese LBCs. Current evidence supports the effectiveness of psychological and pharmacological interventions. Tricyclic antidepressants (TCAs) and selective serotonin reuptake inhibitors (SSRIs) are the main pharmaceuticals used for

depression in children and adolescents [35]. Psychological therapies could also be effective in treating DD and attenuating its association with SH among children and adolescents. Some small-scale intervention studies have found promising effects of cognitive behavioral therapy (CBT) [36], mindfulness training [37], and mindfulness-based cognitive therapy (MBCT) [38] in treating mental health problems and SH in Chinese LBCs. Family-based interventions, such as Attachment-Based Family Therapy (ABFT), which focusing on strengthening family bonds and improving communication could also be useful [39]. However, population-based intervention studies with large representative sample sizes and finer designs are warranted. Targeting mediators that lie in the path of the DD-SH association, such as psychological resilience [14, 33], could also be considered for the prevention of SH in depressive LBCs.

To our best knowledge, this is the first study that elaborately estimated the prevalence of DD and discussed its association with SH in a representative large sample of Chinese LBCs. Our major findings can provide valuable evidence for better understanding the severity and

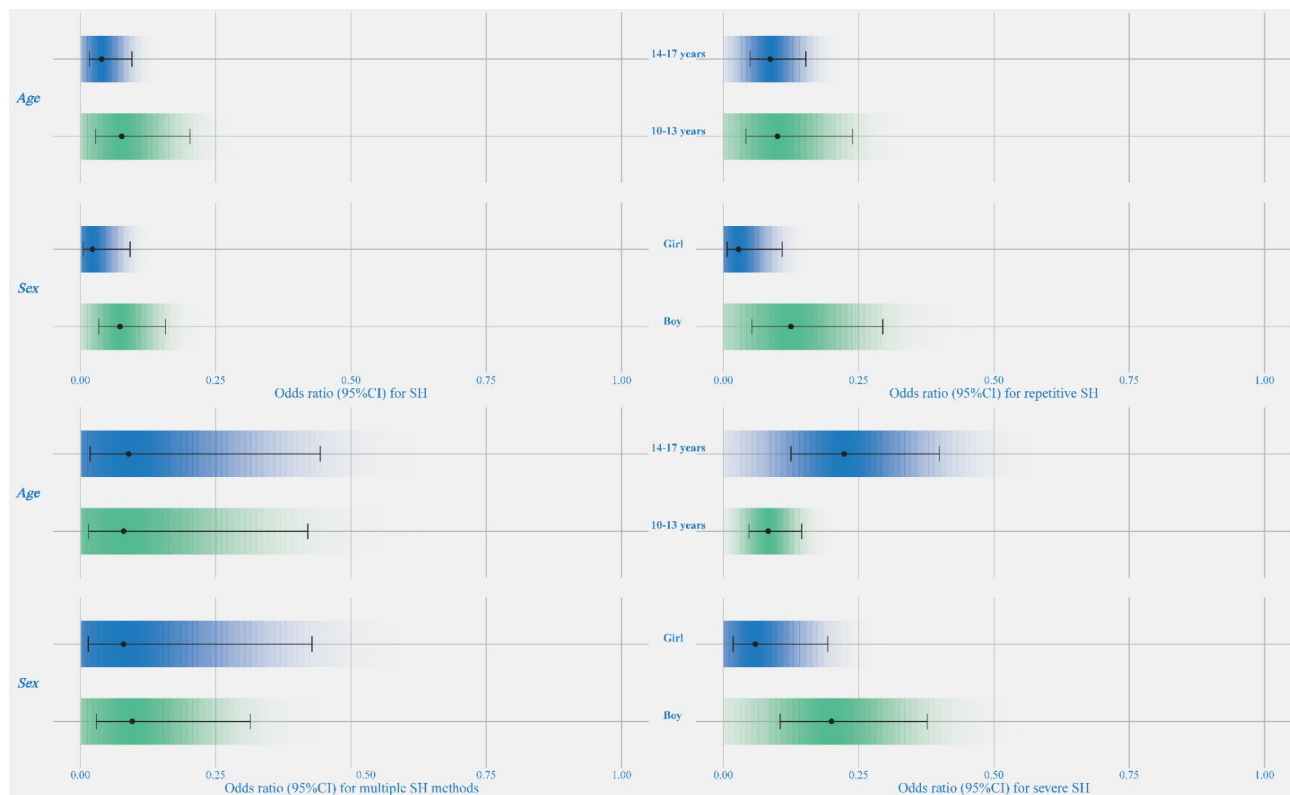


Fig. 4 Stratified analysis for the adjusted associations between lifetime DD and SH, repetitive SH, multiple SH methods, severe SH. DD: depressive disorders; SH: self-harm

distributional characteristics of DD in this disadvantaged population. However, several limitations should be mentioned. First, causal inference cannot be reached due to cross-sectional study design. Second, self-report method is prone to information bias. Finally, all LBCs were selected from a single province in southwest China, which hinders the generalization of study results to the entire Chinese LBC population at a certain extent. Future research should consider adopting longitudinal design to establish causal relationships and objective measuring methods to reduce information bias. Effective intervention strategies should also be developed and validated, in order to substantially reduce depression associated self-harm risk in vulnerable Chinese LBCs.

Conclusions

In this population-based cross-sectional study of a large representative sample, we found that the prevalence of clinically diagnosed depression is high in Chinese LBCs. Additionally, depression was significantly associated with SH behaviors. These findings emphasize the vulnerability of Chinese LBCs to DD and the associated SH behaviors. Future prospective studies are needed to further corroborate our results and validate the effectiveness of currently available intervention measures in treating depression and SH in Chinese LBCs.

Abbreviations

SH	Self-harm
DD	Depressive disorders
LBC	Left-behind children
MHSCAY	The Mental Health Survey for Children and Adolescents in Yunnan

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s13690-024-01393-3>.

Supplementary Material 1

Acknowledgements

None.

Author contributions

YX and JL conceived the study; HR, WC and CX conducted statistical analysis and drafted the manuscript; YC, DF, LC, SW, XL, HS, JP, QL and YS assisted with data collection, cleaning, and statistical analysis; YX and JL critically revised the manuscript. All authors provided critical revision of the manuscript for important intellectual content.

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Data availability

The manuscript's data are available from the corresponding author.

Declarations**Ethics approval and consent to participate**

The study was conducted in accordance with the ethical standards of the institutional and national research committees and with the 1964 Helsinki Declaration and its subsequent revisions or similar ethical standards. The study protocol of the MHSCAY was reviewed and approved by the Ethics Review Board of Kunming Medical University. Informed consents were obtained from both the participants and their legal guardians prior to the survey.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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