

Preplanned Studies

A Large-Scale Cross-Sectional Study on Mental Health Status Among Children and Adolescents — Jiangsu Province, China, 2022

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Summary

What is already known about this topic?

The prevalence of mental health disorders among children and youth in China stands at 17.5%, a figure that has been gradually escalating over recent years. This surge has led to substantial psychological distress and financial strain for both families and the wider society.

What is added by this report?

This study boasts an expansive geographical scope by covering Jiangsu Province extensively and utilizing a substantial sample size. An investigation was conducted on the prevalence and risk factors, which included family type and health behaviors, of depressive, anxiety, and stress symptoms.

What are the implications for public health practice?

The mental health status of children and adolescents should be of great concern to the government. Therefore, it is important that public health measures are implemented to mitigate the development of depressive symptoms. These measures may include regular screening procedures and the implementation of proven interventions.

Mental health disorders in childhood and adolescence often indicate a long-term and recurring disease course that extends into adulthood, causing significant psychological distress and financial strain for families and society. An increasing trend in the prevalence of these disorders has been noted in recent years, making them a significant public health concern in China (1). Li et al. reported that the general prevalence of mental disorders among children and adolescents in China was 17.5%, and 18.8% in Jiangsu Province. Notably, Jiangsu Province, one of the nation's most developed regions located in eastern China, is renowned for its high-quality education. This research intends to examine the mental health status of children

and adolescents in Jiangsu Province in order to inform and guide prevention and intervention strategies. This cross-sectional study was carried out from September to November 2022, encompassing 123,005 students, aged 6–18 years, from all 13 cities (84 counties), and 499 schools across Jiangsu Province. Diligent public health surveillance of children's and adolescents' mental health can offer essential data on prevalence trends and health behavior variances in different populations. This information is crucial for proposing early identification and targeted interventions for high-risk groups (2).

This cross-sectional study, conducted in 2022, was aligned with the “Surveillance for Common Disease and Health Risk Factors Among Students” program. Participants were students aged 6–18 years, drawn from all 13 cities (encompassing 84 counties) and 499 schools in Jiangsu Province. The sampling approach utilized a cluster randomized method, selecting two primary schools, two middle schools, and two high schools from each county. Within these institutions, two classes per grade level were targeted, and all members of the chosen classes were invited to participate, yielding at least 80 survey participants per grade.

Survey participants completed an online questionnaire in multimedia computer classrooms resulting in the accumulation of 123,005 valid responses, representing a 97.7% effective rate. Inclusion criteria required participants to be residents of Jiangsu Province, studying there, and willing to take part in the research. The exclusion criteria were: acute or severe illnesses impacting the ability to cooperate with the investigation, or an incomplete electronic questionnaire submission.

The questionnaire was segmented into two sections. The first solicited sociodemographic information which included variables such as age, gender, grade, family type, parental education level, accommodation status, and residential area. Resident students were

defined as those who lived in a school dormitory more than three days per week. Single-parent family was denoted as living exclusively with one parent. Current smoking and drinking behaviors were described as the consumption of alcohol or smoking of cigarettes within the past 30 days.

The second part of the questionnaire appraised the participants' mental health status over the preceding week. Evaluation tools used included the Center for Epidemiology Studies Depression (CES-D) scale and the Depression Anxiety Stress Scale (DASS-21). It also scrutinized health behaviors related to smoking and drinking.

This study utilized the CES-D to evaluate the prevalence of depressive symptoms. Responses were graded on a four-point Likert scale, with higher accumulated scores indicating severe depressive symptoms. The Chinese version of the CES-D scale has been employed and verified for its reliability in previous studies involving Chinese cohorts (3). A CES-D score of 20 or higher was utilized to determine the presence of depressive symptoms.

The DASS-21 was used to gauge three negative emotional states: depression, anxiety, and stress. As the depressive symptoms were already appraised using CES-D, the study employed only two subscales or 14 items of the DASS-21 to evaluate the participants' symptoms of anxiety and stress. Responses were calculated on a four-point Likert scale. Each subscale's total score was determined by doubling the sum of its seven items. High scores indicated severe negative emotions. The presence of anxiety symptoms was determined with scores above 7, while indications of stress symptoms were ascertained with scores exceeding 14 (4).

The Cronbach's alpha for both the CES-D and DASS-21 were 0.866 and 0.914, respectively, pointing to substantial internal validity.

Categorical variables are presented in percentages, while continuous variables are furnished as Mean \pm SD. The statistical evaluations were executed using IBM SPSS Statistics (version 25, IBM SPSS Inc., Chicago, USA), and the Chi-square test served to juxtapose the prevalence of symptoms linked to depression, anxiety, and stress across different variables. Factors associated with depressive symptoms were evaluated a priori, drawing on clinical significance, established scientific knowledge, as well as predictors spotlighted in previously published articles. With univariate logistic regression, variables of statistical significance were incorporated into a multivariate

logistic regression in a subsequent step to assess the correlations between depressive symptoms and the explanatory variables, utilizing R software (version 4.2.2; The R Foundation for Statistical Computing, Vienna, Austria). In this study, a *P*-value of less than 0.05 was accepted to signal statistical significance.

This study incorporates 123,005 eligible questionnaires. Among the respondents, 64,785 (52.7%) identified as males and 58,220 (47.3%) as females; 34.9% were primary school attendees, 32.9% were middle school students, and 32.2% were high school pupils. It was found that 14.6% exhibited depression symptoms, 8.0% exhibited evidence of anxiety, and 27.4% demonstrated signs of stress (Table 1). The Chi-square test disclosed a statistically significant discrepancy in the prevalence of depression, anxiety, and stress-related symptoms ($P < 0.001$) across distinct academic phases. A higher incidence of these symptoms was observed among female students, upper-grade students, current smokers or alcohol users, and individuals from single-parent households. Multivariable logistic regression results indicated that the potential risk factors for depressive symptoms include being female [odds ratio (*OR*)=1.39, 95% confidence interval (*CI*): 1.35–1.44], a high school student (*OR*=1.98, 95% *CI*: 1.88–2.07), residing in a single-parent household (*OR*=1.12, 95% *CI*: 1.08–1.17), current smoking (*OR*=2.40, 95% *CI*: 2.14–2.68), and current alcohol consumption (*OR*=3.18, 95% *CI*: 3.06–3.30) (Table 2).

DISCUSSION

This study explored the occurrence of symptoms relating to depression, anxiety, and stress in children and adolescents across Jiangsu Province via a large-scale cross-sectional survey. The findings reveal that mental health issues remain a significant public health concern among the juvenile population in Jiangsu. A total of 14.6% of participants in the study demonstrated depressive symptoms, a figure in alignment with the data reported in the "Report on National Mental Health Development (2021–2022)" (5). When compared to other provinces, the occurrence rate of depressive symptoms among children and adolescents in Jiangsu is notably lower than that in Shandong Province (36.0%) (6), Henan Province (20.0%) (7), and Anhui Province (18.6%) (8). These discrepancies might be due to the lower economic status of these provinces. Previous research has concluded that

TABLE 1. Characteristics of the participants.

Factor	Primary school students (N=42,971)	Middle school students (N=40,439)	High school students (N=39,595)	Total (N=123,005)	P value
	Mean±SD/N (%)	Mean±SD/N (%)	Mean±SD/N (%)	Mean±SD/N (%)	
Age	10.7±0.9	13.8±0.9	16.7±0.9	13.7±2.6	<0.001
Gender					0.049
Male	22,505 (52.4)	21,499 (53.2)	20,781 (52.5)	64,785 (52.7)	
Female	20,466 (47.6)	18,940 (46.8)	18,814 (47.5)	58,220 (47.3)	
Depressive symptoms					<0.001
No	39,257 (91.4)	34,172 (84.5)	31,605 (79.8)	105,034 (85.4)	
Yes	3,714 (8.6)	6,267 (15.5)	7,990 (20.2)	17,971 (14.6)	
Anxiety symptoms					<0.001
No	40,312 (93.8)	36,799 (91.0)	36,043 (91.0)	113,154 (92.0)	
Yes	2,659 (6.2)	3,640 (9.0)	3,552 (9.0)	9,851 (8.0)	
Stress symptoms					<0.001
No	34,659 (80.7)	29,313 (72.5)	25,327 (64.0)	89,299 (72.6)	
Yes	8,312 (19.3)	11,126 (27.5)	14,268 (36.0)	33,706 (27.4)	
Region					<0.001
Urban	21,277 (49.5)	20,118 (49.7)	29,391 (74.2)	70,786 (57.5)	
Rural	21,694 (50.5)	20,321 (50.3)	10,204 (25.8)	52,219 (42.5)	
Resident students					<0.001
No	42,281 (98.4)	35,122 (86.9)	22,047 (55.7)	99,450 (80.9)	
Yes	690 (1.6)	5,317 (13.1)	17,548 (44.3)	23,555 (19.1)	
Single-parent family					<0.001
No	36,529 (85.0)	33,726 (83.4)	33,167 (83.8)	103,422 (84.1)	
Yes	6,442 (15.0)	6,713 (16.6)	6,428 (16.2)	19,583 (15.9)	
Paternal education					<0.001
≤12 years	27,067 (63.0)	32,423 (80.2)	32,026 (80.9)	91,516 (74.4)	
>12 years	15,904 (37.0)	8,016 (19.8)	7,569 (19.1)	31,489 (25.6)	
Maternal education					<0.001
≤12 years	27,485 (64.0)	33,467 (82.8)	33,356 (84.2)	94,308 (76.7)	
>12 years	15,486 (36.0)	6,972 (17.2)	6,239 (15.8)	28,697 (23.3)	
Current smoking					<0.001
No	42,762 (99.5)	39,948 (98.8)	38,930 (98.3)	121,640 (98.9)	
Yes	209 (0.5)	491 (1.2)	665 (1.7)	1,365 (1.1)	
Current drinking					<0.001
No	39,614 (92.2)	33,956 (84.0)	28,291 (71.5)	101,861 (82.8)	
Yes	3,357 (7.8)	6,483 (16.0)	11,304 (28.5)	21,144 (17.2)	

Abbreviation: SD=standard deviation; N=number.

children residing in areas with economic hardship are more prone to develop adverse emotional states, including hostility, interpersonal tension, depression, anxiety, maladaptation, and psychological imbalances (9).

Past research indicates a correlation between health

risk behaviors, social relationships, education, and mental health in children and adolescents. Li et al. (10) suggested that females are more prone to depression than males, a claim supported by the findings of our study. We observed that senior students exhibited more depressive symptoms, potentially due to the

TABLE 2. Multivariable Logistic regression analysis for symptoms of depressive, anxiety, and stress.

Factor	Depression symptoms			Stress symptoms			Anxiety symptoms		
	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value
Academic period									
Primary school	1.00 (Ref)			1.00 (Ref)			1.00 (Ref)		
Middle school	1.69	(1.61, 1.76)	<0.001	1.30	(1.23, 1.37)	<0.001	1.42	(1.37, 1.47)	<0.001
High school	1.98	(1.88, 2.07)	<0.001	1.08	(1.02, 1.15)	0.013	1.87	(1.80, 1.94)	<0.001
Gender									
Male	1.00 (Ref)			1.00 (Ref)			1.00 (Ref)		
Female	1.39	(1.35, 1.44)	<0.001	1.51	(1.44, 1.57)	<0.001	1.40	(1.36, 1.43)	<0.001
Region									
Urban	1.00 (Ref)				*		1.00 (Ref)		
Rural	1.00	(0.97, 1.04)	0.788				1.00	(0.98, 1.03)	0.740
Resident students									
No	1.00 (Ref)			1.00 (Ref)			1.00 (Ref)		
Yes	1.01	(0.96, 1.05)	0.756	0.94	(0.88, 0.99)	0.027	0.99	(0.96, 1.03)	0.576
Single-parent family									
No	1.00 (Ref)			1.00 (Ref)			1.00 (Ref)		
Yes	1.12	(1.08, 1.17)	<0.001	1.11	(1.05, 1.17)	<0.001	1.11	(1.07, 1.15)	<0.001
Paternal education									
≤12 years	1.00 (Ref)			1.00 (Ref)			1.00 (Ref)		
>12 years	0.95	(0.90, 1.00)	0.056	1.01	(0.94, 1.07)	0.874	0.95	(0.91, 0.99)	0.009
Maternal education									
≤12 years	1.00 (Ref)			1.00 (Ref)			1.00 (Ref)		
>12 years	0.95	(0.90, 1.00)	0.066	0.99	(0.92, 1.06)	0.695	0.95	(0.91, 0.99)	0.010
Current smoking									
No	1.00 (Ref)			1.00 (Ref)			1.00 (Ref)		
Yes	2.40	(2.14, 2.68)	<0.001	2.01	(1.76, 2.28)	<0.001	1.51	(1.35, 1.69)	<0.001
Current drinking									
No	1.00 (Ref)			1.00 (Ref)			1.00 (Ref)		
Yes	3.18	(3.06, 3.30)	<0.001	3.56	(3.40, 3.73)	<0.001	2.79	(2.71, 2.89)	<0.001

Abbreviation: Ref=reference; OR=odds ratio; CI=confidence interval.

* Data missing here is due to the univariate logistic regression of anxiety symptoms showing that "region" is not statistically significant (P value >0.05), so "region" was not incorporated into a multivariate logistic regression of anxiety symptoms.

stressors associated with more rigorous academic demands and college preparations. Additionally, participants from single-parent households recorded a higher incidence of depressive symptoms. This may be attributed to a communication gap between parents and deficient psychological adjustment capabilities (11).

Interestingly, current smoking was linked with a two-fold increase in the likelihood of depressive symptoms among adolescents, in line with Raffetti et al.'s findings (12). Moreover, self-identified alcohol consumers in this study had a higher probability of depression compared to non-drinkers. Certain scholars

argue that the correlation between depression and unhealthy behaviors, such as smoking and excessive drinking, may point to a coping mechanism rather than a cause. They suggest that the increased incidence of depression in smokers and drinkers may arise from individuals using tobacco and alcohol to manage their mental state (13).

Nicotine, present in tobacco, has a stimulant effect on the brain and triggers the release of substances that govern depressive pathways, anxiety, and stress response. Although nicotine may temporarily alleviate depression, stress, and anxiety, its long-term consumption can lead to addiction, increased

sensitivity, and a heightened depressive tendency. Similarly, alcohol, a central nervous system depressant, can affect neurotransmitter levels in the brain, leading to mood alterations. However, the causality of the observed associations cannot be definitively established within the confines of this study due to the cross-sectional design's inherent limitations.

This study was subject to several limitations. First, the outcomes cannot be universally applied since the sample was limited to Jiangsu Province and may not accurately represent the entire population. Second, as this was a cross-sectional study, it is not feasible to infer potential causal consequences. Lastly, given this was an internet-based survey, participants' accessibility data was obtained through a sole self-reported question, with no subsequent confirmation processes or extensive resources incorporated into this questionnaire. There is a need for additional longitudinal studies to be carried out in the future.

Childhood and adolescence represent critical stages in an individual's development, characterized by several physical and emotional changes. These changes may potentially disrupt functioning in the family, school, society, and adaptive functioning. It is therefore essential to identify primary indicators of depression and develop effective prevention and intervention measures. This approach is instrumental in promoting the physical and mental well-being of adolescents (14).

Monitoring the mental health of children and adolescents plays a critical role in understanding the broader public health impact, increasing awareness about mental health, and pinpointing potential resource allocation needs (15). This study's findings can assist public health professionals, policymakers, and educators in early recognition and intervention of mental health issues. Specifically, these findings can support targeting students who are upper-classmen, female, current smokers, alcohol users, or those living in single-parent families, leading potentially to improved long-term health outcomes.

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