

Article

A Study on the Mental Health Status and Influencing Factors among University Medical Students in Hainan Province during the Post-COVID-19 Era

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Abstract: Objective: This study aimed to assess the mental health status of medical students in colleges and universities in Hainan Province during the post-COVID-19 era and to explore the key factors influencing their psychological well-being, with the goal of providing a theoretical foundation for the development of targeted and effective psychological intervention strategies. Methods: A cross-sectional survey was conducted from January 2024 to January 2025, involving a total of 1,371 medical students from one undergraduate university and one junior college in Hainan Province. Data were collected using the Symptom Checklist-90 (SCL-90) alongside a structured general information questionnaire. The survey captured demographic characteristics, academic-related pressures, and lifestyle factors potentially associated with mental health outcomes. Statistical analyses were performed to identify significant predictors of mental health problems among the participants. Results: The findings revealed a notably high prevalence of mental health problems among medical students in Hainan, with anxiety, depression, and obsessive-compulsive tendencies being the most prominent symptoms. Multiple factors were found to significantly affect students' mental health, including academic stress, sleep patterns, social support, and coping strategies. The study highlights the complex interplay between individual, academic, and environmental factors in shaping students' psychological resilience. Conclusion: The mental health of medical students in Hainan Province during the post-pandemic era warrants urgent attention. Higher education institutions should proactively implement comprehensive mental health monitoring and intervention programs. Integrating systematic mental health education into the curriculum, promoting stress management and coping skills, and enhancing the availability of psychological support services are essential measures to strengthen students' resilience and preparedness in facing public health emergencies. These strategies may not only improve individual well-being but also foster a healthier and more supportive academic environment.

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Keywords: post-COVID-19 era; medical students; mental health; SCL-90; associated factors; Hainan province

1. Introduction

The COVID-19 pandemic has had a profound and enduring impact on global public health, social systems, and individual psychological well-being. Among affected populations, medical students represent a particularly vulnerable group, as they not only face rigorous academic demands but also bear the psychological burden associated with their training in health care and the anticipation of future professional responsibilities. The post-COVID-19 era, characterized by ongoing public health uncertainties, epidemic prevention measures, and the residual effects of prolonged social restrictions, has intensified the mental health challenges faced by this population, making it a critical area for research and intervention.

Hainan Province, as an island region with unique geographical, socio-economic, and educational characteristics, provides a distinctive context for examining the mental health of medical students. The region's relatively isolated environment, coupled with its evolving higher education system, may influence both the prevalence and the nature of psychological problems among students. Investigating these patterns is essential not only for understanding the current mental health landscape but also for identifying key factors—such as academic stress, social support, lifestyle habits, and coping strategies—that contribute to psychological vulnerability [1].

Given this context, the present study aims to assess the mental health status of medical students in universities and colleges across Hainan Province during the post-pandemic period [2]. Utilizing the Symptom Checklist-90 (SCL-90) alongside a structured general information questionnaire, this research seeks to provide a comprehensive analysis of students' psychological conditions and the associated influencing factors. The findings are expected to offer valuable insights for the development of targeted psychological interventions, inform mental health policies within higher education institutions, and ultimately contribute to the enhancement of both student well-being and the overall quality of medical education.

2. Teaching reform plans and practical processes

2.1. Research objectives

The participants of this study comprised medical students enrolled in various programs, including clinical medicine, midwifery, nursing, rehabilitation, and pharmacy, at universities and colleges in Hainan Province [3].

Inclusion Criteria:

- 1) Students currently enrolled in undergraduate or junior college medical programs.
- 2) Students who voluntarily provided informed consent and agreed to cooperate fully with the investigators.

Exclusion Criteria:

- 1) Students on leave of absence or taking leave exceeding one month during the study period.
- 2) Visiting or exchange students who were not regularly enrolled in the institution.

2.2. Sampling Method

This research employed a cross-sectional design using convenience sampling. Between January 2024 and January 2025, a minimum of 1,000 students were recruited from one undergraduate university and one junior college in Hainan Province [4]. The sampling strategy was designed to capture a representative range of medical students across different disciplines and academic levels while considering the practical constraints of accessibility and participant availability.

2.3. Questionnaire Survey Method

Data were collected using a structured, self-administered questionnaire divided into three sections:

- 1) Introduction: This section provided participants with an overview of the study, including research background, objectives, significance, and a summary of the survey methodology. It emphasized voluntary participation, confidentiality, and the purpose of the research to ensure informed consent.
- 2) General Information: Participants reported demographic and academic characteristics such as age, gender, educational level, major, grade, and any leadership

or organizational positions held. This information allowed for subgroup analyses to identify potential associations between participant characteristics and mental health outcomes.

- 3) **Mental Health Assessment:** The Symptom Checklist-90 (SCL-90), developed by Derogatis LR, was used to evaluate participants' psychological status. The SCL-90 is a validated, widely applied self-report instrument known for its reliability, sensitivity, and ease of administration. Participants rated the presence and severity of 90 symptoms experienced over the previous week on a 5-point Likert scale ranging from 1 ("none") to 5 ("severe"). The scale measures ten primary symptom dimensions: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism, and additional items including sleep and dietary disturbances. A total score above 160, more than 43 positive items, or a score ≥ 2 on any symptom dimension was considered indicative of psychological distress. Higher total and factor scores correspond to greater mental health challenges.

To ensure data quality, all questionnaires were completed anonymously and returned directly to the research team. Each questionnaire was carefully checked for completeness before data entry and analysis [5]. The SCL-90 demonstrated high internal consistency in this study, with Cronbach's α coefficients ranging from 0.84 to 0.91, supporting its reliability and suitability for assessing the mental health of medical students in this context.

3. Main contents and policy recommendations of the research results

3.1. Main contents of the research results

A total of 1,280 questionnaires were distributed, of which 1,204 were returned. After excluding 4 invalid responses, 1,200 valid questionnaires were retained, resulting in an effective response rate of 99.35%. Among the respondents, 300 were male (25.5%) and 900 were female (74.5%), with ages ranging from 17 to 32 years (mean $\pm$ SD: 20.09 $\pm$ 1.31 years). Additional demographic and academic characteristics of the participants are summarized in Table 1.

Table 1. Demographic Characteristics of Medical Students (n=1371, %).

Variable	Groups	Number of cases	Composition ratio (%)
Education level	undergraduate	1131	82.49
	junior college	240	17.51
	freshman	394	28.74
Grade	sophomore	870	63.46
	junior	82	5.98
	senior	25	1.82
Major	Nursing (including Geriatric and ICU specializations)	622	45.437
	midwifery	68	4.96
	clinical medicine	371	27.06
	rehabilitation medicine	124	9.04
	stomatology	141	10.28
Student officer (Yes/No)	pharmacy	45	3.28
	Yes	219	15.97
	No	1152	84.03

3.1.1. Descriptive statistical results

Descriptive statistics were performed on the average scores of each SCL-90 factor, using the mean item scores for analysis and comparison. The results revealed that the scores for phobic anxiety and psychoticism, as well as the overall mean score, were significantly higher among medical students in universities and colleges in Hainan Province compared with national norms. These findings indicate that students exhibited relatively lower mental health levels specifically in areas related to phobic anxiety and psychoticism. Overall, the general mental health status of the participants was below the national average, highlighting a concerning trend that warrants attention. Detailed results are provided in Table 2.

Table 2. Mean Scores of Mental Health Status of Medical Students (n=1371, $\bar{x} \pm s$).

Variable	Range	Items	Average score of items	National Norm	t	p
Total Points	90~250	90	1.41±0.55	1.44±0.43	-1.73	0.084
Somatization	12~60	12	1.33±0.50	1.37±0.48	-3.24	0.001
Obsessive-Compulsive Symptoms	10~50	10	1.64±0.68	1.62±0.58	1.162	0.245
Interpersonal Sensitivity	9~45	9	1.47±0.63	1.65±0.51	-10.64	<0.001
Depression	13~65	13	1.46±0.63	1.50±0.59	-2.24	0.025
Anxiety	10~50	10	1.37±0.57	1.39±0.47	-1.23	0.218
Hostility	6~30	6	1.36±0.55	1.48±0.56	-8.03	<0.001
Phobic Anxiety	7~35	7	1.37±0.58	1.23±0.43	9.06	<0.001
Paranoid Ideation	6~30	6	1.34±0.55	1.43±0.57	-5.73	<0.001
Psychoticism	10~50	10	1.33±0.54	1.49±0.42	3.06	0.002
Other Symptoms (Sleep and Diet)	7~35	7	1.41±0.59	1.41±0.43	0.09	0.925

3.1.2. One-way Analysis of Variance

To investigate potential gender differences in the overall SCL-90 scores and its individual factors, independent-samples t-tests were conducted [6]. The results revealed significant gender differences in the total SCL-90 score as well as in six specific dimensions: obsessive-compulsive symptoms, anxiety, hostility, paranoid ideation, psychoticism, and additional symptoms related to sleep and diet ($P < 0.05$). Female students demonstrated better psychological health than their male counterparts in terms of the overall score, anxiety, hostility, paranoid ideation, psychoticism, and sleep- and diet-related symptoms. In contrast, male students exhibited relatively better psychological health than females specifically in the obsessive-compulsive symptoms dimension. Detailed statistical results are presented in Table 3.

Table 3. Analysis of Gender Differences in Mental Health Status Scores of Medical Students (n=1371, $\bar{x} \pm s$).

Variable	Male	Female	t	p
Total Points	1.42±0.63	1.41±0.51	0.09	0.006
Somatization	1.33±0.58	1.32±0.48	0.13	0.062
Obsessive-Compulsive Symptoms	1.62±0.74	1.65±0.66	-0.74	0.047

Interpersonal Sensitivity	1.46±0.70	1.47±0.61	-0.32	0.101
Depression	1.44±0.68	1.47±0.61	-0.91	0.350
Anxiety	1.38±0.66	1.37±0.54	0.52	0.007
Hostility	1.38±0.65	1.35±0.51	0.75	0.001
Phobic Anxiety	1.35±0.66	1.38±0.54	-0.86	0.142
Paranoid Ideation	1.38±0.66	1.33±0.51	1.38	0.002
Psychoticism	1.36±0.64	1.32±0.50	1.06	0.001
Other Symptoms (Sleep and Diet)	1.41±0.59	1.41±0.43	1.35	<0.001

To assess whether educational level was associated with differences in overall SCL-90 scores and its individual dimensions, independent-samples t-tests were performed. The results indicated significant differences in the total SCL-90 score and seven specific factors: interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism ($P < 0.05$). Notably, undergraduate medical students demonstrated better overall mental health and higher scores in interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism compared with their junior college counterparts. Detailed results are presented in Table 4.

Table 4. Analysis of Differences in Mental Health Status Scores among Medical Students by Educational Level ($n=1371$, $\bar{x} \pm s$).

Variable	Junior college	Undergraduate	t	p
Total Points	1.42±0.57	1.38±0.44	0.92	0.003
Somatization	1.33±0.52	1.29±0.42	1.16	0.077
Obsessive-Compulsive Symptoms	1.64±0.69	1.66±0.62	-0.48	0.061
Interpersonal Sensitivity	1.48±0.65	1.42±0.53	1.09	0.004
Depression	1.46±0.65	1.43±0.51	0.86	0.005
Anxiety	1.38±0.59	1.33±0.47	1.09	0.005
Hostility	1.37±0.57	1.31±0.41	1.40	0.001
Phobic Anxiety	1.38±0.59	1.32±0.46	1.38	0.005
Paranoid Ideation	1.35±0.58	1.29±0.42	1.53	<0.001
Psychoticism	1.34±0.56	1.30±0.44	1.10	0.003
Other Symptoms (Sleep and Diet)	1.41±0.60	1.39±0.51	1.60	0.088

To investigate potential differences in overall SCL-90 scores and individual factors across academic grades, a one-way analysis of variance (ANOVA) was conducted. The results revealed significant differences in four specific dimensions: hostility, phobic anxiety, paranoid ideation, and psychoticism ($P < 0.05$). Notably, senior medical students demonstrated better mental health than their junior counterparts in these dimensions, with scores following the order: senior year > junior year > sophomore year > freshman year. Detailed statistical results are presented in Table 5.

Table 5. Analysis of Differences in Mental Health Status Scores among Medical Students by Grade ($n=1371$, $\bar{x} \pm s$).

Variable	Freshman	Sophomore	Junior	Senior	t	p
Total Points	1.43±0.59	1.41±0.53	1.47±0.47	1.28±0.43	2.56	0.054
Somatization	1.33±0.52	1.32±0.50	1.37±0.47	1.22±0.50	1.00	0.393

Obsessive-Compulsive Symptoms	1.63±0.72	1.63±0.66	1.75±0.69	1.44±0.54	1.75	0.154
Interpersonal Sensitivity	1.48±0.67	1.45±0.62	1.54±0.58	1.32±0.51	1.66	0.175
Depression	1.48±0.67	1.45±0.62	1.54±0.54	1.35±0.61	1.49	0.214
Anxiety	1.38±0.59	1.36±0.47	1.41±0.47	1.28±0.49	1.66	0.174
Hostility	1.39±0.60	1.34±0.54	1.37±0.43	1.24±0.39	3.80	0.010
Phobic Anxiety	1.39±0.62	1.37±0.57	1.37±0.53	1.17±0.32	2.82	0.038
Paranoid Ideation	1.38±0.61	1.32±0.53	1.39±0.46	1.21±0.36	4.08	0.007
Psychoticism	1.37±0.59	1.32±0.53	1.37±0.46	1.21±0.40	4.51	0.004
Other Symptoms (Sleep and Diet)	1.42±0.62	1.41±0.58	1.47±0.53	1.24±0.40	1.90	0.128

To examine whether there were significant differences in overall SCL-90 scores and its ten symptom dimensions across students from different professional specializations, a one-way analysis of variance (ANOVA) was conducted. However, the results indicated that there were no significant gender differences in the total SCL-90 score or any of the ten symptom dimensions. Detailed statistical results are presented in Table 6.

Table 6. Analysis of Differences in Mental Health Status Scores among Medical Students by Professional Direction (n=1371, $\bar{x} \pm s$).

Total Points	Nursing (including geriatric and ICU nursing directions)	Mid-wifery	Clinical Medicine	Rehabilitation Medicine	Stomatology	Pharmacy	t	p
Somatization	1.41±0.51	1.39±0.46	1.42±0.59	1.37±0.64	1.43±0.51	1.53±0.57	0.73	0.598
Obsessive-Compulsive Symptoms	1.32±0.48	1.29±0.45	1.34±0.55	1.28±0.58	1.33±0.44	1.36±0.47	0.38	0.862
Interpersonal Sensitivity	1.64±0.65	1.66±0.69	1.64±0.72	1.56±0.75	1.64±0.64	1.82±0.66	0.71	0.618
Depression	1.47±0.60	1.45±0.59	1.47±0.66	1.41±0.72	1.48±0.61	1.59±0.68	0.46	0.807
Anxiety	1.46±0.59	1.46±0.56	1.46±0.67	1.40±0.70	1.48±0.60	1.64±0.76	0.77	0.575
Hostility	1.36±0.53	1.34±0.42	1.38±0.61	1.31±0.67	1.40±0.55	1.54±0.70	1.60	0.157
Phobic Anxiety	1.36±0.54	1.31±0.38	1.35±0.58	1.35±0.62	1.39±0.51	1.48±0.54	0.75	0.586
Paranoid Ideation	1.38±0.55	1.32±0.51	1.35±0.61	1.32±0.70	1.42±0.53	1.44±0.54	0.34	0.889
Psychoticism	1.34±0.53	1.29±0.39	1.36±0.60	1.32±0.66	1.36±0.51	1.39±0.50	1.34	0.246
Other Symptoms (Sleep and Diet)	1.32±0.49	1.29±0.44	1.35±0.60	1.32±0.66	1.37±0.50	1.43±0.56	1.31	0.257
Total Points	1.40±0.55	1.38±0.49	1.43±0.64	1.38±0.67	1.43±0.54	1.51±0.65	1.48	0.193

To examine whether holding student cadre positions was associated with differences in overall SCL-90 scores and individual symptom dimensions, a one-way analysis of variance (ANOVA) was performed. The results revealed a statistically significant difference in the somatization dimension ($P < 0.05$). Specifically, medical students who served as

student cadres exhibited better mental health in terms of somatization symptoms compared with their peers who did not hold such positions. These findings suggest that assuming student leadership roles may be linked to slightly improved somatic mental health, potentially reflecting enhanced coping skills, organizational engagement, or social support among student cadres. Detailed results of this analysis are presented in Table 7.

Table 7. Analysis of Differences in Mental Health Status Scores of Medical Students by Student Cadre Status (n = 1371, $\bar{x} \pm s$).

Variable	Student Officers	Non-Student Officers	t	p
Total Points	1.45±0.58	1.41±0.54	1.16	0.079
Somatization	1.38±0.58	1.31±0.49	1.85	0.004
Obsessive-Compulsive Symptoms	1.68±0.72	1.63±0.67	1.00	0.082
Interpersonal Sensitivity	1.51±0.67	1.46±0.62	1.03	0.162
Depression	1.52±0.67	1.45±0.62	1.42	0.071
Anxiety	1.40±0.59	1.35±0.57	0.74	0.317
Hostility	1.40±0.58	1.35±0.54	1.20	0.115
Phobic Anxiety	1.39±0.60	1.37±0.57	0.64	0.299
Paranoid Ideation	1.37±0.53	1.34±0.56	0.805	0.570
Psychoticism	1.37±0.54	1.33±0.54	0.93	0.316
Other Symptoms (Sleep and Diet)	1.44±0.63	1.41±0.58	0.76	0.144

3.2. Suggestions for Countermeasures

The analysis of the questionnaire data indicates that, under the normalized management of the COVID-19 pandemic, the overall mental health status of medical students in universities in Hainan Province is lower than the national average [7]. Among the various psychological dimensions assessed, phobic anxiety and psychoticism scores were particularly elevated, suggesting that students exhibit comparatively weaker mental health in these areas. These findings underscore the need for universities to maintain and even strengthen mental health services, including regular counseling, targeted workshops, and evidence-based interventions, particularly for students who experienced prolonged campus lockdowns and other pandemic-related restrictions, as they may be at heightened risk for psychological distress.

The results further demonstrate that gender significantly influences psychological well-being among medical students. Female students generally exhibited better overall mental health and lower scores in anxiety, hostility, paranoid ideation, psychoticism, and sleep- and diet-related symptoms, whereas male students showed better mental health specifically in obsessive-compulsive symptoms. These differences may be partially attributable to inherent personality traits, with females tending to be more emotionally sensitive and introspective, and males often exhibiting greater extroversion and independence. These gender-specific patterns highlight the importance of tailoring mental health interventions to address the distinct psychological characteristics of each group, ensuring that support services are both relevant and effective.

Educational level also emerged as a significant factor influencing mental health. Undergraduate students reported better overall mental health and lower scores in interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism compared with junior college students. This suggests that higher educational attainment may enhance coping mechanisms, resilience, and understanding of medical knowledge, thereby mitigating psychological distress during public health crises.

Universities are encouraged to create opportunities for academic advancement and enriched learning experiences, which may have secondary benefits for students' mental well-being.

The findings additionally indicate that mental health improves progressively with academic seniority. Senior students exhibited better psychological outcomes in hostility, phobic anxiety, paranoid ideation, and psychoticism compared to their junior peers (senior > junior > sophomore > freshman). This trend may be attributable to systematic accumulation of medical knowledge, increased familiarity with clinical and academic environments, and more structured career planning, all of which reduce vulnerability to pandemic-related stressors. Institutions may further support students by implementing mentorship programs and career guidance from experienced medical professionals, which can provide positive role models, reinforce resilience, and enhance motivation and engagement.

Finally, students holding leadership positions demonstrated lower levels of somatic symptoms relative to non-leaders. This may reflect the development of adaptive coping skills, enhanced responsibility, and engagement in social and administrative activities associated with student leadership. Universities should ensure that student leaders receive adequate psychological and physical support, resources for stress management, and guidance to balance their academic and leadership responsibilities effectively.

In conclusion, this study provides a systematic analysis of the mental health status and associated influencing factors among medical students in Hainan Province. The findings offer valuable insights for the design and implementation of targeted interventions to enhance psychological well-being, support professional development, and improve the overall quality of medical education. These results can inform university mental health policies, guide the construction of professional counseling teams, and provide empirical evidence for educational authorities to develop tailored strategies, ultimately contributing to the cultivation of competent and resilient medical professionals, strengthened public health preparedness, and the sustainable development of healthcare services.

4. Conclusion

This study conducted a comprehensive survey of the mental health status of medical students in universities across Hainan Province and systematically analyzed their psychological conditions and associated influencing factors under the normalized management of the COVID-19 pandemic. The findings indicate that the overall mental health of these students is below the national average, with phobic anxiety and psychoticism scores particularly elevated, suggesting vulnerabilities in these domains. Key factors influencing mental health included gender, educational level, academic grade, and student leadership status. Female students generally demonstrated better psychological health across most dimensions, whereas male students exhibited relatively better outcomes in obsessive-compulsive symptoms. Undergraduate students and those in higher academic years showed greater overall psychological resilience, likely reflecting enhanced medical knowledge, clearer career planning, and accumulated coping experience. Additionally, students serving as student leaders reported better somatic mental health, possibly due to the demands of active engagement, responsibility, and peer and faculty interactions, which may foster adaptive coping mechanisms.

These results highlight the critical need for targeted mental health interventions within universities. Regular psychological counseling, guidance tailored to gender and grade, and additional support for student leaders are essential to mitigate stress and promote overall well-being. Integrating structured mental health education into the medical curriculum, providing professional lectures on career planning, and fostering a supportive and inclusive campus environment can further enhance students' resilience and capacity to cope with public health challenges.

Overall, this study provides practical evidence for universities and educational authorities to design effective mental health policies, strengthen counseling services, and cultivate high-quality, well-prepared medical professionals. By addressing these key factors, higher education institutions can safeguard the psychological well-being of medical students while contributing to the long-term improvement of medical service quality and public health preparedness.

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