

ASSESSMENT OF ANXIETY, STRESS, AND DEPRESSION AMONG MEDICAL STUDENTS USING A ZALO OA CHATBOT AND ASSOCIATED FACTORS***Quach Thai Bao**

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Abstract

Aims: This study aimed to assess the prevalence of anxiety, stress, and depression among medical students using a Zalo OA chatbot and to identify associated factors. **Study design:** Cross-sectional study. **Place and Duration of Study:** Conducted from September to October 2025 at a private university with health programs in Ho Chi Minh City, Vietnam. **Methodology:** A total of 399 students completed a self-administered questionnaire via the Zalo OA chatbot, including demographic data, lifestyle, social and family factors, and mental health assessment using the DASS-21 scale. Descriptive statistics and multivariate logistic regression were applied to identify factors related to anxiety, stress, and depression. **Results:** Females comprised 51% of participants. Most were Kinh (89.2%) and from urban areas (60.4%). Over half were Buddhists (53.1%) and 32.1% reported no religious affiliation. About 36.6% reported difficulty making new friends, 62.2% belonged to peer groups, and 28.8% had challenges adapting to living environments. Regular exercise was reported by 30.3%, and 19.1% had experienced self-harming thoughts. Mental health prevalence was as follows: anxiety – normal 37.1%, mild 10.8%, moderate 20.8%, severe 12.5%, extremely severe 18.8%; stress – normal 63.4%, mild 10.8%, moderate 16%, severe 6.0%, extremely severe 3.8%; depression – normal 47.6%, mild 17.3%, moderate 22.6%, severe 8.0%, extremely severe 4.5%. Multivariate analysis indicated that difficulty adapting to living environments, female gender, having a close friend, and frequent exposure to parental conflict were significantly associated with anxiety, stress, or depression ($p < 0.05$). **Conclusion:** Mental health problems are common among medical students, influenced by individual, social, environmental, and family factors. Early identification via digital tools and timely interventions are necessary to reduce anxiety, stress, and depression in this population.

Keywords: Medical students, Anxiety, Stress, Depression, Zalo OA chatbot, Mental health.

INTRODUCTION

Mental health, particularly disorders such as anxiety, stress, and depression, has become an increasingly urgent concern among medical students individuals who are continuously exposed to intense academic demands, high-pressure clinical environments, and significant expectations regarding future professional performance. According to the World Health Organization, depression is among the leading contributors to the global burden of disease in young adults(1), (2). Heavy coursework, prolonged study schedules, stressful clinical rotations, and societal expectations place medical students at heightened risk for mental health problems. Following the COVID-19 pandemic, the prevalence of psychological difficulties in this population has shown a marked increase, adversely affecting academic achievement, interpersonal functioning, and long-term career development. Globally, mental health disorders are highly prevalent among medical students. A comprehensive review reported that approximately 27% of medical students experience depression or depressive symptoms(3), while a meta-analysis estimated the prevalence of anxiety at 33.8%(4). These issues not only diminish academic performance and clinical competence but also elevate the risk of burnout, self-harm ideation, and reduced professional capacity in the future. In Vietnam, several studies have revealed similarly concerning trends. In Ho Chi Minh City, 43.3% of medical students reported depressive symptoms and 44.0% showed signs of anxiety(5); Meanwhile, a study in Can Tho found that 64.8% experienced moderate to severe stress(6).

Despite the high burden, many students do not seek psychological support due to stigma, limited awareness of early symptoms, and barriers in accessing mental-health services. Traditional screening methods such as paper-based questionnaires or face-to-face interviews are limited by low flexibility, resource intensity, and difficulty in scaling to large student populations. In the context of rapid digital transformation, technology-based approaches particularly chatbots are emerging as promising tools for mental-health screening. Chatbots can support self-assessment, provide psycho education, track mood changes, and automatically collect data in a convenient and user-friendly manner. International evidence suggests that chatbot-based interventions can enhance user engagement, reduce symptoms, and generate data with reasonable reliability(7). Notably, the Tess chatbot has demonstrated short-term reductions in anxiety and depression(8). In Vietnam, Zalo Official Account (OA) is a widely used communication platform among young people, offering high accessibility, a user-friendly interface, and seamless chatbot integration. Deploying a chatbot on Zalo OA enables students to complete standardized psychological assessments such as the DASS-21 confidentially, efficiently, and with reduced psychological barriers to help-seeking. However, no empirical study to date has evaluated the application of a chatbot integrated into Zalo OA for mental-health screening among medical students in Vietnam representing a critical evidence gap. In addition to screening, identifying factors associated with anxiety, stress, and depression is essential for developing targeted and effective interventions. Previous studies have highlighted associations between mental-health outcomes in medical students and variables such as gender, academic year, academic pressure, social relationships, and lifestyle behaviors. Therefore,

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examining both prevalence and associated factors is necessary to inform meaningful recommendations in the current medical-education context. Given the practical need and the lack of domestic evidence regarding chatbot-based mental-health screening, the present study, titled “Assessment of Anxiety, Stress, and Depression Among Medical Students Using a Zalo OA Chatbot and Associated Factors”, was conducted to (1) describe the mental-health status of medical students, (2) identify associated factors, and (3) evaluate the feasibility of chatbot-based screening. Findings from this study are expected to provide a scientific foundation for medical schools to develop timely, appropriate, and effective psychological support programs for their students. The study focuses on two specific research objectives: (1) To describe the prevalence of anxiety, stress, and depression among medical students using a Zalo OA-based chatbot. (2) To identify factors associated with anxiety, stress, and depression using a Zalo OA chatbot integrated with the DASS-21 screening tool.

MATERIALS AND METHODS

Study Design

This study employed a cross-sectional design. The survey was conducted from September to October 2025. The study setting was a private university in Ho Chi Minh City offering health-related programs.

Eligibility Criteria and Sample Selection

The study population included students enrolled in the year 2025. Inclusion criteria: Regular (full-time) students who voluntarily agreed to participate in the study. Exclusion criteria: Students who declined to participate or were unable to access the Zalo OA chatbot platform to complete the full set of survey questionnaires.

Sample Size

The sample size was calculated using the formula for estimating a population proportion in a cross-sectional study. Based on the study by Nguyễn Thành Trung on “Stress, Anxiety, Depression, and Related Factors among Undergraduate Students at the University of Public Health in 2017,” which used the DASS-21 scale, the reported prevalence rates were: stress 34.4%, anxiety 42.3%, and depression 35.1% (9). For the current study, we selected the highest prevalence ($p = 0.432$ for anxiety) to calculate the largest required sample size, ensuring sufficient power for analyses of factors related to mental health. The calculated sample size was $n = 384$.

Data Collection Tool

The survey was conducted online through the Zalo OA Chatbot platform. The data collection instrument was a pre-structured questionnaire programmed within the Chatbot, comprising four sections: (1) General information; (2) Family, peer, and social factors; (3) Academic factors; and (4) Stress assessment items derived from the DASS-21 (Depression Anxiety Stress Scales – 21 items). The questionnaire provided participants with complete information on the study objectives, participation requirements, response instructions, and data confidentiality assurances. In this study, the stress variable was measured using the DASS-21, a widely used and standardized psychological assessment tool. Although the DASS-21

includes 21 items across three domains (depression, anxiety, and stress), this study used only the 7 items related to the stress subscale, corresponding to items 1, 6, 8, 11, 12, 14, and 18 of the original questionnaire. Each item was rated on a 4-point Likert scale from 0 to 3, reflecting the severity and frequency of symptoms over the past week. The stress score was calculated by summing the scores of the 7 items and multiplying by two, according to the DASS-21 scoring guidelines. The total score was then used to classify stress levels based on standardized thresholds: normal (0–14), mild (15–18), moderate (19–25), severe (26–33), and extremely severe (≥ 34). The use of this standardized scale ensures objectivity, reliability, and comparability of the results with previous studies.

Data Analysis and Processing

Data Analysis Methods: Data were analyzed in two main steps: descriptive statistics and inferential statistics. Categorical variables were presented as frequencies and percentages. To assess associations between stress levels and related factors, the Chi-square test was used. In cases where more than 20% of cells had expected counts less than 5, Fisher’s Exact test was applied to ensure the accuracy of results. The significance level was set at $p < 0.05$.

In this study, associations between risk factors and the presence of anxiety, stress, and depression were evaluated using odds ratios (ORs) with 95% confidence intervals (95% CI) to estimate the strength of associations between background characteristics, family-peer-social factors, and academic factors with stress status. Associations were considered statistically significant when $p < 0.05$ and the 95% CI did not include 1.

Data Handling: Data collected from the Zalo OA Chatbot were stored as log files. These files were subsequently imported into R software for coding, data cleaning, and performing statistical analyses according to the research plan.

RESULTS AND DISCUSSION

Among the participants, 51% were female, slightly higher than males (48.1%). The majority of students were Kinh (89.2%), followed by Hoa (6.8%) and Khmer (4%). More than half of the students practiced Buddhism (53.1%), while 32.1% reported having no religion. Urban-born students accounted for 60.4%. Regarding personal characteristics, 52.6% were satisfied with their appearance. Most reported a moderate financial situation, often having to budget carefully (43.6%), while only 24.1% considered their finances sufficient or nearly sufficient. The majority had a good GPA (58.2%), and 56.4% were dissatisfied with their exam results over the past year. The rate of school regulation violations was 11%. In terms of social relationships, 36.6% had difficulty making new friends; 70.2% had a close friend, and 31.6% had experienced conflicts with close friends. Overall, 62.2% belonged to a peer group, among whom 55.6% frequently shared academic and life issues, and 23.1% reported group conflicts. Regarding the living environment, 28.8% reported difficulties adapting to their residence. Lifestyle habits showed that 31.6% did not exercise regularly, while 30.3% exercised three or more times per week. Most students did not consume alcohol excessively (59.9%), and 17.3% smoked cigarettes or e-cigarettes. Regarding mental health, 19.1% had experienced self-harm thoughts at varying levels.

Table 1. Personal Characteristics of Medical Students (n = 399)

Characteristic	Frequency	Percentage (%)	
Gender	Male	192	48.1
	Female	207	51
Ethnicity	Hoa	27	6.8
	Kinh	356	89.2
	Khmer	16	4.0
Religion	None	128	32.1
	Buddhism	212	53.1
	Catholicism	56	14.0
	Other	3	0.75
Place of birth	Urban	241	60.4
	Rural	158	39.6
Satisfied with body image	Yes	210	52.6
	No	189	47.4
Perceived personal financial status	Sufficient/almost sufficient	96	24.1
	Need to consider when spending	174	43.6
	Insufficient for living expenses	80	20.1
	Not enough to pay tuition fees	49	12.3
GPA in the last academic year	Excellent (3.6–4.0)	78	19.6
	Good (3.2–3.59)	232	58.2
	Fair (2.5–3.19)	65	16.3
	Average (2.0–2.49)	16	4.01
	Poor (<2.0)	8	2.01
Satisfied with exam performance	Yes	174	43.6
	No	225	56.4
Violation of school regulations	Yes	44	11.0
	No	355	88.9
Difficulty making new friends	Yes	146	36.6
	No	253	63.4
Having close friends	Yes	280	70.2
	No	119	29.8
Conflict with close friends	Yes	126	31.6
	No	273	68.4
Being part of a close friend group	Yes	248	62.2
	No	151	37.8
Frequently sharing life and academic issues	Yes	222	55.6
	No	177	44.4
Frequent conflicts within friend group	Yes	92	23.1
	No	307	76.9
Difficulty adapting to living environment	Yes	115	28.8
	No	284	71.2
Physical exercise (>30 minutes/day)	None	126	31.6
	Occasionally (1–2 times/week)	152	38.1
	Regularly (≥ 3 times/week)	121	30.3
Alcohol consumption (≥ 330 ml)	None	239	59.9
	Occasionally (1–2 times/week)	98	24.6
	Frequently (≥ 3 times/week)	62	15.5
Smoking (cigarettes/e-cigarettes)	Yes	69	17.3
	No	330	82.7
Thoughts of self-harm	Sometimes	51	12.8
	Quite often	25	6.3
	Never	260	65.2
	Very rarely	63	15.8
Number of siblings	Two	233	58.4
	One	62	15.8
	More than two	103	25.8
Parents' marital status	One parent deceased	24	6.0
	Living together	339	84.9
	Divorced	36	9.0
Perceived family economic status	Well-off/Rich	123	30.8
	Average	276	69.2
Witnessing parental conflict	Yes	140	35.1
	No	259	64.9
Conflict with family members	Yes	115	28.8
	No	284	71.2

Concerning family characteristics, 58.4% had two siblings; 84.9% reported that their parents were living together, and 69.2% rated their family's economic status as average. Additionally, 35.1% frequently witnessed parental conflicts, and 28.8% reported conflicts with other family members. Regarding anxiety, 37.1% of students were classified as normal. The remaining students were distributed across mild (10.8%), moderate (20.8%), severe (12.5%), and extremely severe (18.8%) levels.

For stress, the majority of students fell within the normal range (63.4%). The proportions for mild, moderate, severe, and extremely severe stress were 10.8%, 16.0%, 6.0%, and 3.8%, respectively.

Regarding depression, 47.6% of students were classified as normal. Symptomatic levels were distributed as mild (17.3%), moderate (22.6%), severe (8.0%), and extremely severe (4.5%).

Table 2. Levels of Anxiety, Stress, and Depression among Medical Students (n = 399)

Characteristic	Severity Level	Frequency	Percentage (%)	
Anxiety	No	Normal	148	37.1
	Yes	Mild	43	10.8
		Moderate	83	20.8
		Severe	50	12.5
		Extremely severe	75	18.8
Stress	No	Normal	253	63.4
	Yes	Mild	43	10.8
		Moderate	64	16.0
		Severe	24	6.02
		Extremely severe	15	3.76
Depression	No	Normal	190	47.6
	Yes	Mild	69	17.3
		Moderate	90	22.6
		Severe	32	8.0
		Extremely severe	18	4.5

Table 3. Factors Associated with Anxiety, Stress, and Depression among Students

Characteristic	Yes	No	Crude OR	Adjusted OR	95% CI	p
Anxiety						
Difficulty adapting to the boarding/relatives' living environment	Yes	95	20	3.89	2.32	1.17 - 3.83
	No	156	128			
Stress						
Gender	Male	50	142	0.41	0.24	0.001 - 0.43
	Female	96	111			
Close friend	Yes	84	196	0.39	0.44	0.25 - 0.76
	No	62	57			
Difficulty adapting to the boarding/relatives' living environment	Yes	64	51	3.09	1.93	1.09 - 3.44
	No	82	202			
Witnessing parental conflict	Yes	69	71	2.29	1.86	1.12 - 3.10
	No	77	182			
Depression						
Difficulty adapting to dormitory/relatives' living environment	Yes	82	33	3.06	1.93	1.17 - 3.83
	No	127	157			
Frequently witnessing parental conflict	Yes	92	48	2.32	1.88	1.19 - 3.39
	No	117	142			

Multivariate logistic regression analysis indicated that students who had difficulty adapting to their dormitory or relatives' home were more likely to experience anxiety compared with their counterparts (Adjusted OR = 2.32; 95% CI: 1.17–3.83; $p = 0.01$).

In the multivariate model for stress, female students had a higher risk compared with male students (Adjusted OR = 0.24; 95% CI: 0.001–0.43; $p = 0.01$), whereas students with close friends reported lower stress levels (Adjusted OR = 0.44; 95% CI: 0.25–0.76; $p = 0.003$). Difficulty adapting to the living environment remained a significant factor (Adjusted OR = 1.93; 95% CI: 1.09–3.44; $p = 0.02$). Additionally, students who frequently witnessed parental conflicts were more likely to experience stress (Adjusted OR = 1.86; 95% CI: 1.12–3.10; $p = 0.02$).

Regarding depression, difficulty adapting to the living environment was significantly associated (Adjusted OR = 1.93; 95% CI: 1.17–3.83; $p = 0.03$). Furthermore, students who frequently witnessed parental conflicts had a higher likelihood of depression (Adjusted OR = 1.88; 95% CI: 1.19–3.39; $p = 0.02$).

Conclusion

The study results indicate that the demographic characteristics of the sample closely reflect the current composition of medical students, with a slightly higher proportion of females than males (51% vs. 48.1%), reflecting the increasing female representation in health sciences in Vietnam in recent years.

The majority of students were Kinh (89.2%), followed by Hoa (6.8%) and Khmer (4%), highlighting the cultural diversity of the Mekong Delta region. More than half of the students identified as Buddhist (53.1%), while 32.1% reported no religious affiliation, consistent with the general religious landscape among medical students. Urban-born students accounted for 60.4%, suggesting that living environments may influence behavior, academic expectations, and adaptability. Regarding personal characteristics, although over half of the students were satisfied with their appearance (52.6%), most reported financial constraints, with 43.6% needing to budget carefully and only 24.1% feeling financially sufficient or nearly sufficient. This suggests that economic pressure may influence mental health. Most students achieved a GPA at the "Good" level (58.2%), yet 56.4% were dissatisfied with their exam results over the past year, reflecting high academic pressure and self-expectations, which may contribute to anxiety and stress. Rule violations were relatively low (11%), consistent with the disciplined nature of medical students. Social relationships also played an important role in mental health. Although 70.2% had a close friend and 62.2% belonged to a peer group, 36.6% experienced difficulty making new friends and 31.6% had conflicts with close friends. This emphasizes that the quality of relationships, rather than their mere presence, is critical for psychological well-being. Group conflicts were reported by 23.1%, reflecting typical social interactions during young adulthood. Regarding living conditions, nearly 29% of students reported difficulty adapting to their residence, suggesting that environmental adaptation is a substantial factor for mental health, particularly for students living away from home. Lifestyle behaviors were relatively

healthy, with most students not abusing alcohol (59.9%), although 17.3% smoked tobacco or e-cigarettes, and 31.6% did not exercise regularly. Notably, 19.1% had experienced self-harming thoughts, highlighting an urgent need for psychological support in universities. Family characteristics revealed potential risk factors. Although 84.9% of students had parents living together and 69.2% rated their family's economic status as average, 35.1% frequently witnessed parental conflicts and 28.8% reported conflicts with other family members. These factors are known to increase the risk of anxiety, depression, and stress among young people. Mental health outcomes assessed using the DASS-21 indicated a substantial prevalence of symptoms. Only 37.1% of students had normal anxiety levels, while 62.9% exhibited symptoms ranging from mild to extremely severe. Similarly, significant proportions of students experienced stress (36.6%) and depression (52.4%). These findings align with both domestic and international studies, highlighting that medical students are at high risk of mental health disorders due to academic pressure, competition, demanding schedules, and stressful clinical environments. Multivariate logistic regression identified several significant associated factors. Difficulty adapting to one's residence consistently correlated with anxiety (Adjusted OR = 2.32), stress (Adjusted OR = 1.93), and depression (Adjusted OR = 1.93), indicating that an unstable or unfavorable living environment strongly impacts mental health, particularly for students living away from home. Frequent exposure to parental conflict also increased the risk of stress (Adjusted OR = 1.86) and depression (Adjusted OR = 1.88). Female gender was associated with higher stress (Adjusted OR = 0.24), whereas having a close friend served as a protective factor against stress (Adjusted OR = 0.44). Overall, these results indicate that mental health among medical students is influenced by multiple personal, family, social, and environmental factors. This multifactorial nature underscores the need for comprehensive interventions, including psychological support, improving living conditions, enhancing social skills, and stress management, particularly for students at high risk but with limited access to mental health services. The findings also support the feasibility and relevance of implementing digital screening and support tools, such as the DASS-21 chatbot, in the current university context.

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Consent: The author confirms that written informed consent was obtained from all participants for the use of their data in this study.

Ethical approval: This study was conducted in accordance with ethical research principles, ensuring the rights, privacy, and confidentiality of all participants.

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