

Psychological distress in health training: depression, anxiety and stress in health science students in Chile.

Malestar psicológico en la formación sanitaria: depresión, ansiedad y estrés en estudiantes de ciencias de la salud en Chile.

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Summary.

Introduction: The mental health of health sciences students is a growing concern in medical education, given the heavy academic workload and early clinical demands that characterize their training. **Objectives:** To evaluate the prevalence of symptoms of depression, anxiety, and stress in health sciences students in Chile and to analyze their association with lifestyle factors relevant to the educational process. **Methods:** An analytical cross-sectional study was conducted with 991 students who, after providing informed consent, completed the DASS-21 (Depression, Anxiety, and Stress Scales), a 21-item self-report questionnaire designed to measure the severity of symptoms of depression, anxiety, and stress. Perceived sleep quality, physical activity, and tobacco use were also analyzed. Descriptive and bivariate analyses were performed, followed by binary logistic regression adjusted for sex and age to identify factors associated with psychological symptoms. The study was approved by a Scientific Ethics Committee. **Results:** A high prevalence of psychological symptoms was observed, especially anxiety (63.8%) and stress (80.3%), with greater severity in women ($p < 0.001$). Poor sleep quality was significantly associated with higher levels of depression, anxiety, and stress. Students with poor sleep quality were approximately three times more likely to experience depressive symptoms (AOR = 3.05; 95% CI: 2.30–4.04), stress (AOR = 3.57; 95% CI: 2.48–5.13), and anxiety (AOR = 2.78; 95% CI: 2.10–3.69). Physical activity did not show an independent association in the adjusted models, while tobacco use showed sex-specific associations. **Conclusions:** A high burden of psychological distress is evident among health sciences students. Sleep quality emerges as a key cross-cutting factor, reinforcing the need to incorporate institutional strategies for sleep promotion and prevention of psychological distress within the educational environment.

Keywords: Mental health, health science students, medical education, depression, anxiety, stress, sleep, lifestyles.

Resumen.

Introducción: La salud mental de los estudiantes de ciencias de la salud constituye una preocupación creciente en el ámbito de la educación médica, dada la alta carga académica y las exigencias clínicas tempranas que caracterizan su formación. **Objetivos:** Evaluar la prevalencia de síntomas de depresión, ansiedad y estrés en estudiantes de ciencias de la salud en Chile, y analizar su asociación con estilos de vida relevantes para el proceso educativo. **Métodos:** Estudio transversal analítico realizado en 991 estudiantes, quienes previo consentimiento informado respondieron la escala DASS-21 (Depression, Anxiety and Stress Scales), cuestionario de autoinforme de 21 ítems diseñado para medir la severidad de los síntomas de depresión, ansiedad y estrés. Se analizaron calidad percibida del sueño, actividad física y consumo de tabaco. Análisis descriptivo y bivariado, seguido de regresión logística binaria ajustada por sexo y edad para identificar factores asociados a sintomatología psicológica. Estudio aprobado por un Comité Ético Científico. **Resultados:** Se observó una elevada prevalencia de sintomatología psicológica, especialmente de ansiedad (63,8%) y estrés (80,3%), con mayor severidad en mujeres ($< 0,001$). La mala calidad del sueño se asoció significativamente con mayores niveles de depresión, ansiedad y estrés. Los estudiantes con mala calidad del sueño presentaron aproximadamente tres veces mayor probabilidad de síntomas depresivos (AOR = 3,05; IC95%: 2,30–4,04), estrés (AOR = 3,57; IC95%: 2,48–5,13) y ansiedad (AOR = 2,78; IC95%: 2,10–3,69). La actividad física no mostró asociación independiente en los modelos ajustados, mientras que el consumo de tabaco mostró asociaciones específicas según sexo. **Conclusiones:** Se evidencia una alta carga de malestar psicológico en estudiantes de ciencias de la salud. La calidad del sueño emerge como factor transversal clave, lo que refuerza la necesidad de incorporar estrategias institucionales de promoción del sueño y prevención del malestar psicológico dentro del entorno formativo.

Palabras clave: Salud mental, estudiantes de ciencias de la salud, educación médica, depresión, ansiedad, estrés, sueño, estilos de vida.

1. Introduction

Entering higher education represents a pivotal moment in life, marked by adaptation to new educational demands, the acquisition of increasing responsibilities, and profound changes in lifestyle habits. During this process, students must develop cognitive, emotional, and social skills that enable them to cope with the demands of the university environment, which can significantly influence their psychological well-being. While this includes positive dimensions, such as optimal functioning and life satisfaction, the assessment of negative symptoms is a widely used approach to identify mental health risks in the university population. In this context, depression, anxiety, and stress (D/A/S) have been recognized as the most common mental health problems among university students, with a potential negative impact on academic performance, the continuation of their studies, and the overall development of their future professional careers (1).

These difficulties are particularly significant for health sciences students, whose training process is characterized by a heavy academic workload, frequent assessments, long study hours, and early exposure to clinical and caregiving situations. Furthermore, there is the gradual contact with human suffering, illness, and death, factors that can increase the emotional burden during the early stages of professional training (2-4). From the perspective of medical and health professions training, the psychological well-being of students is a fundamental aspect of the educational process, as it affects not only learning but also the development of professionalism, self-care, and the future quality of healthcare.

In Chile, the mental health of university students has become a high-priority public health issue, a situation exacerbated by the cumulative effects of the COVID-19 pandemic. Prolonged isolation, academic uncertainty, and the rapid adoption of online education increased existing risks and negatively impacted the educational experience of university students (5). In this regard, it was reported that three out of four Chilean university students felt their mood had worsened compared to before the pandemic (6). Subsequently, a steady increase in symptoms of psychological distress was observed in the post-pandemic period, with prevalences of 63.1% for depression, 69.2% for anxiety, and 57% for stress, suggesting a prolonged decline in psychological well-being in this group (7).

The literature has identified multiple factors related to the presence of anxiety, stress, and anxiety (ASD) symptoms among health sciences students. Consistently, both national and international studies show that women tend to report higher levels of anxiety and stress compared to their male counterparts, as well as differences in risk factors and coping strategies. These gaps are not explained solely by biological factors, but also by social and cultural determinants that shape differentiated experiences in the academic environment (1, 5-6, 8-9). In this sense, incorporating analysis by sex allows for a more comprehensive understanding of psychological distress and helps guide more relevant and equitable interventions. Furthermore, belonging to sexual minorities and being in the early years of study is linked to greater challenges in adapting to the university environment, as well as to high levels of psychological distress (7). From an educational perspective, the feeling of exclusion from the university community, low academic performance, workload overload, financial instability, and the perception of a lack of institutional support have been highlighted as factors that intensify psychological symptoms in this group (10-11).

This phenomenon transcends the Chilean context. Research conducted in Latin America has reported a high prevalence of anxiety and depression symptoms in medical students during the pandemic, with high levels persisting in the subsequent period (12-13). Similarly, studies in Saudi Arabia have revealed that 39% of students experienced moderate to severe anxiety, while 29.5% showed depressive symptoms of the same severity, with women being the most affected group (8). Furthermore, longitudinal studies in Asia have shown higher levels of anxiety during early stages of academic training, especially in women, which underscores the importance of considering the educational period as a crucial factor (9).

Understanding the prevalence of psychological distress among health sciences students is essential from a health education perspective, given that their training includes clinical placements that often take place outside the university, reducing access to formal academic and psychosocial support networks. In this context, coping mechanisms, self-care practices, and support-seeking may differ from other student groups, highlighting the importance of early detection of psychological distress symptoms. In the Chilean context, this information is key to guiding the development of preventive interventions and university policies that promote psychological well-being and foster healthy learning environments. Thus, the objective of this research was to evaluate the prevalence of symptoms of depression, anxiety, and stress in health sciences students in Chile, as well as to analyze their association with lifestyle factors relevant to the educational process.

2. Methods

2.1 Study design.

Quantitative observational cross-sectional study aimed at determining the symptoms of depression, anxiety, and stress in university students of health sciences.

2.2 Study population.

University students over 18 years of age, enrolled during 2024 in on-campus programs in the health sciences and related disciplines at three Chilean universities affiliated with the Council of Rectors of Chilean Universities, were considered. Students from the following programs were included: Medicine, Dentistry, Chemistry and Pharmacy, Obstetrics, Nursing, Nutrition and Dietetics, Medical Technology, Occupational Therapy, and Psychology.

2.3 Inclusion and exclusion criteria.

Students enrolled in undergraduate programs in health sciences or related disciplines were included in the study. After receiving an invitation to participate via their institutional email, they accessed the online questionnaire (Google Forms) and agreed to participate voluntarily. Participation was preceded by reading and accepting the informed consent form, a prerequisite for completing the questionnaire. Pregnant students and students participating in academic exchange programs during the data collection period were excluded from the study.

2.4 Sample size and sampling.

The sample size was estimated a priori considering a conservative expected proportion ($p = 0.50$), a 95% confidence level, and a maximum error of 5%, resulting in a minimum required sample size of 323 students per university. The final sample consisted of 991 students, after accounting for an approximate 5% loss due to incomplete questionnaires. The mean age was 21.1 years ($SD = 2.99$; range = 18–43). 73.2% were female and 26.8% were male. Selection was carried out using non-probability convenience sampling. Students participated in the study after providing informed consent via Google Forms.

2.5 Ethical considerations.

The study protocol was approved by the Scientific Ethics Committee of Andrés Bello University, accredited by the competent health authority. The data collected were anonymous, with no access to the participants' identities.

2.6 Instruments.

The abbreviated version of the *Depression Anxiety Stress Scales* (14), in its Spanish adaptation validated in a Chilean university population (15), was used. This instrument aims to assess the severity of symptoms of depression, anxiety, and stress, understood as distinct but interrelated negative emotional states. The DASS-21 consists of 21 items distributed across three subscales of seven items each (Depression, Anxiety, and Stress), which are answered on a four-point Likert scale ranging from 0 ("It didn't happen to me at all") to 3 ("It happened to me a lot or most of the time"), referring to experiences that occurred during the past week. Scores for each subscale can range from 0 to 21 points (or from 0 to 42 when multiplied by two to equate with the original DASS-42 version), with higher scores indicating greater symptom severity. The results are classified into categories: normal, mild, moderate, severe, and very severe, with the following cut-off points for DASS-21 interpretation: Depression: 5-6, mild depression; 7-10, moderate depression; 11-13, severe depression; 14 or higher, very severe depression. Anxiety: 4, mild anxiety; 5-7, moderate anxiety; 8-9, severe anxiety; 10 or higher, very severe anxiety. Stress: 8-9, mild stress; 10-12, moderate stress; 13-16, severe stress; 17 or higher, very severe stress. In the present study, internal consistency was adequate: Depression ($\alpha = 0.876$), Anxiety ($\alpha = 0.832$), and Stress ($\alpha = 0.794$), with an overall consistency of $\alpha = 0.883$. The three-dimensional structure and the convergent and discriminant validity of the DASS-21 have been previously confirmed in the Chilean population, supporting its use in this study for the assessment of emotional symptoms in university students (11).

2.7 Variables.

The main variables of the study were symptoms of depression, anxiety, and stress, assessed using the *Depression Anxiety Stress Scales-21* (DASS-21), a widely used self-report instrument for measuring psychological distress in university students. Scores for each of the three dimensions evaluated were obtained from this questionnaire. Sociodemographic variables included sex (male/female), age (in completed years), and the student's major at the time of data collection (Medicine, Dentistry, Chemistry and Pharmacy, Obstetrics, Nursing, Nutrition and Dietetics, Medical Technology, Occupational Therapy, and Psychology).

To contextualize the participants' psychological well-being in relation to lifestyle habits relevant to their health sciences training, variables related to sleep, physical activity, and tobacco use were included. Subjective sleep quality was assessed using the question: "Over the past month, how would you rate the overall quality of your sleep?" This item is from the *Pittsburgh Sleep Quality Index* (PSQI). The PSQI is a 19-item self-administered questionnaire that evaluates sleep patterns over the past month and provides an overall subjective perception of sleep quality, with response categories ranging from very good to very poor. Physical activity was assessed using a question derived from the short version of the *International Physical Activity Questionnaire* (IPAQ), which inquired about the weekly frequency of physical activity or sport (excluding walking) during the past month. Responses were recoded into a dichotomous variable, classifying participants who reported no physical activity as sedentary. This variable was used as a proxy indicator of habitual physical activity. Tobacco use was obtained from the World Health Organization's *STEPwise questionnaire* (WHO, 2008), specifically from the module on tobacco product use (STEP 1), using the question: "Do you currently smoke any tobacco product?". The variable was recorded dichotomously (yes/no).

2.8 Data collection

Data collection took place during the second semester of the 2024 academic year. The DASS-21 questionnaire was administered via an online form, developed using the Google Forms platform, and distributed to students via institutional email, with the collaboration of the Academic Secretariats of each participating program. Detailed information about the study, including its objectives, scope, and ethical considerations, was provided at the beginning of the form. An informed consent form was also included, which participants were required to read and explicitly accept before accessing the questionnaire itself. Only students who provided their consent were allowed to proceed with the survey. Participation was anonymous, and no personally identifiable information was collected. The questions were presented sequentially, and the estimated time to complete the questionnaire was communicated beforehand. The data collection period lasted 45 calendar days.

2.9 Data Analysis.

The data were analyzed using Stata 19.5 statistical software. A descriptive analysis of categorical variables was performed using absolute frequencies and percentages, and of continuous variables using median and interquartile range (IQR), since they did not show a normal distribution according to the Shapiro-Wilk normality test ($p < 0.001$). To evaluate differences by sex in the distribution of categorized levels of depression, anxiety, and stress (DASS-21), as well as in lifestyle variables, Pearson's chi-squared test was used. For continuous DASS-21 scores, comparisons between men and women were performed using the non-parametric Mann-Whitney U test. Binary logistic regression models were constructed to evaluate the association between lifestyle factors (sleep quality, physical activity, and tobacco use) and the outcomes of depression, anxiety, and stress symptoms. To this end, the dependent variables (depression, anxiety, and stress) were dichotomized into absence (normal level) and presence of symptoms (mild to very severe). Adjusted odds ratios (ORs) with their respective 95% confidence intervals (95% CIs) were

estimated. The adjusted models included sex and age as covariates. The model assumptions were verified, including the absence of multicollinearity among independent variables. A statistical significance level of $p < 0.05$ was considered in all analyses.

3. Results

A total of 991 university students participated. Specific sample sizes may vary slightly between analyses due to missing data for some variables. Table 1 presents the distribution of depression, anxiety, and stress levels, assessed using the DASS-21 scale, by sex. Regarding depression levels, no statistically significant differences were observed between sexes in the distribution by categories ($p = 0.066$). The majority of students were classified at normal or moderate levels. However, when analyzing continuous scores, women had a significantly higher median than men ($p = 0.026$).

Regarding anxiety, significant differences were found according to sex ($p < 0.001$). Men showed a higher proportion at the normal level (50.7%), while women showed higher percentages at the moderate, severe, and very severe levels. Likewise, the median anxiety level was significantly higher in women compared to men ($p < 0.001$).

Regarding stress, statistically significant differences were also observed according to sex ($p < 0.001$). Men showed a higher proportion at the normal level (30.5%), while women had higher percentages at the severe and very severe levels. Consistently, the median stress level was significantly higher in women compared to men.

Table 1. Depression, anxiety and stress according to sex in Chilean students (DASS-21 scale).

Variable	Total (n=991) n (%)	Men (n=272) n (%)	Women (n=719) n (%)	χ^2	p
Depression Level					
Normal	372 (37.5)	113 (41.5)	259 (36.0)		
Mild	201 (20.3)	61 (22.4)	140 (19.5)		
Moderate	254 (25.6)	64 (23.5)	190 (26.4)	8,815	0.066
Severe	87 (8.8)	14 (5,2)	73 (10,2)		
Very severe	77 (7,8)	20 (7,4)	57 (7,9)		
Median [IQR]	12 [6 – 18]	10 [6 – 16]	12 [6 – 18]		0.026
Anxiety Level					
Normal	359 (36.2)	138 (50.7)	221 (30.7)		
Mild	171 (17,3)	49 (18.0)	122 (17.0)		
Moderate	293 (29.6)	57 (21.0)	236 (32.8)	42,598	< 0.001
Severe	93 (9.4)	19 (7.0)	74 (10.3)		
Very severe	75 (7,6)	9 (3,3)	66 (9,2)		
Median [IQR]	12 [6 – 18]	8 [4 – 14]	14 [8 – 20]		< 0.001
Stress Level					
Normal	195 (19.7)	83 (30.5)	112 (15.6)		
Mild	177 (17,9)	60 (22,1)	117 (16,3)		
Moderate	343 (34.6)	88 (32.4)	255 (35.5)	50,445	< 0.001
Severe	148 (14,9)	27 (9,9)	121 (16,8)		
Very severe	128 (13.0)	14 (5,2)	114 (15.9)		
Median [IQR]	16 [10 – 22]	12 [8 – 18]	16 [12 – 25]		< 0.001

Note: n = sample size; % = percentage; IQR = interquartile range. Comparisons by categories were performed using Pearson's χ^2 test and continuous scores using the Mann-Whitney U test. (*) Statistical significance level: $p < 0.05$.

In the analysis of lifestyles by sex, statistically significant differences were observed in sleep quality ($p = 0.002$). Women more frequently reported poor or very poor sleep quality compared to men (53.8% vs. 42.7%). Physical activity also showed significant differences ($p < 0.001$), with a higher proportion of physically active men (83.9%) compared to women (53.4%). No significant differences were observed in current tobacco use by sex ($p = 0.213$).

Table 2. Distribution of lifestyles by sex in Chilean university students.

Variable	Category	Total n (%)	Men n (%)	Women n (%)	χ^2	p
Quality of sleep	Good / very good	477 (49.3)	154 (57.3)	323 (46.2)	9.472	0.002
	Bad / very bad	491 (50.7)	115 (42.7)	376 (53.8)		
Physical activity	Yes	593 (61.9)	224 (83.9)	369 (53.4)	75.93	< 0.001
	No	365 (38.1)	43 (16.1)	322 (46.6)		
Current tobacco consumption	Yes	106 (11.2)	35 (13.3)	71 (10.4)	1.55	0.213
	No	840 (88.8)	229 (86.7)	611 (89.6)		

Note: n = sample size; % = percentage; χ^2 = Pearson's chi-square test value; p = significance level of 0.05

Table 3 shows that, in the bivariate analysis, sleep quality was significantly associated with higher scores for depression, anxiety, and stress. Students who reported poor or very poor sleep quality had higher median scores for depression, anxiety, and stress compared to those with good or very good sleep quality ($p < 0.001$). Regarding physical activity, students who did not engage in physical activity showed higher levels of anxiety ($p = 0.009$) and stress ($p = 0.008$), with no significant differences in depression scores ($p = 0.175$). In relation to current tobacco use, smoking students had higher median scores for depression ($p = 0.021$) and anxiety ($p = 0.020$), with no statistically significant differences in stress levels ($p = 0.233$). In the binary logistic regression models adjusted for sex and age shown in Table 4, perceived sleep quality remained the factor most consistently associated with the presence of symptoms of depression, anxiety, and stress. Compared with students who reported good or very good sleep quality, those who reported poor or very poor sleep quality were approximately three times more likely to experience depressive symptoms (AOR = 3.05; 95% CI: 2.30–4.04; $p < 0.001$) and stress (AOR = 3.57; 95% CI: 2.48–5.13; $p < 0.001$), as well as nearly three times more likely to experience anxiety (AOR = 2.78; 95% CI: 2.10–3.69; $p < 0.001$).

Table 3. Depression, anxiety and stress scores (DASS-21) according to lifestyles in health science students.

Variable	Category	Depression	p	Anxiety	p	Stress	p
Quality of sleep	Good and very good	8 (4 – 14)		10 (4 – 14)		14 (8 – 18)	
	Bad, very bad	14 (10–22)	< 0.001	14 (10–20)	< 0.001	18 (12–26)	< 0.001
Physical activity	Yes	10 (6–16)		12 (6–18)		14 (10–22)	
	No	12 (6–18)	0.175	14 (8–20)	0.009	16 (10–24)	0.008
Tobacco consumption	No	10 (6–16)		12 (6–18)		16 (10–22)	
	Yes	14 (8–22)	0.021	14 (8–22)	0.020	18 (11–24)	0.233

Note: Depression, anxiety, and stress data are the median and IQR. IQR = interquartile range (P25–P75). Comparisons were performed using the Mann-Whitney U test. Statistical significance level: $p < 0.05$.

Engaging in physical activity did not show a statistically significant association with the presence of depression, anxiety, or stress after adjusting for sex and age. Regarding current tobacco use, a significant association was observed only with symptoms of depression. Students who reported smoking were 1.64 times more likely to experience depression compared to non-smokers (AOR = 1.64; 95% CI: 1.02–2.63; $p = 0.038$). No significant associations were found between tobacco use and symptoms of anxiety or stress.

Table 4. Binary logistic regression models adjusted for symptoms of depression, anxiety and stress according to lifestyles.

Lifestyles		Depression		Anxiety		Stress	
		AOR (95% CI)	P	AOR (95% CI)	P	AOR (95% CI)	P
Sleep quality	Good / very good	Ref.					
	Bad / very bad	3.05 (2.30 – 4.04)	< 0.001	2.78 (2.10 – 3.69)	< 0.001	3.57 (2.48 – 5.13)	< 0.001
Engage in physical activity	Yes	Ref.					
	No	1.06 (0.78 – 1.43)	0.702	1.09 (0.80 – 1.48)	0.563	0.78 (0.54 – 1.14)	0.208
Current tobacco consumption	No	Ref.					
	Yes	1.64 (1.02 – 2.63)	0.038	1.23 (0.78 – 1.94)	0.370	1.05 (0.61 – 1.80)	0.836

Note: AOR = Logistic regression, model adjusted for sex and age; p = significance level of 0.05. Ref., reference category used as a basis for comparison in the regression model.

4. Discussion

The results of this study demonstrate a high burden of emotional symptoms in health sciences students, particularly in the dimensions of anxiety and stress. These findings reinforce the growing concern within medical education regarding psychological well-being during professional training, a stage characterized by high academic demands, evaluative pressure, and progressive exposure to complex clinical scenarios.

In accordance with international studies conducted on medical students and students in other health sciences fields (2, 12, 16, 17), the levels observed in this sample are high, suggesting that psychological distress is a structural phenomenon of the educational process rather than an isolated event. In the Chilean context, these results align with previous research documenting persistent vulnerability in university mental health (1, 10, 18). Recent research suggests that factors inherent to the educational process in health sciences, such as academic workload, curriculum organization, and clinical experiences, significantly influence student mental health (19), emphasizing the need to consider the academic environment as a structural determinant of psychological well-being.

The study's most robust finding was the consistent association between poor sleep quality and a higher likelihood of experiencing symptoms of depression, anxiety, and stress. Students who reported poor sleep quality were nearly three times more likely to experience psychological distress. This result suggests that sleep may not be merely a personal habit, but rather an element

closely linked to academic structure, curricular demands, and the specific learning rhythms of health science disciplines. From a medical education perspective, these results call for a review of pedagogical practices, the organization of assessments, and time demands that could negatively impact students' sleep cycles.

These results are consistent with evidence establishing sleep as an essential regulator of emotional and cognitive processes, whose disruption is linked to increased emotional reactivity, difficulties in affect regulation, and a higher risk of developing psychopathology (20-21). In the case of university students, sleep deprivation and irregular sleep schedules are associated with higher levels of academic stress and poor daytime functioning, which could explain the magnitude and consistency of the observed relationship. These findings reinforce the importance of sleep as a priority target for mental health promotion and prevention strategies in university students.

Sex differences represent another relevant finding of the analysis. In the adjusted regression model, females showed an association with greater severity of anxiety and stress compared to males, while the association with depression did not reach statistical significance. This pattern coincides with studies conducted in Latin American and European settings (5-6, 22), which indicate greater vulnerability among females to symptoms of anxiety and stress in university students.

From an explanatory standpoint, these differences could be related to biological factors and sociocultural determinants. This includes processes of emotional socialization, greater role burdens, and different ways of coping with academic demands. Furthermore, it has been suggested that men tend to express psychological distress through externalizing behaviors or behaviors that are less recognized in clinical settings, which could lead to an underestimation of internalizing symptoms in this group (23). This finding highlights the importance of developing mental health prevention and promotion strategies that take gender differences into account, including academic and psychological support programs specifically aimed at female students. Early detection of symptoms and the implementation of interventions focused on stress management and emotional self-regulation could reduce the progression of psychological distress and improve the overall well-being of students in the health field.

Physical activity did not act as an independent predictor of depression, anxiety, or stress in the regression model adjusted for sex and age, despite the high prevalence of sedentary behavior reported, especially among women. While the bivariate analysis revealed higher levels of anxiety and stress in those who did not engage in physical activity, these associations lost statistical significance after adjustment, suggesting the possible influence of confounding variables.

This result partially contradicts the evidence that consistently supports the beneficial effect of physical activity on mental health (24-26). Several studies have shown that regular exercise, especially during leisure time, is associated with a lower risk of depressive symptoms and improved psychological well-being. However, it has been noted that these effects vary depending on the intensity, frequency, and type of activity (20-21), as well as the context in which it takes place, with greater benefits found when exercise is performed in natural environments (27).

The dichotomous measurement used in this study (yes/no) likely failed to identify significant differences in the quantity or quality of physical activity, which could explain the lack of an independent association. Furthermore, variables related to the university context, such as academic demands, lack of time, and lower motivation for exercise, especially among women, could affect both physical activity levels and emotional state (28). In this sense, physical activity could interact with other psychosocial factors that were not considered.

The university years represent a transitional phase toward early adulthood, where habits and lifestyles that may include risky behaviors are consolidated. In this study, 11.2% of participants indicated that they currently smoke, a figure lower than that reported in university students in Chile (29) and Mexico (30). Chile has the highest prevalence of tobacco use in all of Latin America, both among young people and adults; according to the 2016–2017 National Health Survey, 33.3% of the population reports currently smoking, with higher percentages among men compared to women (37.8% versus 29.1%) (31). This lower prevalence observed in this sample could be explained by greater awareness of the health risks, the impact of anti-smoking policies that limit its consumption in public spaces, the increase in the price of tobacco, and the loss of its appeal as a social practice. In addition, the university environment fosters health-focused principles, which could lead students to be more influenced by their own perceptions of risk (32).

Regarding the observed association between current tobacco use and depression, this aligns with studies linking smoking to higher levels of psychological distress, although establishing causality in cross-sectional studies remains challenging (28-29). While some risky behaviors are common among university students, their influence on emotional symptoms may be mediated by other psychosocial factors not considered in this analysis, such as social support, perceived academic stress, or coping techniques.

From a medical education perspective, these findings suggest that psychological distress among health sciences students is not merely a temporary response, but rather part of a structural context of greater vulnerability, exacerbated in the post-pandemic period. In this context, the implementation of systematic screening strategies using validated instruments, such as the DASS-21, along with institutional interventions focused on promoting sleep hygiene and adjustments to curriculum planning that reduce academic overload, are key to an effective response from higher education.

4.1 Limitations

When interpreting these results, it is important to consider the study's limitations. The sample consisted of students from three Chilean universities, which could limit the representativeness of the findings and their generalizability to other educational contexts. Furthermore, the cross-sectional design prevents establishing causal relationships or determining the directionality between the variables analyzed; it is possible that poor sleep quality contributes to increased emotional symptoms, but also that psychological distress negatively affects sleep, suggesting a possible bidirectional relationship. The information was collected using self-report instruments, which may introduce recall bias or social desirability bias, and voluntary participation could have generated selection bias, in addition to slight variations in sample size due to missing data for some variables. Moreover, certain lifestyle behaviors, such as physical activity, were assessed globally, without considering intensity, frequency, or context, which could have attenuated potential associations. Specific academic variables such as objective curriculum load, the organization of clinical rotations, or the perception of academic rigor were not incorporated, which could act as relevant determinants of psychological distress in the particular context of health science training.

5. Conclusions

- There is a high prevalence of symptoms of depression, anxiety, and stress among health science students in Chile, particularly in the domains of anxiety and stress.
- Poor sleep quality emerges as the factor most consistently associated with a higher probability of presenting symptoms of depression, anxiety and stress, even after adjustment for sex and age, becoming the factor with the most consistent association in the models analyzed.

- Women exhibit greater severity of anxiety and stress, which reinforces the need to incorporate a gender perspective into student support strategies.
- Physical activity and tobacco use did not show consistent associations in the adjusted models, suggesting that, with the available measures and the model used, only the association of sleep was robustly detected.
- From the perspective of medical education, the results underscore the importance of integrating institutional policies aimed at promoting healthy sleep, early detection of emotional distress, and strengthening protective learning environments.

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