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ORIGINAL ARTICLES

Severity progression markers of suicide-risk depression among undergraduate students in Brazil

Marcadores de progressão da gravidade da depressão com risco de suicídio entre estudantes universitários no Brasil

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Abstract

Aims: Mood disorders are highly prevalent among young undergraduate students and, in more severe cases, can lead to suicide. This study aimed to identify progression markers of depressive symptoms with suicide risk among undergraduate students. **Methods:** We conducted a cross-sectional survey of 996 undergraduates at a southern Brazilian public university. We calculated the chance of classifying individuals as "not depressed, no suicide risk", "depressed, no suicide risk", or "depressed, suicide risk" according to individual characteristics using multinomial regression. **Results:** The prevalence of depressive symptoms and suicide risk in the sample were 38.3% and 15.7%, respectively. Severity progression markers included a history of domestic violence in childhood, non-heterosexual sexual orientation, food insecurity, enrollment in a humanities course, dissatisfaction with the course, frequent and heavy use of alcohol, and clinical levels of anxiety and stress. **Conclusions:** In the university context, researchers can utilize the results of this study to identify cases with an increased risk of suicide early on. In addition to screening for clinically relevant depressive symptoms, assessing the severity progression markers identified in this investigation may help prevent the worsening of cases and, ultimately, suicide itself.

Keywords: depression, suicide risk, university, students, Brazil

Resumo

Objetivos: Os transtornos de humor são altamente prevalentes entre os jovens universitários e, em casos mais graves, podem levar ao suicídio. Este estudo teve como objetivo identificar marcadores de progressão dos sintomas depressivos com risco de suicídio entre os estudantes universitários. **Métodos:** Realizamos um levantamento transversal com 996 universitários em uma universidade pública do sul do Brasil. Calculamos a chance de classificar os indivíduos como "não deprimidos, sem risco de suicídio", "deprimidos, sem risco de suicídio" ou "deprimidos, com risco de suicídio" de acordo com as características individuais usando regressão multinomial. **Resultados:** A prevalência de sintomas depressivos e risco de suicídio na amostra foram de 38,3% e 15,7%, respectivamente. Os marcadores de progressão da gravidade incluíram histórico de violência doméstica na infância, orientação sexual não heterossexual, insegurança alimentar, matrícula em um curso de humanidades, insatisfação com o curso, uso frequente



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e pesado de álcool e níveis clínicos de ansiedade e estresse. **Conclusões:** No contexto universitário, os pesquisadores podem utilizar os resultados deste estudo para identificar casos com risco aumentado de suicídio desde cedo. Além de triar os sintomas depressivos clinicamente relevantes, a avaliação dos marcadores de progressão da gravidade identificados nesta investigação pode ajudar a prevenir o agravamento dos casos e, em última instância, o próprio suicídio.

Palavras-chave: depressão, risco de suicídio, universidade, estudantes, Brasil.

Introduction

Depression affects about 300 million people worldwide and is a clinical condition often associated with suicidal ideation and death by suicide (1). The main symptoms of depression consist of depressive mood, disturbances in appetite, sleep, and difficulties in feeling pleasure or interest (2). Suicide, in turn, is the second leading cause of death among young people aged 19 to 29 (2). One of the primary forms of screening for suicide risk is suicidal ideation, which consists of thoughts about taking one's own life, with the presence or not of suicidal plans and methods (1). Combining these two factors – depression and suicide risk – can be a severe public health problem worldwide.

Among university students, the findings are more alarming, as the prevalence of mental disorders in this group is higher than in the general population (3). The academic environment has specific stressors, such as high levels of demand, competitiveness, sleep deprivation, and high levels of stress (4). Furthermore, personal, curricular, institutional, and affective aspects can be barriers to the healthy development of this population (3). As a result, one in five students globally has some psychological disorder, depression being one of the most prevalent (5), and one in four students has suicidal ideation (4).

Investigations with university students show differences in the prevalence of depression, ranging from 6.9% to 59% (6, 7). Regarding suicidal behaviors, the prevalence ranges from 7.6% (8), to 28.5% (7). In Brazil, a meta-analysis identified pooled prevalence's of 28.51% for depressive symptoms and 9.1% for suicidal behaviors among undergraduate students (9). Sociodemographic

factors, including female sex, sexual orientation, and socioeconomic status, are associated with the onset of depressive symptoms (9). Among university students, course-related characteristics may further contribute to symptom emergence (3). In addition, the intensification of depressive symptoms is often linked to pre-existing mental health conditions, such as stress and anxiety (5). Poor management of these comorbidities may exacerbate depressive states and contribute to the progression toward suicidal ideation.

It is noteworthy that not all cases of depression evolve into suicidal behavior. However, one in four of those affected ends up developing chronic depressive conditions, with a higher probability of having comorbid disorders, where the risk of suicide is high (10). Thus, the motivating question for the present research was: "Which factors differentiate a case of depression that evolves into the risk of suicide from one that does not?". Identifying current characteristics that can serve as indicators of possible severity in depressive cases can help mental health professionals in their clinical decision-making processes, especially those at campus-based wellness and support services. Such information can benefit Brazilian universities, given the alarming numbers of psychological distress in this context.

Therefore, this study aimed to analyze current markers associated with the progression from depression without suicide risk to depression with suicide risk among university students in southern Brazil.

Methods

This study is part of the research consortium "Health and Wellness of Undergraduate Students (SABES-Grad)", which aimed to assess undergraduate students' physical and mental health and social and academic well-being. We conducted a cross-sectional study at the Federal University of Rio Grande (FURG), a public university in southern Brazil with approximately 9,000 undergraduates. Individuals aged 18 years or older regularly enrolled in any on-site undergraduate course in 2019 were eligible for the study. We considered

those with severe intellectual, motor, or sensory limitations that prevent them from answering the questionnaire, as well as those who had dropped out of their courses at the time of data collection, as ineligible. Details regarding every procedure can be found elsewhere (11).

We systematically carried out the sampling strategy by conglomerates in a single stage, based on the list of classes offered at the university in 2019, which we retrieved from the university system. In this study, a class was conceptually defined as a group of people enrolled in the same subject. Since the sampling unit was the classes, we calculated the design effect and used it as a parameter to determine the required sample size (design effect = 1.5, with parameters including an intraclass correlation coefficient of 0.02 and an average size of the conglomerate of 20) (12).

Two sample size calculations were performed for the SABES-Grad survey, one descriptive and one for associated factors. The descriptive sample calculation indicated that it was necessary to include at least 847 undergraduates (parameters: expected prevalence of 15% (risk of suicide - basis used for the sample calculation of the study as a whole), with a margin of error of 3 percentage points, power of 80 %, 5% significance level, plus 10% for possible losses and refusals and 1.5 design effect). The sample size calculation for associated factors indicated the need to sample 1,089 individuals.

The average class size is approximately 20 students (12). Therefore, it would be necessary to sample at least 55 classes ($1,089 \div 20$). However, to account for the possibility of individuals being enrolled in two or more classes and being under 18 years of age, we added five more classes (10%) to the sampling process. Therefore, we systematically drew 60 classes from the university system using a previously calculated selection interval.

A self-administered and confidential questionnaire was used for data collection, filled out individually by the research participants. The primary outcomes of this study were depression and suicide risk. In this study, the term depression refers to a Major Depressive Episode, screened

through the Patient Health Questionnaire-9 instrument, consisting of 9 questions about the frequency with which the participant has shown major depressive episode symptoms in the last two weeks. Possible answers for each of these questions are "not at all", "several days", "more than half the days", or "nearly every day". In addition, there is one more question about how much these symptoms are hindering the participant's functioning. We obtained the definition of cases and non-cases from the algorithm proposed by Munhoz et al. (13).

Suicide risk was measured using an adapted self-administered version of the Mini International Neuropsychiatric Interview – suicide section, translated and validated for use in Brazil (14). In this instrument, five questions ask if, in the last month, the participant "thought it would be better to be dead or wished to be dead", "wanted to harm himself", "thought about suicide", "thought of a way to commit suicide" and "attempted suicide", worth 1, 2, 6, 10 and 10 points, respectively. Also, there is one last question about a suicide attempt ever, which is worth 4 points. Participants with scores greater than or equal to 6 points were classified as having moderate or severe suicide risk.

The following independent variables were used: gender (male/female), age (18-24 years/25-31 years/32 years or more), skin color (white/black, brown or yellow), sexual orientation (heterosexual/homosexual, bisexual or other), monthly family per capita income (quintiles), economic status in childhood (poor or medium-low/medium, medium-high or high), childhood food insecurity (no/yes), domestic violence in childhood (no/yes), housing situation (lives with family/alone/friends or peers), quality of housing (better = adequate access to energy, treated water, sewage and garbage collection/worse = lack of proper access in at least one of these services), fear of violence in the neighborhood (none or little/medium/high or very high), current food insecurity, field of study (exact/humanities/health/biological), undergraduate course desired when entering the university (no/yes), satisfaction with the current course (totally satisfied or satis-

fied/medium/unsatisfied or not at all satisfied), leisure-time physical activity, inactive [0 minutes/week]/insufficiently active [1-149 minutes/week]/and active [150 minutes/week or more]), obesity (body mass index ≥ 30 kg/m²), frequent or heavy use of alcohol (use of any substance derived from alcohol in at least 6 days in the last month), illicit drug use in the previous month (use of any illicit substance at least once in the last 30 days), generalized anxiety and perceived stress, (having isolated the quartile with the highest level of stress). More information regarding scales used during the original study can be found in the methodological article (11).

Fieldwork took place between September and November of 2019. We contacted the professors responsible for the selected classes to schedule data collection. Class visits followed a protocol, starting with the presentation of the research aims and confidentiality measures. We informed undergraduates that their participation was voluntary and those who agreed to participate signed an informed consent form. At the end of the application of the instrument, the individuals deposited their completed questionnaires in a sealed urn to increase the confidentiality and reliability of the answers. We visited each class at least twice. After these two attempts, classes with more than ten losses were visited once more. We considered individuals who were not found in any of the visits or who refused to participate as losses. Different professionals double entered the data using the Epidata 3.1 software.

First, we conducted univariate analysis to calculate the prevalence of depression and risk of suicide and to describe the sample according to the independent variables. Soon after, we performed bivariate analysis to describe the prevalence of depression, suicide risk, and the difference in proportions between the categories of progression (without depression and suicide risk, with depression and without suicide risk, with depression and suicide risk) according to exposure categories, using the chi-square test.

We performed multivariate analysis using multinomial regression to identify associated factors

with the progression from depression without suicide risk to depression with suicide risk. A variable was created by crossing the presence of depression and suicide risk, generating the categories "not depressed, without suicide risk", "depressed, without suicide risk", and "depressed, with suicide risk". A fourth category ("not depressed, with suicide risk") was also identified (n=38). Although this group is theoretically relevant, it was excluded from the main analyses due to its small size and the specific objective of the study, which was to investigate factors associated with the co-occurrence of depressive symptoms and suicide risk. The limited number of individuals in this category could compromise the estimates in multivariable analyses. Also, participants who did not have complete information on depression and suicide risk (n=17) were excluded. Control for potential confounders was performed using a model with five hierarchical levels of analysis (15): 1st) social and childhood variables; 2nd) economic and demographic variables; 3rd) academic variables; 4th) behavioral variables; 5th) comorbidities. Variables were selected using the backward method, starting with the first-level variables and going up to the fifth. Variables with a p-value ≤ 0.2 remained in the final adjusted model. The results of these analyses were presented in terms of odds ratios (OR), 95% confidence intervals (95% CI), and p-values. Statistical analyses were conducted using STATA 13 IC software, and all estimates calculated with a significance level of 5%.

All those responsible for data collection in this investigation received training to deliver mental health support during the questionnaire's application if necessary. During this period, psychologists worked on-call to support the research team, providing free and comprehensive psychological care for severe cases. The contacts of those responsible for the research and the University's Psychological Care Center were also made available so that respondents could have access to psychosocial support after their participation. The Research Ethics Committee of FURG, registration number 196/2019, approved the study.

Results

Sixty classes were included, of which 1,169 eligible enrollments were counted for this study. 996 undergraduate students participated, corresponding to a response rate of 85.2%; 144 (12.3%) students were not found and 29 (2.5%) refused to participate. However, considering excluded individuals ($n=38$, the category "no depression and suicide risk") and those without information about depression and suicide risk ($n=17$), the final sample of this investigation was 941 respondents.

Table 1 presents the sample characteristics according to the analyzed variables, as well as the proportion of depression and moderate/severe suicide risk across their categories. **Table 2** presents the sample distribution across progression categories by the presence or absence of depression and suicide risk. **Table 3** shows the results of multinomial regression analysis. The following results were identified:

- a) the groups with a higher risk of depression, regardless of being at risk of suicide, were homosexual, bisexual, or other non-heterosexual orientation, obese, with generalized anxiety, and with higher stress levels. Any levels of physical activity exerted protection against a depression without suicide risk; however, only those physically active (>150 min/week) had a significantly lower chance of being in the "depressed,

with suicide risk" group. It is noteworthy that homosexual, bisexual, or other non-heterosexual oriented individuals had almost three times greater chance of having depression with suicide risk than depression without suicide risk, and that those with generalized anxiety and with a higher level of stress were more than twice as likely to have depression with suicide risk than depression without suicide risk;

- b) the groups that presented the highest chance to be classified only as "depressed, without suicide risk" were the poorest in childhood, with food insecurity in childhood, female, 25 years or older, and fear of violence in the neighborhood. Participants who lived with friends or peers had a lower chance to be depressed without suicide risk;
- c) the groups with most significant chance to be classified only as "depressed, with suicide risk" were those with a history of violence in the domestic context in childhood, with current food insecurity, enrolled in a humanities course, dissatisfied with the course, and with frequent or heavy use of alcohol;
- d) skin color, per capita income, quality of housing, desired course upon entering, and illicit drug use in the last month were not significantly associated with the outcome (Table 3).

TABLE 1 – DESCRIPTION OF THE UNDERGRADUATE STUDENT SAMPLE (N=941). SABES-GRAD RESEARCH, RIO GRANDE/RS, 2019

Variable	n (%)	Depression (%)§	Moderate or severe suicide risk (%)§
Gender (N=939)			
Male	329 (35.0)	102 (31.0)	44 (13.4)
Female	610 (65.0)	269 (44.2)	71 (11.6)
Age (N=941)			
18-24 years	654 (69.5)	264 (40.4)	88 (13.5)
25-31 years	164 (17.4)	70 (42.7)	18 (11.0)
32 or more	123 (13.1)	38 (30.9)	10 (8.1)
Skin color (N=939)			
White	692 (73.7)	266 (38.4)	85 (12.3)
Black, brown, or yellow	247 (26.3)	106 (42.9)	31 (12.6)

Variable	n (%)	Depression (%)§	Moderate or severe suicide risk (%)§
Childhood socioeconomic status (N=937)			
Poor/medium-low	523 (55.8)	237 (45.3)	74 (14.2)
Medium/Medium-High/High	414 (44.2)	134 (32.4)	42 (10.1)
Childhood food insecurity (N=938)			
No	806 (85.9)	299 (37.1)	89 (11.0)
Yes	132 (14.1)	72 (54.6)	27 (20.5)
Childhood domestic violence (N=939)			
No	713 (75.9)	266 (37.3)	74 (10.4)
Yes	226 (24.1)	105 (46.5)	42 (18.6)
Sexual Orientation (N=936)			
Heterosexual	732 (78.2)	253 (34.6)	62 (8.5)
Homo/Bisexual or others	204 (21.8)	116 (56.9)	53 (26.0)
Obesity (N=929)			
No	809 (87.1)	300 (37.1)	94 (11.6)
Yes	120 (12.9)	66 (55.0)	20 (16.7)
Monthly per capita income (quintiles) (N=788)			
1st quintile (poorest)	164 (20.8)	81 (49.4)	26 (15.9)
2nd quintile	203 (25.8)	85 (41.9)	22 (10.9)
3rd quintile	141 (17.9)	57 (40.4)	14 (9.9)
4th quintile	128 (16.2)	42 (32.8)	16 (12.5)
5th quintile (richest)	152 (19.3)	46 (30.3)	19 (12.5)
Living arrangement (N=891)			
With relatives	592 (66.4)	240 (40.5)	62 (10.5)
Alone	143 (16.1)	52 (36.4)	21 (14.7)
With friends/peers	156 (17.5)	57 (36.5)	24 (15.4)
Housing quality (N=924)			
Adequate	656 (71.0)	246 (37.5)	74 (11.3)
Inadequate	268 (29.0)	117 (43.7)	39 (14.6)
Fear of violence in the neighborhood (N=940)			
None/little	281 (29.9)	86 (30.6)	35 (12.5)
Medium	322 (34.3)	114 (35.4)	32 (9.9)
High/very high	337 (35.8)	172 (51.0)	49 (14.5)
Current food insecurity (N=934)			
No	655 (70.1)	220 (33.6)	63 (9.6)
Yes	279 (29.9)	147 (52.7)	52 (18.6)
Field of study (N=934)			

Variable	n (%)	Depression (%)§	Moderate or severe suicide risk (%)§
Exact sciences	378 (40.4)	125 (33.1)	32 (8.5)
Humanities	338 (36.2)	152 (45.0)	62 (18.3)
Health sciences	148 (15.9)	58 (39.2)	14 (9.5)
Biological sciences	70 (7.5)	35 (50.0)	8 (11.4)
Desired course upon university entering (N=939)			
No	231 (24.6)	92 (39.8)	36 (15.6)
Yes	708 (75.4)	279 (39.4)	79 (11.2)
Satisfaction with current course (N=940)			
Satisfied or totally satisfied	501 (53.3)	167 (33.3)	45 (9.0)
Moderately satisfied	358 (38.1)	161 (45.0)	51 (14.3)
Unsatisfied or not at all satisfied	81 (8.6)	43 (53.1)	19 (23.5)
Physical activity (N=811)			
Inactive	311 (38.4)	159 (51.1)	51 (16.4)
Insufficiently active	241 (29.7)	87 (36.1)	27 (11.2)
Active	259 (31.9)	73 (28.2)	21 (8.1)
Alcohol use (N=922)			
No	676 (73.3)	258 (38.2)	69 (10.2)
Frequent use (6-19 days)	213 (23.1)	84 (39.4)	30 (14.1)
Heavy use (20 days or more)	33 (3.6)	18 (54.6)	13 (39.4)
Illicit drugs use in the last month (N=903)			
No	715 (79.2)	276 (38.6)	80 (11.2)
Yes	188 (20.8)	79 (42.0)	31 (16.5)
Generalized anxiety (N=918)			
No	627 (68.3)	155 (24.7)	39 (6.2)
Yes	291 (31.7)	208 (71.5)	76 (26.1)
Perceived stress level (N=863)			
Low (0 – 37 points)	656 (76.0)	175 (26.7)	41 (6.3)
High (38 – 55 points)	207 (24.0)	161 (77.8)	66 (31.9)
Total*		39.5 (38.7)†	12.3 (15.7)†

*Outcome prevalence excluding of 55 participants classified as not depressed and at risk of suicide (n=38) or without information about depression and suicide risk (n=17); † outcome prevalence including all study participants (N=996). § The percentages were calculated within each category of the variables.

TABLE 2 – SAMPLE DISTRIBUTION BETWEEN THE PROGRESSION CATEGORIES ACCORDING TO THE PRESENCE OR ABSENCE OF DEPRESSION AND SUICIDE RISK (N=941). SABES-GRAD RESEARCH, RIO GRANDE/RS, 2019

Variable, n (%)§	Not depressed, without suicide risk	Depressed, without suicide risk	Depressed, with suicide risk	p-value*
	n = 569	n = 256	n = 116	
Gender (N=939)				<0.001
Male	227 (69.0)	58 (17.6)	44 (13.4)	
Female	341 (55.9)	198 (32.5)	71 (11.6)	
Age (N=941)				0.15
18-24 years	390 (59.6)	176 (26.9)	88 (13.5)	
25-31 years	94 (57.3)	52 (31.7)	18 (11.0)	
32 or more	85 (69.1)	28 (22.8)	10 (8.1)	
Skin color (N=939)				0.41
White	426 (61.6)	181 (26.1)	85 (12.3)	
Black, brown, or yellow	141 (57.1)	75 (30.4)	31 (12.5)	
Childhood socioeconomic status (N=937)				<0.001
Poor/medium-low	286 (54.6)	163 (31.2)	74 (14.2)	
Medium/Medium-High/High	280 (67.6)	92 (22.2)	42 (10.2)	
Childhood food insecurity (N=938)				<0.001
No	507 (62.9)	210 (26.1)	89 (11.0)	
Yes	60 (45.4)	45 (34.1)	27 (20.5)	
Childhood domestic violence (N=939)				0.003
No	447 (62.7)	192 (26.9)	74 (10.4)	
Yes	121 (53.5)	63 (27.9)	42 (18.6)	
Sexual Orientation (N=936)				<0.001
Heterosexual	479 (65.4)	191 (26.1)	62 (8.5)	
Homo/Bisexual or others	88 (43.1)	63 (30.9)	53 (26.0)	
Obesity (N=929)				0.001
No	509 (62.9)	206 (25.5)	94 (11.6)	
Yes	54 (45.0)	46 (38.3)	20 (16.7)	
Monthly per capita income (quintiles) (N=788)				0.011
1 st quintile (poorest)	83 (50.6)	55 (33.5)	26 (15.9)	
2 nd quintile	118 (58.1)	63 (31.0)	22 (10.9)	
3 rd quintile	84 (59.6)	43 (30.5)	14 (9.9)	
4 th quintile	86 (67.2)	26 (20.3)	16 (12.5)	
5 th quintile (richest)	106 (69.7)	27 (17.8)	19 (12.5)	
Living arrangement (N=891)				0.049
With relatives	352 (59.4)	178 (30.1)	62 (10.5)	
Alone	91 (63.6)	31 (21.7)	21 (14.7)	
With friends/peers	99 (63.4)	33 (21.2)	24 (15.4)	

Variable, n (%)§	Not depressed, without suicide risk n = 569	Depressed, without suicide risk n = 256	Depressed, with suicide risk n = 116	p-value*
Housing quality (N=924)				0.18
Adequate	410 (62.5)	172 (26.2)	74 (11.3)	
Inadequate	151 (56.3)	78 (29.1)	39 (14.6)	
Fear of violence in the neighborhood (N=940)				<0.001
None/little	195 (69.4)	51 (18.1)	35 (12.5)	
Medium	208 (64.6)	82 (25.5)	32 (9.9)	
High/very high	165 (49.0)	123 (36.5)	49 (14.5)	
Current food insecurity (N=934)				<0.001
No	435 (66.4)	157 (24.0)	63 (9.6)	
Yes	132 (47.3)	95 (34.1)	52 (18.6)	
Field of study (N=934)				<0.001
Exact sciences	253 (66.9)	93 (24.6)	32 (8.5)	
Humanities	186 (55.0)	90 (26.6)	62 (18.3)	
Health sciences	90 (60.8)	44 (29.7)	14 (9.5)	
Biological sciences	35 (50.0)	27 (38.6)	8 (11.4)	
Desired course upon entering (N=939)				0.15
No	139 (60.2)	56 (24.2)	36 (15.6)	
Yes	429 (60.6)	200 (28.2)	79 (11.2)	
Satisfaction with current course (N=940)				<0.001
Satisfied or totally satisfied	334 (66.6)	122 (24.4)	45 (9.0)	
Moderately satisfied	197 (55.0)	110 (30.7)	51 (14.3)	
Unsatisfied or not at all satisfied	38 (46.9)	24 (29.6)	19 (23.5)	
Physical activity (N=811)				<0.001
Inactive	151 (48.9)	108 (34.7)	51 (16.4)	
Insufficiently active	154 (63.9)	60 (24.9)	27 (11.2)	
Active	186 (71.8)	52 (20.1)	21 (8.1)	
Alcohol use (N=922)				<0.001
No	418 (61.8)	189 (28.0)	69 (10.2)	
Frequent use (6-19 days)	129 (60.5)	54 (25.4)	30 (14.1)	
Heavy use (20 days or more)	15 (45.4)	5 (15.2)	13 (39.4)	
Illicit drugs use in the last month (N=903)				0.14
No	439 (61.4)	196 (27.4)	80 (11.2)	
Yes	109 (58.0)	48 (25.5)	31 (16.5)	
Generalized anxiety (N=918)				<0.001
No	472 (75.3)	116 (18.5)	39 (6.2)	
Yes	83 (28.5)	132 (45.4)	76 (26.1)	

Variable, n (%)§	Not depressed, without suicide risk n = 569	Depressed, without suicide risk n = 256	Depressed, with suicide risk n = 116	p-value*
Perceived stress level (N=863)				<0.001
Low (0 – 37 points)	481 (73.3)	134 (20.4)	41 (6.3)	
High (38 – 55 points)	46 (22.2)	95 (45.9)	66 (31.9)	
Total	569 (60.5)	256 (27.2)	116 (12.3)	

*Chi Square test. § The percentages were calculated within each category of the variables. Bold values indicate statistical significance.

TABLE 3 – MULTIVARIATE ANALYSIS TO IDENTIFY CURRENT SEVERITY PROGRESSION MARKERS TO DEPRESSION WITH SUICIDE RISK USING MULTINOMIAL REGRESSION (N=941). SABES-GRAD RESEARCH, RIO GRANDE/RS, 2019

Variable	Depressed, without suicide risk		Depressed, with suicide risk	
	OR (95% CI)	p-value*	OR (95% CI)	p-value*
Sex (ref. Male)				
Female	2.54 (1.78-3.61)	<0.001	1.19 (0.77-1.83)	0.44
Age group (years) (ref. 18-24)				
25-31	1.76 (1.06-2.93)	0.029	1.85 (0.87-3.91)	0.11
≥ 32	1.90 (1.06-3.39)	0.030	1.27 (0.53-3.02)	0.59
Skin color (ref. White)				
Black, brown, or yellow	1.10 (0.77-1.55)	0.61	0.89 (0.54-1.46)	0.65
Childhood socioeconomic status (Ref. medium/ medium-high/high)				
Poor/medium-low	1.65 (1.19-2.30)	0.003	1.54 (0.98-2.44)	0.06
Childhood food insecurity (ref. No)				
Yes	1.62 (1.02-2.57)	0.039	1.71 (0.96-3.06)	0.07
Childhood domestic Violence (ref. No)				
Yes	1.17 (0.80-1.73)	0.40	1.88 (1.17-3.02)	0.009
Sexual Orientation (ref. Heterosexual)				
Homo/bisexual or others	1.63 (1.11-2.39)	0.013	4.18 (2.67-6.55)	<0.001
Per capita income (quintile) (ref. 1 st)				
2 nd	0.85 (0.51-1.42)	0.53	0.65 (0.31-1.33)	0.23
3 rd	0.88 (0.51-1.55)	0.67	0.61 (0.28-1.35)	0.22
4 th	0.63 (0.33-1.18)	0.15	0.92 (0.41-2.07)	0.83
5 th	0.61 (0.33-1.14)	0.12	1.17 (0.53-2.57)	0.70
Living arrangement (ref. With relatives)				
Alone	0.69 (0.42-1.12)	0.13	1.39 (0.77-2.52)	0.27
With friends/peers	0.56 (0.35-0.90)	0.016	0.91 (0.51-1.61)	0.73
Housing quality (ref. Adequate)				
Inadequate	1.10 (0.73-1.64)	0.65	1.18 (0.70-2.01)	0.53
Fear of violence in the neighborhood (ref. Low)				
Medium	1.42 (0.92-2.19)	0.11	0.87 (0.49-1.54)	0.63
High/very high	2.19 (1.43-3.36)	<0.001	1.53 (0.89-2.63)	0.13

Variable	Depressed, without suicide risk		Depressed, with suicide risk	
	OR (95% CI)	p-value*	OR (95% CI)	p-value*
Current food insecurity (ref. No)				
Yes	1.42 (0.98-2.06)	0.06	1.86 (1.15-3.00)	0.012
Field of study (ref. Exact sciences)				
Humanities	0.94 (0.62-1.43)	0.78	2.70 (1.53-4.76)	0.001
Health sciences	1.19 (0.71-2.00)	0.50	1.75 (0.78-3.93)	0.17
Biological sciences	1.84 (0.98-3.47)	0.06	1.26 (0.47-3.37)	0.65
Desired course (ref. No)				
Yes	0.72 (0.48-1.08)	0.11	1.09 (0.64-1.86)	0.74
Course satisfaction (ref. Very/totally)				
Moderately	1.41 (0.98-2.03)	0.06	2.82 (1.68-4.75)	<0.001
Not/little	1.44 (0.74-2.77)	0.28	4.50 (2.07-9.81)	<0.001
Physical activity (ref. Inactive)				
Insufficiently active	0.62 (0.40-0.98)	0.040	0.61 (0.33-1.13)	0.12
Active	0.52 (0.34-0.86)	0.009	0.36 (0.19-0.70)	0.003
Obesity§ (ref. No)				
Yes	1.97 (1.10-3.51)	0.022	2.39 (1.09-5.24)	0.029
Alcohol use (ref. None)				
Frequent use (6-19 days)	1.18 (0.74-1.88)	0.49	1.88 (1.02-3.44)	0.042
Heavy use (≥20 days)	0.72 (0.21-2.52)	0.61	4.50 (1.57-12.88)	0.005
Illicit drugs use (ref. No)				
Yes	1.16 (0.71-1.91)	0.55	1.21 (0.64-2.28)	0.56
Generalized anxiety (ref. No)				
Yes	4.15 (2.54-6.78)	<0.001	9.20 (4.72-17.96)	<0.001
Perceived stress level (ref. Low)				
High	4.71 (2.71-8.19)	<0.001	9.90 (4.78-20.48)	<0.001

*Multinomial regression, heterogeneity test. Bold values indicate statistical significance. § BMI ≥ 30kg/m².

Discussion

The prevalence of depressive symptoms and suicide risk in this study was high compared with Brazilian undergraduate students (9) and with the general population from the same municipality as the university (16,17). Previous studies also found that undergraduate students have a higher prevalence of depressive symptoms than the general population (5). This stage of development (most young adults) has greater susceptibility to mental disorders and specific issues in the university context, such as overwhelming deadlines, and competitiveness, among others, can worsen this probability (18).

The first marker for depression with suicide risk

progression was the history of childhood violence. A similar result has already been observed (19), where the history of violence contributed to the emergence of suicidal thoughts. Children have reduced biological and psychological maturity to deal with situations of violence, which can reduce their ability to cope (20). In addition, victims of violence can develop characteristics that put them at greater risk for depression and suicidal thinking, such as loneliness and social isolation. The lack of social support can also lead to greater current vulnerability, triggering depression and suicide ideation (19).

Homosexual, bisexual, and other non-hete-

rosexual individuals had a significantly higher probability of being depressed than heterosexual individuals, with an even greater chance of being in the "depressed, with suicide risk" group. Several studies highlight that the prevalence of depression (21) and suicide risk (22) are higher among sexual minorities. This subgroup has higher levels of psychological distress due to discrimination, violence, and homophobia, which can lead to suicidal behaviors (21,23). Furthermore, a recent study identified that sexual minorities have lower levels of social support, which can facilitate the development of difficulties in emotional regulation, increasing the risk of suicide (23).

Current food insecurity is a risk factor for depression with suicide risk. Studies that investigated this theme with university students as the target population are scarce. However, investigations conducted with children (24) and adults (25), have already established an association between food insecurity and suicide risk. Food insecurity reflects a socio-economic reality of vulnerability. Poverty and financial stress stemming from this context can lead to increased anxiety and other harmful impacts on mental health, culminating in suicide risk (24). Moreover, malnutrition and micronutrient deficiency among populations with food insecurity, resulting from a diet with low nutritional quality, can also worsen mental health cases (25).

One of the progression markers identified in this research was studying in a humanities field of study undergraduate course, which corroborates with other investigations (26, 27). Flesh et al. (27) pointed out that humanities students had a 25% higher risk of developing a major depressive episode than exact sciences students. On one hand, it is possible that a portion of individuals who seek these courses are already more susceptible to (or has a history of) mental disorders and find these courses a welcoming environment. On the other hand, humanities courses can expose and trigger existing conflicts by addressing emotions, memories, and suffering, but not necessarily with sufficient tools, skillful personnel, and appropriate setting to handle unintentional adverse psycho-

logical outcomes. This stimulation can make students more sensitive, increasing the intensity of preexisting symptoms, and leading to distress and suicidal risk.

Dissatisfaction with the current course was another progression marker. Being satisfied with the course can help the individual engage with proposed activities and be more willing to face the challenges that stem from graduation. Often, students dissatisfied with the course may be dissatisfied with their own lives. In this regard, developing a sense of belonging to the course and a more effective social support network is essential for the student, as they are protective factors concerning hopelessness, decreasing the probability of experiencing suicidal ideation (28). It is believed that satisfied students can count on greater possibilities to visualize a positive future in their graduation area, favoring a sense of purpose and adequate vitality investment. Such factors can act as motivators to face the challenges of the academic environment, serve as anchors in times of most significant difficulty, and may be protective factors that give strength and meaning to the university journey, consequently reducing their vulnerability.

Any level of physical activity protected from depression without suicide risk. However, only those physically active (>150 min/week) had a significantly lower chance to be classified as "depressed, with suicide risk". Obesity acted as a risk factor in both cases, with no significant change in the effect measure. Evidence indicates that physical activity causes physiological changes in the body, reducing the stress response and protecting against adverse health effects (29). It is possible that the neurotransmitters released in the process of physical activity, such as serotonin, dopamine, and norepinephrine, could act positively in depression and suicidal ideation (29).

Studies conducted with university students indicate a very high prevalence of alcohol consumption (12). This behavior is well accepted in the university context, being used as a socializing element and part of the "university experience". Thus, the assessment of use by itself may not

be a marker of psychological distress. However, when analyzing the frequent or heavy use of alcohol, which indicates a more harmful use, it was observed that the chance of these individuals being in the group of people with depression and suicide risk was 1.8 and 4.5 higher than the participants without this use frequency, being the variable with the most significant discriminatory power. This result indicates that frequent and heavy alcohol use can be both a marker of suicide risk and a factor that contributes to the increased chance of suicide. On the one hand, people with mental disorders abuse alcohol to avoid emotional, behavioral, and cognitive symptoms of psychological distress. On the other hand, the intoxication state induced by the harmful use of alcohol can increase impulsiveness and thoughts and feelings of sadness and hopelessness (30).

Students with generalized anxiety and higher levels of stress were ten times more likely to progress in the depressive condition. A study carried out in 2018 identified that having other mental health disorders diagnosed was related to a 25.6% greater chance of developing depression (6). More suffering can lead to greater severity of the condition and difficulties in solving problems, increasing the possibility of suicide as a "viable" alternative for coping, given the lack of different ways to solve internal and external issues (4). Both anxiety and stress activate the nervous system to threat reactions, and those mechanisms increase the emotional arousal to prepare and adapt the coping response to the environmental demands. However, some individuals are more sensitive to possible threats from the environment and activate with greater frequency, this being a natural biological characteristic (18). Still, such factors can become a problem associated with the absence of effective skills to deal with excessive anxiety and stress, resulting from an environment permeated by deadlines, demands, and social tests. A constant state of alertness impairs the performance of important tasks, increases the feeling of tiredness, and generates a feeling of inability to cope (26), which can contribute to an increased sense of failure and hopelessness, intensifying

the psychological suffering and severity of the depressive condition.

The results of this study must be interpreted considering its limitations. The cross-sectional design does not allow establishing temporality and, consequently, causality. Thus, the identified factors should be interpreted as current markers (personal characteristics or the student's background) that indicate a greater probability of progression to depression with suicide risk and not as causes of this outcome. It is important to consider the possibility of recall bias, especially in variables related to childhood. Furthermore, the exclusion of participants from the analysis may have underestimated the prevalence of the outcome. However, this study was based on a large and representative sample, providing a comprehensive understanding of the current burden of psychological suffering within the university. Therefore, the results presented in this manuscript might be a helpful source of information for university staff and other stakeholders to address such a challenging scenario.

In conclusion, the prevalence of depression and suicide risk was high among university students, with sociodemographic, behavioral, and mental health factors associated with potential progression. Therefore, individuals with these markers require greater attention regarding possible interventions. Early identification of cases that may have a worse prognosis is essential for proper situation management. Given the cross-sectional design, the findings should be interpreted with caution and do not allow causal inferences. The results may contribute to informing screening and support strategies within university settings, particularly for the early identification of students at higher risk, and may support decision-making regarding monitoring, referral, and care, as well as guide future longitudinal studies.

Notes

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The authors declare no competing interests relevant to the content of this study.

Authors' contributions

All the authors declare to have made substantial contributions to the conception, or design, or acquisition, or analysis, or interpretation of data; and drafting the work or revising it critically for important intellectual content; and to approve the version to be published.

Availability of data and responsibility for the results

All the authors declare to have had full access to the available data and they assume full responsibility for the integrity of these results.

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