



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

IJDR

International Journal of Development Research

Vol. 12, Issue, 01, pp. 53505-53511, January, 2022

<https://doi.org/10.37118/ijdr.23911.01.2022>



RESEARCH ARTICLE

OPEN ACCESS

ASSOCIATED FACTORS WITH SUICIDE'S ATTEMPT AMONG BRAZILIAN UNIVERSITY STUDENTS: A MULTI-LEVEL ANALYSIS

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ARTICLE INFO

Article History:

Received 10th October, 2021
Received in revised form
29th November, 2021
Accepted 16th December, 2021
Published online 30th January, 2022

Key Words:

Metabolic Syndrome, Obesity,
Overweight, Fat percentage.

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ABSTRACT

To estimate the prevalence and factors associated with attempted suicide among university students. A cross-sectional study (n=1,252) carried out at the Federal University of Catalao. A multilevel analysis was carried out considering level I: individual variables, level II: the city of origin as context variable, to verify the association between attempted suicide and sociodemographic dimensions, illness/violent behavior and the use and abuse of alcohol and other drugs. The sample consisted of 1,252 individuals for the dependent variable suicide attempt; the prevalence was 20.02% of the individuals answering that they had already attempted suicide. After the multilevel analysis, it associated the following variables: agnostic, sexual abuse, anxiety, depression, use of hypnotics, friends who consume alcohol, first cigarette smoked at age <10, and parents who smoke. The findings of this study indicated the high prevalence of attempted suicide among university students and its association with the variables that refer to the fragility of university students.

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Citation: Roselma Lucchese, Letícia de Oliveira Santana, Bruno Ferreira Melo, Graciele Cristina Silva, Thiago Aquino de Amorim, Moisés Fernandes Lemos, Rodrigo Lopes Felipe and Rafael Alves Guimarães. "Associated factors with suicide's attempt among Brazilian University students: a multi-level analysis", *International Journal of Development Research*, 12, (01), 53505-53511.

INTRODUCTION

Suicide is a public health problem and contributes to premature mortality rates worldwide, with variations of a sociodemographic nature and geographical location [1]. It is estimated that the mean of suicide worldwide is approximately 16 deaths per 100,000 inhabitants, with a 60% increase in the last 45 years, representing the main cause of death in individuals from 10 to 24 years old [2]. In Latin America, it was the main cause of death by age, being more prevalent in males [2]. In Brazil, there is a death rate of 30.7% in people aged 15 to 29 years old [3]. A number of studies have pointed out that the presence of mental disorder increases the risk of suicide [4-6]. It is estimated that 15% to 25% of young people have some type of mental disorder, depression being the most frequent. A fact that makes young people vulnerable to suicidal behavior, especially university students, because they are in adolescence and early adulthood facing obstacles proposed in life, such as unsatisfactory academic performance, family conflicts, psychosocial stress, exposure to violence, drug use and abuse, and inspiring models that may come to act as triggers for attempting suicide [4,7]. Suicide is considered complex and multi-factorial because it encompasses socio-cultural, economic, psychological, biological and environmental issues.

It is known that its rates can vary according to region, considering the heterogeneity of Brazil [3]. In this sense, few studies have investigated its dimension and associated factors in universities in the Brazilian Midwest region [8]. Most of the studies carried out concentrated in other regions of the country [9] and verified a 22% prevalence for suicidal ideation and association with the use of alcohol, smoking and other drugs, history of bullying, attempted suicide and not being on the desired course [10]. This study innovates attempted suicide with the following variables: sociodemographic, illness and violent behavior, and abuse of alcohol and other drugs, considering control by the context in the multilevel statistical analysis, that is, the university student's city of origin. In theory, regardless of the distance from the student's origin, the student's vulnerability to suicide is high and should be part of discussions in the university community. Above all, due to the precociousness of the suicidal act when perceived in young people, its implications that drive the rates of years of life lost, it becomes essential to identify vulnerable populations and to prepare coping strategies [3]. In view of the above, the objective was to estimate the prevalence and factors associated with attempted suicide among university students, controlling the context variable in the origin city.

MATERIALS AND METHODS

A cross-sectional study carried out at the Federal University of Goiás – Catalão Regional, located in the Brazilian Midwest region, which has 4,000 university students from July 2014 to March 2017. To calculate the sample size, the OpenEpi® software was used; the sample was obtained by 80% of statistical power, 3.0 for the purpose of sample design, with a significance level of 95%, with reference to the prevalence of approximately 50% of risk behavior for consumption of psychoactive substances among university students. After adding 10% for losses, the value of 1,294 undergraduate students was obtained [11]. Sampling took place at random, by means of a draw of the course and the period from the list of courses and classes. Undergraduate students, regularly enrolled in the morning, afternoon and day shifts at the university, aged 18 years old or above, were adopted as inclusion criteria; and, as exclusion criterion, those who were absent from classes during data collection. The instrument used consisted of sociodemographic information; family history, health-disease process, risky social behavior and academic life. To test the study hypothesis, that is, to describe the prevalence of vulnerability to suicide, the dependent variable ‘attempted suicide’ was defined, as obtained by the following question: “Have you ever committed any voluntary act against your own life?” (yes vs. no).

Dependent variables that constituted level I of analysis were considered as those related to the individual: gender (female vs. male vs. not informed); skin color (yellow/others vs. white vs. black/brown/mulatto); marital status of the participant (single vs. married/living together vs. separated/divorced vs. widowed); parents' marital status (married/living together vs. single vs. separated/divorced vs. none vs. not informed); religion (evangelical vs. catholic vs. spiritist/others vs. agnostic vs. not informed); attended parties/nightclubs during university life? (no vs. yes vs. not informed); Have you suffered sexual abuse at least once in your life? (no vs. yes); Have you been involved in fights during university life? (no vs. yes); Have you ever had a diagnosis and/or been treated for panic syndrome? (no vs. yes); Have you had a diagnosis and/or been treated for bipolar disorder? (no vs. yes); Have you had a diagnosis and/or been treated for anxiety? (no vs. yes); Have you ever been diagnosed and/or treated for depression? (no vs. yes); Use of hypnotics in life? (no vs. yes); Do you use alcohol on a weekly basis? (no vs. yes); Do you have friends who consume alcohol? (no vs. yes); Mother or father consumes alcohol? (no vs. yes); Did you smoke cigarettes or similar in the last seven days? (no vs. yes; first cigarette smoked (<10 years old vs. 10-14 years old vs. 15-17 years old vs. ≥18 years old); Do you have friends who smoke? (no vs. yes); Mother or father smokes? (no vs. yes); Use of Lysergic Acid Diethylamide (LSD) in life? (no vs. yes); Use of crack in life? (no vs. yes vs. not informed); Used cocaine in the last year? (no vs. yes).

Level II of the analysis included the contextual variable, consisting of 21 cities representing the place of origin of each individual in the sample. The relevance of an analysis that considers the context is based on considering the mutual influence between the environment and the health-disease process. Thus, the multilevel analysis model tests the study hypothesis, adjusting the model of individual variables with the contextual variable.

Data were entered in *Stata Software Package* (STATA), version 14. Descriptive analysis was carried out, in which the continuous variables were presented as mean, confidence interval (95% CI) and standard deviation (SD). Bivariate analysis was conducted with logistic regression and measure of *Poisson* effect, expressed in gross Prevalence Ratio (PR). For the multiple analysis, it was decided to select variables with $p < 0.10$ from the bivariate. The multiple model was carried out with the adjustment of level II; in this analysis, levels I = of the individual and II = contextual, city of origin, were defined.

To understand the conceptual model adapted in this analysis, Figure 1 is displayed.

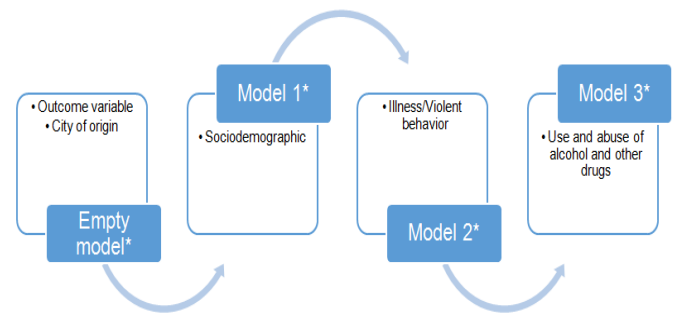


Fig. 1. Conceptual model of the multilevel analysis, Midwest Brazil, 2020

The quality of fit between the models was assessed using the – *loglikelihood* test, and by the values of the *variance* of level II (standard coefficient of error CE, deviation from standard error SE). The full model was considered as the final analysis, and the p -values < 0.05 . As for the ethical aspects, the present research derives from the research project on risk behavior for Sexually Transmitted Infections (STIs) and others, among university students. It was approved by the Research Ethics Committee of the Federal University of Goiás, by protocol No. 697.31 and Certificate of Presentation of Ethical Appreciation (*Certificado de Apresentação de Apreciação Ética*, CAAE) No. 31657214.1.0000.5083 and was conducted according to the principles expressed in the Declaration of Helsinki.

RESULTS

From the sample of 1,252 university students, 138 individuals were lost due to inconsistency in filling out the instruments for the dependent variable ‘attempted suicide’. The majority were female, 707 (60.5%, 95% CI 57.6-63.3), mean age of 21.95 years old (95% CI 21.66-22.24, SD 5.11). As for the area of knowledge of the students' undergraduate courses, most of them studied Human Sciences, 440 (35.4%, 95% CI 32.7-38.4); Engineering, 333 (26.8%, 95% CI 24.1-29.3); Exact and Earth Sciences, 147 (14.0%, 95% CI 12.1-16.0); Education, 122 (9.8%, 95% CI 8.1-11.3); Linguistics, Letters and Arts, 68 (9.8%, 95% CI 4.3-6.8); Health Sciences, 59 (4.7%, 95% CI 3.6-6.0); Biological Sciences, 23 (1.9%, 95% CI 1-12.7) and Applied Social Sciences, 24 (1.9%, 95% CI 1.2-2.7). Of these, 229 (20.02%, 95% CI 17.7-22.4) answered that they had already attempted suicide.

Table 1 shows the prevalence of attempted suicide and associated factors in the bivariate analysis. All the variables with a “ p ”-value less than or equal to 0.05 were selected for the multilevel analysis, namely: “Separated or divorced parents” (0.008); “Agnostic religion” (>0.001); Attends nightclubs/ parties (0.013); Have you ever been sexually abused? (>0.001); Fights (>0.001); Panic Syndrome (>0.001); bipolar disorder (>0.001); Anxiety (>0.001); Depression (>0.001); Use of hypnotics in life (0.004); Weekly alcohol consumption (0.001); Has friends who consume alcohol (0.005); Does mother or father consume alcohol? (0.048); Have you smoked in the last seven days? (<0.001); First cigarette smoked at what age (0.040); Do you have friends who smoke? (>0.001); Does mother or father smoke? (>0.001); Use of LSD in life (0.014); Use of CRACK in life? (0.025), and Use of cocaine in the last year (0.012). The quality of level II with the contextual factor is observed in the value more than doubled of the CE in relation to the SE in the full model. After the multilevel analysis, only the variables that remained with a “ p ”-value less than or equal to 0.05 were discussed, namely: Agnostics (0.015); They have already suffered sexual abuse (0.038); Have anxiety (0.033); Have depression (0.003); First cigarette smoked at age < 10 years old (0.034); Parents who smoke (0.044), and Have used LSD (0.043). The quality of fit for the analysis model is verified by the reduction of -2loglikelihood as model 0 was inserted into model 3 (Table 2).

Table 1. Bivariate analysis of the dependent variable “attempted suicide” and associated factors. Central Brazil, 2020

Variable	Attempted suicide		Gross PR*			
	n/all**	%	PR	(95% CI)	P	
Gender	Female	143/681	21.00	1		
	Male	83/437	18.99	0.904	0.690-1.185	0.467
Skin color	NI ^o	3/26	11.54	0.549	0.175-1.772	0.305
	Yellow/Others	5/44	11.36	1		
	White	114/560	20.36	1.791	0.731-4.386	0.202
Participant's marital status	Black/Brown/Mulatto	110/535	20.56	1.809	0.738-4.433	0.195
	Single	199/992	20.06	1		
	Married/Living together	26/130	20.00	0.996	0.662-1.500	0.988
	Separated/divorced	4/16	21.05	1.246	0.463-3.353	0.662
Parents' marital status	Widow/Widower	0/3	0.00	1		
	Married/Living together	132/770	17.14	1		
	Single	12/42	28.57	1.666	0.923-3.009	0.090
	Separated/Divorced	78/311	25.08	1.463	1.105-1.935	0.008
Religion	None	5/13	38.46	2.243	0.918-5.479	0.076
	NI ^o	1/4	25.00	1.458	0.203-10.429	0.707
	Evangelical	41/274	14.96	1		
	Catholic	87/534	16.29	1.088	0.751-1.578	0.653
	Spiritist and others	33/136	24.26	1.621	1.025-2.564	0.039
Attended Parties/Nightclub	Agnostic	68/199	34.17	2.283	1.550-3.364	0.000
	NI ^o	0/1	0.00	0.000	0	0.986
	No	57/373	15.28	1		
Have you ever been sexually abused?	Yes	172/771	22.31	1.459	1.081-1.969	0.013
	No	210/1,076	19.52	1		
Fights	Yes	17/28	60.71	3,110	1.897-5.099	0.000
	No	141/835	16.89	1		
Panic Syndrome	Yes	88/308	28.57	1.691	1.296-2.208	0.000
	No	187/1,054	17.74	1		
Bipolar Disorder	Yes	42/90	46.67	2.630	1.882-3.675	0.000
	No	174/1,030	16.89	1		
Anxiety	Yes	55/114	48.25	2.855	2.108-3.867	0.000
	No	36/387	9.30	1		
Depression	Yes	193/757	25.50	2.740	1.920-3.912	0.000
	No	100/900	11.11	1		
Use of hypnotics in life	Yes	129/244	52.87	4.758	3.664-6.178	0.000
	No	212/1,101	19.26	1		
Weekly alcohol consumption	Yes	7/12	58.33	3.029	1.426-6.432	0.004
	No	127/727	17.47	1		
Has friends that consume alcohol	Yes	101/370	27.30	1.562	1.203-2.029	0.001
	No	36/263	13.69	1		
Mother or father consumes alcohol?	Yes	191/837	22.82	1.667	1.167-2.380	0.005
	No	97/542	17.90	1		
Smoked in the last seven days?	Yes	130/557	23.34	1.304	1.002-1.696	0.048
	No	179/947	18.90	1		
First cigarette smoked	Yes	34/81	41.98	2.220	1.539-3.204	0.000
	<10 years old	6/7	85.71	1		
	10-14 years old	19/58	32.76	0.382	0.152-0.956	0,040
	15-17 years old	46/108	42.59	0.496	0.212-1.163	0.107
Do you have friends who smoke?	≥ 18 years old	31/110	28.18	0.328	0.137-0.788	0.013
	No	111/725	15.31	1		
Does mother or father smoke?	Yes	107/309	34.63	2.261	1.734-2.949	0.000
	No	178/933	19.08	1		
Use of LSD in life	Yes	40/101	39.60	2.075	1.473-2.925	0.000
	No	202/1,062	19.02	1		
Use of CRACK in life?	Yes	20/59	33.90	1.782	1.125-2.821	0.014
	No	220/1,111	19.80	1		
Cocaine in the last year	Yes	6/12	50.00	2.525	1.122-5.681	0.025
	NI ^o	3/21	14.29	0.721	0.230-2.254	0.574
	No	212/1,089	19.47	1		
	Yes	11/26	42.31	2.173	1.185-3.984	0.012

DISCUSSION

This study investigated attempted suicide among university students and its association with variables in their sociodemographic dimensions, illness/violent behavior and the use and abuse of alcohol and other drugs. To our best knowledge, this is the first study on the topic in public universities in central Brazil, in which multilevel analysis was applied, considering Level I the individual variables and Level II the context variable, which allowed discussing the associations regardless of the context to which the university student refers, in this case the city of origin and its characteristics. In the meantime, the findings showed a high prevalence of attempted suicide among the individuals studied and suggest the vulnerability of

university students to suicide, with implications for the university community, whether in the planning of pedagogical actions or in the context of promoting the mental health of this population. In this research, 20.02% of the individuals answered that they had already attempted suicide at least once in their lives, a higher prevalence than that found in a study carried out in Portugal, in which 12.6% had already thought about killing themselves throughout life, and 10.7% in the last 12 months [9]. A meta-analysis that investigated the prevalence of suicidal behaviors among university students revealed the prevalence of ideation (22.3%), plans (6.1%) and suicide attempts throughout life (3.2%) [12]. In Brazil, a survey conducted in the Midwest region with a smaller sample compared to the present study identified a prevalence of suicidal ideation of 9.9% in the last 30 days [13].

Table 2. Multilevel analysis, level I: individual, level II: contextual factor, city of origin, Midwest, Brazil, 2018

Level I	Empty model		PR°	Model 1		p	Model 2		p	Model 3		p
	CE**	SE*		95% CI	95% CI		95% CI	95% CI				
	24.17	0.013										
Sociodemographic												
Separated/Divorced parents			1.491	1.121-1.983	0.006	1.326	0.986-1.783	0.062	1.133	0.663-1.937	0.646	
Agnostic			2.371	1.596-3.522	0.000	1,831	1.205-2.780	0.005	1.806	1.121-2.911	0.015	
Violent behavior												
Clubs/Parties						1.270	0.921-1.753	0.144	1.062	0.507-2.227	0.872	
Sexual abuse						2.134	1.280-3.555	0.004	2.350	1.051-5.258	0.037	
Fight						1.044	0.774-1.490	0.774	0.857	0.513-1.429	0.554	
Panic						1.064	0.734-1.542	0.742	0.819	0.425-1.581	0.553	
Bipolar disorder						1.379	0.989-1.922	0.058	1.685	0.972-2.920	0.063	
Anxiety						2.214	1.539-3.186	0.000	1.972	1.057-3.676	0.033	
Depression						3.729	2.784-4.995	0.000	2.257	1.324-3.846	0.003	
Use and abuse of alcohol and other drugs												
Use of hypnotics									0.150	0.466-4.850	0.495	
Alcohol in the last seven days									1.158	0.644 2.080	0.623	
Friends who consume alcohol									1.787	0.611-5.220	0.288	
Parents who consume alcohol									1.040	0.606-1.786	0.885	
Smoked in the last seven days									1.169	0.628-2.175	0.621	
First cigarette smoked at age <10									3.275	1.096-9.786	0.034	
Friends who smoke									0.952	0.351-2.578	0.923	
Parents smoke									1.597	1.013-2.520	0.044	
Use of LSD in life									1.911	1.021-3.578	0.043	
Use of CRACK in life									1.335	0.453-3.931	0.600	
Cocaine use in the last year									0.609	0.225-1.648	0.330	
Level II	CE**	SE*	CE**	SE*		CE**	SE*		CE**	SE*		
Variance	5.250	1.280	5.120	1.050		1.520	4.760		5.250	1.180		
-2loglikelihood												-146.92005
-2loglikelihood Positive												293.8401

Thus, it is argued that the differences in prevalence between the various studies are related to the object of study “attempting suicide” and “suicidal ideation”; and, as for the investigated temporality, “at least once in life” and “in the last 30 days”. However, it is verified among the aforementioned studies that the prevalence of the phenomenon is present, a worrisome fact because it presents the vulnerability of the university students, and there is lack frequent studies on the theme, in addition to these considerations for student assistance policies. Regarding religious belief, the university students who declare themselves agnostic are more likely to attempt suicide (PR = 1.806, 95% CI: 1.121-2.911). Religious behavior is commonly associated with the suicidal behavior variable, which reinforces the evidence that the individuals who maintain a constant practice in religiosity tends to protect themselves from actions against their own life; thus, cultivating a religion contributes for the student's spiritual well-being by distancing the appearance of suicidal ideas [14-16]. Having a religion, praying or meditating, contributes to the psychological balance of emotions and feelings of the individual, away from ideas, thoughts and/or attempted suicide [17]. The results found in the study suggest an increase in the chances of attempting suicide in the face of sexual abuse (PR = 2.350, 95% CI: 1.051-5.258), being characterized as a potential risk for those individuals who were victims of sexual abuse in childhood, adolescence or any age group during their life [18]. However, the mechanisms linking the history of sexual abuse to suicidal behavior are poorly understood [19]. A number of studies have pointed out that physical or sexual abuse is a

strong motivator for suicidal ideation or attempted suicide, due to high exposure, thus being able to cause several problems, either physical, psychological, cognitive, behavioral, social or emotional, in addition to being more likely to have trauma and complex pathologies such as depression [19-21] and potential risk in attempting self-mutilation [7]. In addition, it is necessary to point out that there are other factors to be studied regarding the effects of violence and stress on suicide, such as epigenetics that advances in search of relationships regarding DNA methylation in individuals who have experienced violence. A study conducted with individuals with Post-Traumatic Stress Disorder (PTSD) verified that they presented higher polymorphism of the catechol-O-methyltransferase gene (COMT), known to be associated with suicidal ideation [22]. In this context, the relationships between phenotype and suicidal behavior allow explanations, for possible interventions in order to guarantee the physical or psychological integrity of these individuals [23]. Another finding of the present study was the association between attempted suicide and diagnosis of anxiety and/or depression (PR = 1.972; 95% CI: 1.057-3.676; PR = 2.257, 95% CI: 1.324-3.846), respectively. These findings corroborate the research study carried out in the same Brazilian region with a smaller sample of students (n=637); the authors verified a high prevalence ratio (11.11%) of suicidal ideation in university students with depressive symptoms, showing the mental and psychiatric disorders as predictors of suicidal behavior [4].

Many aspects of suicidal behavior are related to the individual's personal characteristics or pathology, such as impulsiveness, aggressiveness, family history of attempted suicide, stressful events, physical or sexual abuse, and the environment in which it is inserted; thus, the risk is accentuated in the presence of such characteristics, inherent to the personality or the health-disease process [7]. Increased levels of stress and anxiety in individuals often lead to the emergence of depression, mainly among young people, especially university students. Academic stress, socioeconomic issues, and distance from the family trigger high levels of anxiety and melancholy, leading to use and abuse of alcohol [13] and other drugs, aggravating cases of depression, correlating the susceptibility of university students to acquire depression and the act of committing suicide [24,25]. Suicidal ideation is identified as the main cause leading to consummated suicide [26], emphasizing that depression is a mental disorder constantly related to suicide and that, when using psychoactive substances, the probability of the act multiplies [27]. Possibly due to symptoms that are characteristic of the pathology, such as melancholy, deep sadness, hopelessness and thoughts of death as motivators for suicidal behavior, showing human fragility and the risk for suicide [28]. In this study, the first cigarette smoked at age >10 variable had a marked risk for attempted suicide (PR = 1.096, 95% CI: 9.786-0.034), because it is characterized as a drug/substance with a very early onset and easy access, often starting in childhood, possibly due to the need to feel accepted in the "wheels" of friends, to define their identity considered as facilitating factors. It is observed that the earlier the contact with these legal drugs, the greater the future risks of health problems, triggering negative consequences for adult life [29].

The early start of the smoking habit is a problem that deserves to be highlighted in suicidal behavior because it is an addiction that opens doors to pathologies, such as depression and anxiety. A study conducted with Portuguese university students verified that smoking is related to higher levels of depression in university students [9]. Using and abusing alcohol and smoking and suicidal ideation/attempted suicide corroborate for the condition of depression and psychological distress, and smoking and consuming alcohol act as a shelter that considerably increases the risk for suicide [9]. The association between attempted suicide and students with parents who smoke is also added (PR = 1.597, 95% CI: 1.013-2.520). It is known that children of smoking parents had a higher prevalence of smoking in their lifetime, which is consistent with the prolonged exposure to smoking that may come to lead to early experimentation and habitual smoking by adolescents and youths [30]. In this sense, the regular smoking addiction among young people is related to family dysfunctionality and difficulties in intra-family relationships, which is consistent with stressful and conflicting situations in the students' lives, and the feeling of little support or attention from the parents, which may work as a trigger for suicidal ideation [24]. However, these are still approximate considerations, as no research/studies have been found that associate these issues as causality, suggesting more robust investigations, with longitudinal designs, for example. In this study, the findings indicated that the individuals who use LSD are susceptible to suicidal behavior (PR = 1.911, 95% CI: 1.021-3.578).

In the adolescents, suicidal behavior is an incessant request for help due to internal suffering, with depression and use of psychoactive substances being the main risk factors for suicide and suicidal ideation [27]. Such effects due to consuming the LSD drug may come to cause psychotic reactions or even suicidal behavior in the individual. The individuals who abuse psychoactive substances do not show significant cognitive changes but, on the other hand, they bring with them a heap of emotional changes, impulsivity and anger [31]. In general, using hallucinogenic substances may come to be risk factors for the presence of suicidal behavior; however, the topic still needs to be clarified, requiring the production of scientific evidence and accuracy for the cause and effects of hallucinogenic and suicidal drugs. On the other hand, the topic is still insufficiently discussed in research for further consideration, where the results were scarce, with the necessary production of scientific evidence and accuracy for the cause and effects of hallucinogenic drugs and suicide. The cross-

sectional design and the impossibility of causality on the predicted factors are admitted as limiting factors of this study, as well as the non-probabilistic sampling which resulted in sample differences in knowledge areas, although the sample number is significant. Memory bias may come to have an influence on self-reported substance use or socially negative behavior among the university students.

CONCLUSION

The findings of this study indicated the high prevalence of attempted suicide among university students and its association with the variables that refer to the fragility of the university student, especially in relation to mental health, risky behaviors and academic life; and, even controlling the city of origin, it is concluded that the university student has a considerable vulnerability to attempted suicide where risk behaviors such as drug addiction, relationships with parents and friends who smoke, and mental disorders, such as, depression, anxiety and lack of religious actions increase the possibilities for attempted suicide.

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