

Predictive Factors for Suicidal Behaviors among University Students in the North-Central Region of Mexico

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ABSTRACT

Introduction. Suicide is a public health problem with multifactorial etiology affecting all age groups. In Mexico, the suicide rate was 6.5 suicides per 100,000 population in 2021. **Objective.** To determine the predictive factors for suicidal behaviors (SB) in college students in the north-central region of Mexico. **Method.** A descriptive, comparative, analytical study was conducted of 1,147 randomly selected college students. Sociodemographic data, alcohol consumption (AC), perceived stress (PS), social support (SS) and suicidal behavior (SB), suicidal ideation (SI), suicide attempt (SA) and suicide risk (SR) were measured. Data analysis in SPSS included descriptive and inferential statistics. **Results.** The mean age of study participants was 20.2 years, with a female predominance (82.2%). Prevalence rates for SB were 62% for SI, 14.9% for SA, and 18.3% for SR. In regard to predictive factors for SB, risky, harmful, or dependent AC increased SR 1.7-fold [1.071-2.926]. At the same time, not having SS increased the risk of SI, SA, and SR by a factor of 2.4 [1.843-3.246], 2.7 [1.890-4.123], and 3.6 respectively. Higher PS increased the risk of SI, SA, and SR by a factor of 5.6 [4.209-7.538], 3.1 [2.103-4.663] and 6.4 [4.184-9.826] respectively. PS and lack of SS predict SB in both sexes and across all states. **Discussion and Conclusion.** The results show the importance of mental health care, in both epidemiologically risky situations and everyday life, together with the early identification, and timely, effective treatment of suicide risk factors in university students.

Keywords: University students, alcohol consumption, perceived stress, social support, suicidal behaviors.

RESUMEN

Introducción. El suicidio, problema de salud pública de etiología multifactorial que afecta a todos grupos de edad. En México, la tasa en 2021 fue de 6.5 suicidios por cada 100,000 habitantes. **Objetivo.** Determinar factores predictores de conductas suicidas (CS) en estudiantes universitarios de la Región Norte-Centro de México. **Método.** Estudio descriptivo, comparativo y analítico, realizado en 1147 estudiantes universitarios, seleccionados aleatoriamente. Se midieron datos sociodemográficos, consumo de alcohol (CA), estrés percibido (EP), apoyo social (AS) y CS (ideación suicida [IS], intento suicida [SA] y riesgo suicida [RS]). Análisis de datos en SPSS, incluyó estadística descriptiva e inferencial. **Resultados.** Edad promedio 20.2 años, género femenino 82.2%. En la prevalencia de CS, el 62% mostró IdS, 14.9% con InS, y 18.3% con RS. Respecto a los factores predictores de CS, el CA de riesgo, perjudicial o dependiente aumentó 1.7 [1.071-2.926] veces el RS. Por otra parte, el no contar con AS aumentó 2.4 [1.843-3.246], 2.7 [1.890-4.123], y 3.6 veces el riesgo de IdS, InS y RS respectivamente; a mayor EP, aumentó 5.6 [4.209-7.538], 3.1 [2.103-4.663] y 6.4 [4.184-9.826] veces el riesgo de IdS, InS y RS respectivamente. El EP y la falta AS predicen las CS en ambos géneros y en todos los estados. **Discusión y conclusión.** Los resultados evidencian la importancia del cuidado de la salud mental de manera cotidiana, así como la identificación temprana, tratamiento oportuno y efectivo de factores de riesgo de suicidio en universitarios.

Palabras clave: Estudiantes universitarios, consumo de alcohol, estrés percibido, apoyo social, conductas suicidas.

INTRODUCTION

According to the World Health Organization (WHO), mental health conditions constitute a worldwide public health problem, as they can affect all age groups at any stage of life, increasing susceptibility to other mental disorders such as anxiety, depression, and suicide (WHO, 2022). According to WHO, suicide represents the fourth leading cause of overall mortality in young people ages 15-29, affecting males and populations with low to middle socioeconomic status to a greater extent (WHO, 2021a). Studies analyzing suicide mortality trends in different world regions have found that suicide rates in the Americas have increased by 17% over the past two decades (WHO, 2021b).

In Mexico, statistics published by the Instituto Nacional de Estadística, Geografía e Informática (INEGI, 2022) show that the general suicide rate was 6.5 suicides per 100,000 population in 2021. These rates have increased in recent years since suicide mortality for the 15-29 age group was 12.4 in 2015, rising to 16.2 in 2021. Likewise, in 2015, the suicide rate for women in this age group was 3.9, increasing to 4.8 per 100,000 population in 2021. Suicide remains one of the leading causes of mortality in the group ages 15-24. In 2022, it ranked as the third leading cause of overall mortality in this age group. When analyzed by sex, it was the third highest cause of death in men and the fourth highest in women (INEGI, 2023).

Prior to death by suicide, young people go through various stages, in which they display suicidal behaviors, suicidal ideas are already present, and a considerable percentage already have plans for how to commit suicide and even attempt it (Voss et al., 2019). High prevalences of suicidal behaviors have been reported among the adolescent population, including both SI and SA, which fluctuate between 9% and 77% (Hernández-Bello et al., 2020).

The multifactorial origin of SB is well documented. Associated variables include personal, familial, and psychological characteristics, such as AC, SS, and stress (Camargo et al., 2021; Hirsch et al., 2019).

Among personal characteristics, AC has gained prominence given its easy availability, prompting the early onset of consumption at increasingly young ages, which in turn predicts greater vulnerability to harmful consumption (WHO, 2022). Likewise, AC is one of the main risk factors for developing SB such as SI and SA, since it has been reported that with AC, the probability of presenting SI increases 2.6 times (Asfaw et al., 2020), raising the probability of developing suicidal behavior to 30% (Hernández-Bello et al., 2020).

In regard to family factors, the literature reports that family function can either serve as a protective or a risk factor for several unhealthy behaviors, and a determinant of suicidal behaviors. Some authors have reported that a high prevalence of severe dysfunctionality, a poor relationship

with one's parents and a perceived lack of family support, increases the risk of suicidal behavior in adolescents up to tenfold (Hernández-Bello et al., 2020). Likewise, young people with poor SS have up to 2.57 times the risk of SI (Asfaw et al., 2020). Poor communication with parents and in family life increases suicide risk up to 3.9 times (Hidalgo-Rasmussen et al., 2019). Conversely, having SS, good family relationships, positive communication with one's parents and the support of friends, has proved to be associated with a lower risk of suicide (Camargo et al., 2021).

One psychological characteristic, which is a significant risk factor associated with SB, is stress levels. Stress levels tends to be higher in the case of college students since some are still teenagers, yet have to cope with the complexity and responsibility of their university studies, including an excessive number of assignments. Several authors have reported high stress levels in this population, including the association existing between stress levels and SB (Lew et al., 2019; López-García et al., 2016; Restrepo et al., 2018).

There is compelling evidence that in college students, the combination of various factors such as AC, high stress levels, and some degree of family dysfunction predicts a higher percentage of SB (suicidal thoughts, SI, SA), which could lead to suicide. It is therefore essential for public health to examine the prevalence of these mental health problems in this population (Camargo et al., 2021; González Sancho & Picado, 2020; Hernández-Bello et al., 2020; Louzán & López, 2021; Soto et al., 2020). Accordingly, the purpose of this study was to determine predictive factors (AC, SS, PS) for SB in college students in the north-central region of Mexico.

METHOD

Study design and sample description

This was a descriptive, comparative and analytical study. The study population comprised 4,167 undergraduate nursing students from four states in the north-central zone of Mexico (Nuevo León, Durango, Zacatecas, and Coahuila). The final sample consisted of 1147 university students, (Nuevo León = 282; Durango = 210, Zacatecas = 399, Coahuila = 256) selected using a systematic random sample, considering the lists of enrolled students with institutional emails provided by the Registrar's Office as the sampling frame. The calculation considered an estimation error of .05, a confidence interval of 95% and a non-response rate of 9%.

Eligibility criteria were being apparently healthy students, identified by answering a filter question in which they stated that they did not have a medically diagnosed disease, being enrolled in the first to the eighth semester of their undergraduate program, and being at least 18 years old.

Measurements

To measure the variables of interest, the following instruments were applied and transcribed into a Microsoft Forms form:

- *Data questionnaire*. This contains information on the state of residence, university, sex, age, marital status, number of children, semester, occupation, whether they worked as well as studied, the number of working hours per week; people whom they were living with at the time of the survey, main form of financial support, as well as the availability of internet and electronic devices to work from home.
- *Okasha's Suicidality Scale (OSS)*. This scale for measuring SB comprises four items covering the past twelve months. The first three items assess SI scored from zero to three (0 = never to 3 = often). The fourth item assesses SA: (no attempt = 0, one attempt = 1, two attempts = 2, three or more attempts = 3). The total scale score ranges from zero to 12, with higher scores indicating greater severity. Values above the 50th percentile were considered to indicate SR. The reliability obtained was .90 (Campo-Arias et al., 2019).
- *CAGE Questionnaire*. This scale detects alcohol dependence through four items with dichotomous yes/no responses. Answers are scored from zero to one = social drinker, two = risky consumption, three = harmful consumption and four = alcohol dependence. The scale has a reliability of .65 (Campo-Arias et al., 2009).
- *Perceived Stress Scale (EPP-10)*. This scale consists of ten items exploring the stress levels experienced in the past month. Response options range from zero = never to four = very often. The higher the score, the greater the stress. Scores above the 50th percentile were regarded as indicators of stress. Reliability was .83 (Campo-Arias et al., 2014).
- *Family and Friends Social Support Scale (AFA-R)*. This scale consists of fifteen items, divided into two subdimensions. The first one measures family support with eight questions (1, 3, 5, 7, 9, 11, 13 and 14) while the second measures friends with seven items (2, 4, 6, 8, 10, 12 and 15). The response option is a Likert-type scale with five options ranging from one = never to five = always. The higher the score, the greater the social support. Values above the 50th percentile were regarded as indicators of social support. The Cronbach's alpha was .94 (González & Landero, 2014).

Procedure

Data collection began with, authorization was requested from each of the directors of the selected schools. The lists

of students enrolled in the August-December 2021 semester were subsequently requested to select the participants. These students were contacted by one of their professors, who also explained the purpose of the study and sent them an email with a link where they could sign the informed consent form electronically and then answer the questionnaires.

Statistical analysis

The data was captured and analyzed in the SPSS version 25 statistical package. Descriptive statistics were used to characterize the population. The Kolmogorov Smirnov test was used to identify the data distribution. The Mann Whitney U and Kruskal Wallis tests were used to compare suicidal behaviors by gender and state. A forward stepwise logistic regression was used to identify predictive factors for SB (SI, SA, and SR). For all analyses, the statistical significance level adopted was equal to or less than .05.

Ethical considerations

The study adhered to the guidelines established in the Helsinki Code. It was approved by the Research Committee (FAENUS-CI-EX-2021-07) and Research Ethics Committee (FAENUS-CEI-EXT-2021-01) of the Nursing Faculty, Saltillo Campus of the Autonomous University of Coahuila, and it was also valid for the rest of the universities included in the study. All students received informed consent forms explaining that their participation was voluntary and confidential, and that they could withdraw from the study whenever they wished.

RESULTS

The final sample consisted of 1,147 undergraduate nursing students from five universities in the north-central zone of Mexico (Coahuila, Durango, Nuevo Leon, and Zacatecas) with an average age of 20.2 (SD = 2.4), 82.2% of whom were female and the rest male.

In regard to predictive factors for SB, 51.9% reported having SS from family and friends, while 48.4% perceived themselves as being stressed. As for alcohol consumption, 91.1% self-identified as social drinkers, 5.7% as having risky consumption, 2.9% as having harmful consumption and .3% as having alcohol dependence. Conversely, in regard to SB, 37.4% reported that they had never had suicidal thoughts; 57.3% had at some time thought that life was not worth it, 47.6% had at some time wished they were dead, while 33.8% had at some time thought of ending their lives. Prevalence rates were 62% for SI, 14.9% for SA, and 18.3% for SR. A comparison by sex showed that women obtained higher SI scores ($U = 84.627; p < .05$) and SR ($U = 85.365; p < .05$).

Table 1
Comparison of Suicidal Behaviors among University Students by State

Suicidal behavior	Mdn				χ^2	df	p
	Coahuila N = 256	Durango N = 210	Nuevo León N = 299	Zacatecas N = 399			
Suicidal ideation	66.66	22.22	11.11	11.11	9.22	3	.026
Suicide attempt (%)	19.9%	12.4%	15.2%	12.8%	7.57	3	.052
Suicide Risk	16.66	16.66	24.83	8.33	9.34	3	.025

Note: Mdn = Median; χ^2 = Chi-square; df = degrees of freedom; Statistically significant at $p < .05$.

Table 2
Logistic Regression of the Association between Alcohol Consumption, Social Support, Perceived Stress and Suicidal Behavior at Universities (N = 1147)

Variables	Suicidal behaviors		
	Suicidal ideation OR [95% CI]	Suicide attempts OR [95% CI]	Suicide risk OR [95% CI]
Risky or dependent alcohol consumption	1.664 [1.985-2.813]	1.583 [1.947-2.648]	1.770 [1.071-2.926]*
Lack of Social Support	2.446 [1.843-3.246]**	2.792 [1.890-4.123]**	3.684 [2.505-5.418]**
Perceived Stress	5.633 [4.209-7.538]**	3.132 [2.103-4.663]**	6.412 [4.184-9.826]**

Note: OR: odds ratio; 95% CI: 95% Confidence interval for each OR. * Statistically significant at the $< .05$ level. ** Statistically significant at the $< .001$ level.

The Kruskal Wallis test was administered to compare SB by state. It found that university students from Coahuila obtained higher SI and SA scores, whereas those from Nuevo León showed higher levels of risk of suicide (Table 1).

When applying logistic regression to identify SB predictors, (SI, SA, and SR), it was found that risky, harmful or dependent AC, not having SS from family and friends, and a greater perception of stress are SR predictive factors with an explained variance of 27.7%; whereas for SI and SA, only the lack of SS and PS were significant, with an explained variance of 28.4% and 14.5% respectively (Table 2).

When analyzing the behavior of SB predictors by gender, it was found that the three predictive factors considered (AC, SS, and PS) were significant in women. In contrast, in men only the lack of SS as well as the highest PS were predictors of SB (Table 3).

Likewise, when assessing whether the predictors behaved the same by state, it was found that the SS of relatives and friends as well as PS continued to be predictors. However, risky or dependent AC was significant for SR in Nuevo León and for SI in Zacatecas (Table 4).

Table 3
Logistic Regression of the Association between Alcohol Consumption, Social Support, Perceived Stress and Suicidal Behavior by Gender (N = 1147)

Variables	Suicidal behaviors					
	Suicidal ideation OR [95% CI]		Suicide attempts OR [95% CI]		Suicide risk OR [95% CI]	
	Men	Women	Men	Women	Men	Women
Risky or dependent alcohol consumption	.599 [.507 - 3.244]	1.977 [1.028 - 3.804]*	1.640 [.524 - 5.132]	1.581 [.886 - 2.820]	1.866 [.602 - 5.789]	1.759 [1.002 - .089]*
Lack of social support	1.993 [1.061 - 3.743]*	2.608 [1.896 - 3.587]**	3.214 [1.368 - 8.594]*	2.721 [1.781 - 4.159]**	3.654 [1.343 - 9.941]*	3.702 [2.436 - 5.626]**
Perceived stress	5.128 [2.595 - 10.132]**	5.599 [4.051 - 7.738]**	3.424 [1.186 - 8.711]**	3.138 [2.017 - 4.884]**	6.677 [2.515 - 17.725]**	6.298 [3.911 - .142]**

Note: OR: odds ratio; 95% CI: 95% Confidence interval for each OR. * Statistically significant at the $< .05$ level. ** Statistically significant at the $< .001$ level.

DISCUSSION AND CONCLUSION

The objective of the study was to determine predictive factors for SB in college students in the north-central region of Mexico. In regard to SB, high prevalences were found, in both SI (62%), SA (14.9%) and SR (18.3%). As in other studies, when participants were compared by sex, women obtained higher scores. These data matches with what was reported in the review by [Hernández-Bello et al. \(2020\)](#), which states that, in studies conducted with the OSS, SA oscillated between 9% and 19.1%, and suicidal ideation between 45% and 77.2%. Likewise, 39% of the articles reviewed reported that being a woman is a risk factor related to SB, which coincides with the results shown in the systematic review by [Zamorano-Espero et al. \(2022\)](#) who report that in 33.3% of the studies analyzed, suicidal ideation is more frequently expressed in women than men.

In relation to the presence of suicidal behaviors by state, this study found that the states of Coahuila and Nuevo León have the greatest presence of SI and SA. This differs from the results of [Rivera-Rivera et al. \(2020\)](#) who, using a cross-sectional study and taking the 2018 National Health and Nutrition Survey as a reference, reported higher prevalences of SI in adolescents ages 10-19 in Zacatecas and Durango, as well as higher percentages of SA in Zacatecas. This is probably due to the ages of those in the group surveyed, which,

in the aforementioned research, comprised those under 19. Conversely, the proximity of these states to the United States, a country in a region with high suicide rates ([Cuesta-Revé, 2017](#)), may have changed certain cultural beliefs regarding this issue in young people. However, follow-up studies should be conducted to assess changes in SB over time.

In regard to predictive factors, in this study population it was found that risky or dependent AC increased SI and SR in women in Zacatecas and Nuevo León, which is similar to what was reported by [Machado et al. \(2020\)](#) and [Santos et al. \(2017\)](#) who showed that AC is a risk factor for presenting SB. However, this differs from [Airtzagüena and Morentin \(2022\)](#) who showed in a retrospective study that alcohol was more prevalent in men according to post-suicide autopsies. This difference in the findings may be due to the various metabolic factors that explain why the side effects of alcohol intake are more harmful in women.

Similarly, in the systematic reviews by [Hernández-Bello et al. \(2020\)](#) and [Zamorano-Espero et al. \(2022\)](#), the authors note that those with AC, especially those with health risks, are more likely to engage in SB. This matches with [Andrade \(2012\)](#), who notes that people who consume alcohol are more likely to present conditions that affect mental health and precipitate suicidal ideation and attempts. This association could be explained by the fact that when young people consume alcohol, it has a depressant

Table 4
Logistic Regression of the Association between Alcohol Consumption, Social Support, Perceived Stress and Suicidal Behavior by State (N = 1147)

Variables	Suicidal behaviors		
	Suicidal ideation OR [95% CI]	Suicide attempts OR [95% CI]	Suicide risk OR [95% CI]
Coahuila			
Risky or dependent alcohol consumption	.662 [.264-1.657]	1.230 [.466-3.247]	1.419 [.562-3.581]
Lack of social support	3.154 [1.711-5.812]**	3.769 [1.626-6.792]**	3.392 [1.563-7.358]**
Perceived stress	4.522 [2.444-8.368]**	3.017 [1.340-6.792]**	5.075 [2.221-11.598]**
Durango			
Risky or dependent alcohol consumption	.692 [.204-2.347]	.846 [.177-4.046]	.772 [.155-3.843]
Lack of social support	3.823 [1.846-7.919]**	1.961 [.807-4.765]	4.310 [1.596-11.642]**
Perceived stress	5.035 [2.545-9.962]**	2.57 [.985-6.702]	4.936 [1.578-15.437]**
Nuevo León			
Risky or dependent alcohol consumption	3.850 [.921-16.085]	3.158 [.977-10.211]	3.838 [1.032-14.269]*
Lack of social support	2.24 [1.254-4.004]**	2.029 [.965-4.264]	2.659 [1.270-5.569]**
Perceived stress	9.038 [4.749-17.202]**	3.444 [1.743-6.806]**	10.370 [4.477-24.020]**
Zacatecas			
Risky or dependent alcohol consumption	3.881 [1.502-10.028]**	1.752 [.737-4.167]	2.189 [.969-4.943]
Lack of social support	1.949 [1.220-3.116]**	3.621 [1.660-7.896]**	6.820 [3.206-14.511]**
Perceived stress	5.115 [3.154-8.296]**	4.955 [2.207-11.126]**	4.395 [2.161-8.939]**

Note: OR: odds ratio; 95% CI: 95% Confidence interval for each OR. * Statistically significant at the < .05 level. ** Statistically significant at the < .001 level.

effect after ingestion that can exacerbate mood disorders such as anxiety and/or depression and therefore lead to the presence of SB (Rodríguez et al., 2014).

Consistent with previous studies, lack of SS was found to be a risk factor for SI, SA, and SR (Hernández-Bello et al., 2020; Hidalgo-Rasmussen et al., 2019; Núñez-Ariza et al., 2020; Torres Torija et al., 2022), in both sexes and across all states. In general, college students who perceived themselves as lacking SS had a 3.6 times higher risk of SR and a nearly threefold risk of SI or SA. This is probably associated with what was mentioned by Morales et al. (2017), in relation to the fact that perceiving that one has an integrated family group and having the support of family and friends is beneficial for the emotional health of adolescents. Social support can therefore serve as a mechanism that provides strategies and coping skills against SR (Viera Viera & Romero Serrano, 2022).

Conversely, stress levels have been associated with the prevalence of SB, such SI and SA (Hernández-Bello et al., 2020; Morales et al., 2021; Gómez et al., 2020). In this study, perceiving oneself as stressed increased the risk of SI, SA, and SR 5.6, 3.12, and 6.41 times, respectively. In agreement with what has been cited in other studies (López-García et al., 2016; Morales et al., 2021; Redhead, 2022; Sánchez-Villena, 2018), this study shows the impact of the prevalence of stress on SB, perhaps due to the hectic globalized society of immediacy and chaotic disposability. Due to the environment of stigmatization mental health in which young university students were born and developed, it is considered a weakness to externalize feelings associated with ineffective stress management, or to seek timely assistance for deteriorating mental health, which, in turn, increases the vulnerability to developing SB.

The statistics on the predictive factors for SB present in this population and the need to be able to use the admission profile to detect the psychosocial context in which students develop and to implement specific strategies to prevent suicide are obtained through the detection, monitoring and timely evaluation of people with risk behaviors. This points to the need for intervention programs within university tutorials that encourage the effective management of stress levels, harmful AC and SB.

Limitations of this study include the fact that data was collected at one point in time. It is therefore suggested that long-term studies and follow-up be conducted, and that educational or behavioral interventions be implemented to reduce the predictive factors for SB.

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Conflict of interest

The authors declare they have no conflicts of interest.

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