

Suicide attempt in teenagers: associated factors

Intento de suicidio en adolescentes: factores asociados

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Abstract

Attempted suicide is the main risk factor for completed suicides. **Objective:** To analyze the prevalence of attempted suicide in junior high school and high school students in Mexico City, and its associated factors. **Subjects and Method:** Observational, cross-sectional and descriptive study conducted with data from the Mexico National Survey on Drug Use Among Students (ENCODE) 2012. The validated survey was anonymous, structured and self-applied, and contains seven sections: Sociodemographic; Tobacco, alcohol and drug use; Problems related to drug use; Antisocial behavior; Social sphere; Interpersonal sphere and Personal sphere. Family atmosphere, communication with parents, and self-esteem indexes were created using principal component analysis. A binomial logistic regression model was adjusted, and the odds ratio (OR) were analyzed. **Results:** The estimated prevalence of attempted suicide was 6.8%. The factors that increased the attempted suicide possibility were: being a woman (OR 3.1), be under 16 years old (OR 1.6), living in an unfavorable family atmosphere (OR 1.5) or having a poor communication with parents (OR 1.8), having low self-esteem (OR 1.9), behavioral or learning problems (OR 1.4) or suffering a mental illness (OR 3.6); having been forced into sexual contact (OR 2.6); or drugs use, smoking or alcohol consumption (OR 1.7, 1.2 and 1.7). **Conclusions:** The attempted suicide prevention should be focused on women younger than 16 years, with any psychiatric disorder, behavioral problem or low self-esteem, who live in an unfavorable family atmosphere, with risky behavior such as smoking, or alcohol or drugs consumption, or who have been forced into sexual contact.

Keywords:

Attempted suicide;
suicide;
adolescent;
sexual violence;
risk factors;
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Introduction

Suicide is the act of deliberately causing one's own death, involving various stages of a continuum called suicidal behavior: ideation, planning, attempt, and completed suicide¹. Suicide is a global public health problem with a high economic, social and psychological burden on individuals, families, communities, and society as a whole². In 2012, suicide was the fifteenth leading cause of death worldwide, accounting for 1.4% of all deaths, resulting in nearly one million suicides, and it was responsible for nearly half of all violent deaths of men and more than 70% of women².

Most suicides occur in developing countries, where early identification is complicated due to scarce and limited resources and services, and insufficient treatment and support². Latin America and the Caribbean have relatively low suicide rates (6.1 per 100,000 inhabitants)², however, in the last 20 years, they have increased throughout the region³. Mexico is no exception, and for more than 40 years suicide mortality has risen steadily and continuously^{4,5}. The mortality rate quintupled from 1.13 suicides⁶ in 1970 to 5.31 in 2015. This increase occurred mainly among young people^{4,5}.

The risk of dying by suicide or to attempt suicide has increased among Mexican adolescents and young people⁵, particularly in Mexico City (CDMX)⁷. The suicide mortality rate in the 10-19 age group tripled nationally (from 1.56 suicides per 100,000 adolescents in 1990 to nearly 5 in 2015). In CDMX, it increased from 2 suicides in 1990 to 4.56 in 2015 (with a maximum of 7 suicides in 2011), placing suicide as the third leading cause of death of men and the first for women in that age group. It is estimated that for every completed suicide there are ten to twenty attempts^{2,4}.

Suicide attempt is the main risk factor of suicide and represents a huge social and economic burden due to the use of health services to treat injuries, the psychological and social impact and, sometimes, resulting in long-term disability². Factors associated with an increased risk of suicide attempt in the population, and particularly in adolescents, include prior suicide attempt², the presence of mental illness or behavioral problems⁵, sex, age⁷, alcohol and drug use, low self-esteem, experiencing violence or abuse, the type of family functioning, impulsivity, and social support¹. Since suicide attempt has increased in CDMX, especially in adolescents⁸, the objective of this study is to analyze the prevalence of suicide attempt in middle and high school adolescent students (MHS) of CDMX in 2012 and its associated factors.

Subjects and Method

An observational, cross-sectional and descriptive study was conducted with information from the CDMX Student Drug Use Survey 2012 (ECDE-2012) of the National Institute of Psychiatry in Mexico. The ECDE is a cross-sectional survey with representativeness for the CDMX, its 16 municipalities, and the middle and high education levels.

The population studied was MHS from public and private schools of CDMX, enrolled in the 2011-2012 school year, comprising 26,503 students. The sample design was stratified and by conglomerates. The sample inclusion/exclusion criteria, the considered non-response rate, and the ethical aspects of the survey are detailed in other research^{9,10}. The questionnaire, anonymous, structured and self-applied, was validated in previous surveys^{9,11} which is applied to all respondents and contains the following seven sections: 1-Sociodemographic; 2-Smoking, alcohol, and drugs use; 3-Problems related to drug use; 4-Antisocial behavior; 5-Social sphere; 6-Interpersonal sphere; and 7-Personal sphere. We used questions of all seven sections that included 22,126 MHS with complete information; students with missing data were not considered.

The questions of the ECDE were: Have you ever purposely hurt, cut, poison, or harm yourself in order to end your life? and What happened that or those times you hurt yourself on purpose in order to end your life? If the student answered the first question "Once" or "More than once," and the second "I did," it was classified as a "suicide attempt sometime in his/her life" with value 1, and any other combination was considered as "no suicide attempt ever in his/her life" with value 0. Therefore, the dependent variable is a nominal dichotomous one. It was considered suicidal ideation if the student answered "I only thought about it" in the second question; if he/she answered "I was about to" it was considered as planning. These last variables were used to contextualize the problem of the phenomenon studied.

As explanatory variables of suicide attempt were selected those that allowed getting as close as possible to the associated factors of suicide attempt that literature reports as most relevant:

Sociodemographic: sex, age, education level, and municipality. The latter two as control variables.

Family environment: presence of the parents at home, a family climate index that was elaborated with questions about how adolescents and young people perceive the relationship with their parents. We used variables that are the opposite of those of family violence elaborated by Villatoro et al¹², and the communication with parents index was constructed considering characteristics related to the involvement and support of parents.

Emotional problems: a self-esteem index was created based on the scale of Rosenberg¹³ and González-Forzte et al¹⁴. As a proxy that the student had a mental illness or had behavioral or learning problems, the following questions were used: Do you have any physical or emotional problem that limits you to do things that people can regularly do without difficulty?, and What physical or emotional problem does this limitation cause you? The answers to the second question were "Learning problems", "Physical illnesses", "Mental illness (depression, anxiety, etc.)", "Behavior problem", "Other", and "I have no physical or emotional problems". Responses were grouped into mental illness; behavioral or learning problems, and if the student answered that he/she had a physical illness, another illness, or no physical or emotional problems, he/she was assigned the "No" category.

Risk behavior: due to the lack of medical diagnosis of alcohol, drug, and tobacco abuse and dependence, the proxy variable used was self-report on consumption in the last month.

Sexual violence: this variable was used as such if the student stated to have been pressured to have any type of sexual contact.

The family climate indexes, such as communication with parents and self-esteem, were obtained through Principal Component Analysis (PCA), applied to qualitative variables using the polychoric correlations matrix, including questions related to the index we wanted to measure and whose Cronbach's alpha was higher than 0.70, to guarantee its internal consistency¹⁵. In each index, the first main component was retained, whose own value was the only one higher than the unit. It was verified that the Kaiser-Meyer-Olkin (KMO) adequacy index was higher than 0.70¹⁶ and that the percentage of explained variance was at least 80%. Each index was stratified into three groups using the Dalenius-Hodges method¹⁷, which allows forming homogeneous groups within, reducing the index's variance of each group and increasing it among them¹⁸ (table 1).

The suicide attempt prevalence was calculated

Table 1. Description and results of the constructed indexes by Principal Component Analysis, 2012

Used Questions	Questionnaire response options	Principal Component Analysis Results			
		Cronbach's Alpha	% of Variance explained by the first principal component	Kaiser-Meyer-Olkin (KMO) Index	First Principal Component Equation
Family climate index Your parents or the surrogates ... clim1 = talk quietly about your differences clim2 = know how to fix problems clim3 = support each other clim4 = show mutual affection clim5 = seek to spend time together	Always Almost always Sometimes Never	0.8984	78.8	0.8800	0.4271 clima1+ 0.4375 clima2+ 0.4614 clima3+ 0.4582 clima4+ 0.4509 clima5
Communication with parents index Your parents or the surrogates ... relp1 = encourage you to do your best relp2 = listen to your opinions relp3 = congratulate you when you do a task or job well relp4 = include you when they plan family activities relp5 = get involved in the activities that interest you (at school, sports)	Never Sometimes Frequently Very Frequently	0.8384	68.71	0.8759	0.4601relp1+ 0.4719relp2+ 0.4649relp3+ 0.4156relp4+ 0.4205relp5
Self-esteem index Please indicate how much you agree or disagree with each of the following sentences auto1 = I feel that I have good qualities auto2 = I'm able to do things as well as almost all people auto3 = I have a positive attitude towards myself auto4 = In general I am satisfied with myself	Completely disagree Disagree Agree Completely agree	0.9117	84.5	0.8263	0.4929auto1+ 0.4948auto2+ 0.5090auto3+ 0.5031auto4

n = 22 126. Source: Created by the authors, based on the 2012 Survey on the consumption of alcohol, tobacco and other drugs in Mexico City.

through the percentage of MHS who reported ever having a suicide attempt in their lifetime with their respective 95% confidence interval (95%CI). A bivariate analysis of this prevalence was carried out according to sociodemographic characteristics, risk behaviors, family and personal environment, and emotional problems. The Pearson Chi-Square test was used to determine the independence between attempting suicide and independent variables. A binomial logistic regression (BLR) model was adjusted to analyze what characteristics affect the possibility that MHSs have attempted suicide at some point in their lives, and their goodness-of-fit was analyzed with the Archer-Lemeshow tests¹⁹. In all analyses, the characteristics' effect of the complex sample design of the survey was considered. In order to make the estimates more reliable, a variation coefficient lower than 25% was considered.

We worked with secondary data in which we guaranteed the confidentiality and anonymity of the studied students. The survey was approved by the Ethics Committee of the National Institute of Psychiatry Ramón de la Fuente Muñiz and by the educational authorities of the Federal District to be applied in the school population. The instructions on the instrument clearly indicated that the subject could accept or not the application of the questionnaire⁹.

Results

Slightly more than half of the MHSs were men and under 15 years of age. Most of them lived with both parents and were in middle school (table 2). The high-

est prevalence was attempted suicide at some point in his/her life, and the lowest one was planning, although the differences between the suicide stages were not statistically significant (figure 1). The ideation, planning, and suicide attempt were higher in female MHSs. Also, in men, the highest prevalence was in the ideation stage, and for women, the highest prevalence among the three stages was in the suicide attempt.

Table 2. Percent distribution of middle and high school students of Mexico City by selected characteristics, 2012

Characteristics	%	CI* 95%
Sex		
Male	50.2	[48.7 - 51.7]
Female	49.8	[48.3 - 51.3]
Age		
15 years or less	68.6	[64.9 - 72.1]
16 - 17 years	24.4	[21.7 - 27.4]
18 years or more	6.9	[5.8 - 8.3]
Schooling		
Middle	53.9	[49.3 - 58.4]
High school	46.1	[41.6 - 58.4]
Presence of parents at home		
None	2.8	[2.6 - 3.1]
Only the father	3.6	[3.3 - 3.8]
Only the mother	23.5	[22.8 - 24.3]
Both parents	70.1	[69.2 - 71.0]

*CI – Confidence Intervals. n = 22 126. Source: Created by the authors, based on the 2012 Survey on the consumption of alcohol, tobacco and other drugs in Mexico City.

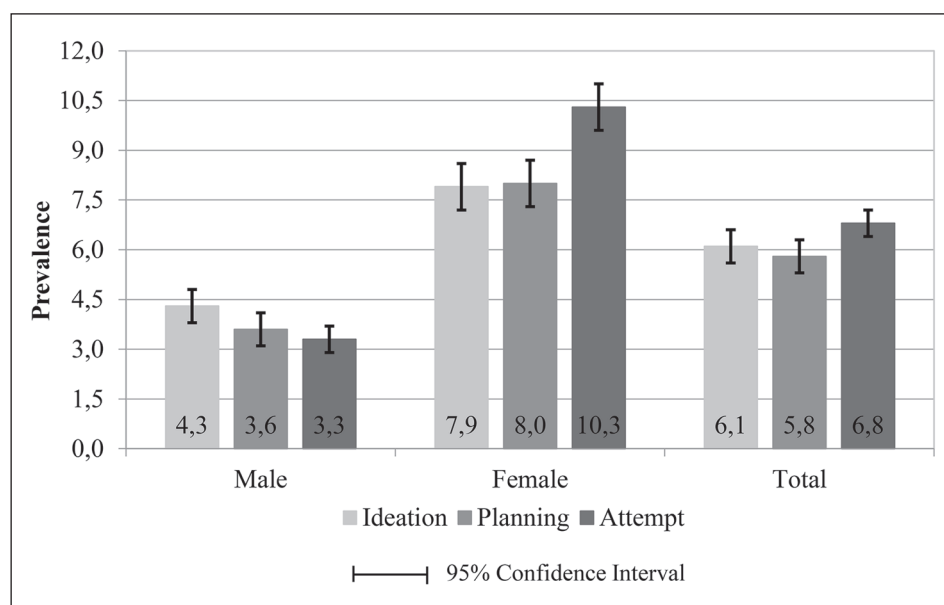


Figure 1. Differences in suicidal behavior in middle and high school students of Mexico City by sex, 2012. n = 22,126. Source: Created by the authors, based on the 2012 Survey on the consumption of alcohol, tobacco and other drugs in Mexico City.

Suicide attempts were more common in extreme age groups. The suicide attempt prevalence was higher in middle school students than in high school students, however, this difference was not statistically significant. The municipalities with the highest suicide attempt prevalence were Azcapotzalco and Milpa Alta. The differences among municipalities were not statistically significant (table 3).

An inverse relationship was observed between the prevalence of suicide attempt and the presence of parents at home, the family climate index, and the index of communication with parents. The highest prevalence of suicide attempt was observed in those students who did not live with their parents which was almost halved in those who lived with both parents (table 3). If the family climate was bad, the prevalence of suicide attempt was 2.5 times higher than in those who lived in a good climate, and the prevalence of suicide attempt was almost 3 times higher in those who had a bad relationship with their parents than if the relationship was good.

MHSs who used drugs, alcohol, or tobacco in the past month had higher percentages of suicide attempt than those who did not (Table 3). The highest prevalence of suicide attempt was observed in students with a mental illness such as depression or anxiety, and in those who were ever forced or pressured to have sexual contact. It was shown that there is a statistically significant relationship between all studied variables and suicide attempts.

The BLR model results show that female students were more than three times more likely to attempt suicide than male students (Table 4). The intermediate age group (16 and 17 years) was a protective factor against suicide attempts, and the younger people were more likely to have this problem. The presence of both parents at home was a protective factor against suicide attempt, however, if only the mother lived with the student, the likelihood of attempting suicide increased compared with those who lived with both parents. Students who lived in a home with a poor family climate or had poor communication with parents, the chance of having attempted suicide increased significantly. Alcohol, tobacco, or drugs use in the past month significantly increased the likelihood of attempting suicide when compared with those who never used such substances.

Among the analyzed characteristics, the one that presented the highest relationship with the suicide attempt in the MHSs was suffering from some mental illness. The presence of this factor or having a behavior or learning problem increased the possibility of a suicide attempt. The lower the self-esteem of the MHSs, the higher the likelihood was that they would attempt suicide. Those who reported being forced or pressured

to have sexual contact were also more likely to attempt suicide than those who did not. The BLR model was properly adjusted to the observed values ($p\text{-value} > 0.05$ from the Archer-Lemeshow test).

Discussion

The suicidal ideation prevalence was lower than that observed in another study conducted in 2006 in the CDMX Metropolitan Area with adolescents aged between 12 and 17 years²⁰, while planning was higher²⁰ than the same study. The suicide attempt prevalence was lower than that reported in 1997 and 2000²¹, however, it was higher than that reported in 2006 in adolescents aged between 12 and 17 in the CDMX Metropolitan Area⁵. Although the suicide attempt prevalence presented here is not fully comparable with these studies, it is within the range reported in Mexico and other Latin American countries in the adolescent and youth population (2.8% and 18.8%)²²⁻²⁹.

As in other contexts, the prevalence of ideation, planning, and suicide attempt was higher in women^{5,20,22-29}. Female MHSs of CDMX were three times more likely than male students to attempt suicide once the effect of the other variables was controlled. This has been linked to the fact that women are more likely to suffer from depression, which puts them at greater risk of suicidal behaviour³⁰. This coincides with the so-called 'gender paradox in suicide', which indicates that women attempt suicide more frequently than men, however, more men die by suicide than women⁷.

The suicide attempt prevalence of MHSs from CDMX was higher for those over 18 years and those under 16 years, however, it was only statistically significant in younger people. In contrast to what has been stated in other research, the higher risk of suicidal behavior occurs in late adolescence³¹. This has been associated with greater exposure to risk factors, such as mood disorders, than in younger adolescents³². One possible explanation is that bullying is more common among younger students and it decreases as age and school grade increases³³, and which, in turn, is associated with an increased risk of depression, ideation, and attempted suicide³⁴⁻³⁵. It is worth mentioning that mortality in those aged between 15 and 19 is four times higher than those aged between 10 and 14, and, given the results obtained in this study, it is possible to presume that in CDMX the onset of suicidal behavior occurs in early adolescence (10-14 years) and leads to completed suicide in late adolescence (15-19 years). These results open the possibility for future research on adolescent suicide.

Psychiatric disorders are one of the main risk factors of suicide attempt³⁶. MHSs of CDMX with mental

Table 3. Differences in suicide attempt in middle and high school students of Mexico City by selected characteristics, 2012

		Suicide Attempt		Chi-square test of independence			Intento de suicidio		Prueba de independencia χ^2	
Characteristics	%	CI* 95%	P value		Characteristics	%	CI * 95%	P value		
Socio-demographic										
Age					Communication with parents index					< 0.001
15 years or less	7.1	[6.6 - 7.7]	0.002		Bad	12.1	[11.0 - 13.2]			
16 - 17 years	5.6	[4.8 - 6.4]			Regular	6.8	[6.0 - 7.7]			
18 years or more	8.2	[6.6 - 10.1]			Good	4.4	[3.9 - 4.8]			
Schooling					Emotional problems					
Middle	7.1	[6.5 - 7.8]	0.1821		Self-esteem index					
High school	6.5	[5.9 - 7.1]			Low	12.9	[11.6 - 14.4]		< 0.001	
					Medium	7.7	[7.0 - 8.4]			
Municipality			0.2275		High	4.4	[4.0 - 5.1]			
Alvaro Obregon	7.2	[5.8 - 8.8]			Emotional problems					
Azcapotzalco	8.6	[6.9 - 10.8]			No	6.0	[5.6 - 6.4]		< 0.001	
Benito Juarez	6.3	[5.1 - 7.8]			Behavioral or learning problems					
Coyoacán	5.9	[4.6 - 7.6]			Mental illness (depression, anxiety, etc.)	30.0	[25.2 - 35.3]			
Cuajimalpa	6.2	[4.7 - 8.2]			Risk behaviors					
Cuauhtémoc	7.9	[6.3 - 9.8]			Tobacco consumption in the last month					< 0.001
Gustavo A. Madero	6.0	[4.9 - 7.2]			No	6.2	[5.7 - 6.7]			
Iztacalco	6.2	[4.9 - 7.9]			Yes	10.6	[9.4 - 12.0]			
Iztapalapa	7.5	[6.0 - 9.5]			Drug consumption in the last month					< 0.001
Magdalena Contreras	7.3	[5.9 - 9.0]			No	5.9	[5.5 - 6.3]			
Miguel Hidalgo	5.8	[4.7 - 7.1]			Yes	15.4	[13.4 - 17.6]			
Milpa Alta	7.9	[6.4 - 9.8]			Alcohol consumption in the last month					< 0.001
Tláhuac	6.7	[5.2 - 8.6]			No	4.8	[4.4 - 5.4]			
Tlalpan	6.3	[4.8 - 8.2]			Yes	9.8	[9.0 - 10.6]			
Venustiano Carranza	7.0	[5.5 - 9.0]			Sexual Violence					
Xochimilco	7.3	[5.9 - 9.1]		Pressured to have any type of sexual contact					< 0.001	
Family environment					No	5.6	[5.2 - 6.1]			
Presence of parents at home					Yes	19.0	[16.8 - 21.4]			
None	10.7	[7.9 - 14.3]	< 0.001							
Only the father	8.7	[6.6 - 11.3]								
Only the mother	8.9	[8.0 - 10.0]								
Both parents	5.9	[5.4 - 6.3]								
Family climate index				< 0.001						
Bad	10.9	[10.0 - 11.9]								
Regular	6.4	[5.7 - 7.2]								
Good	4.3	[3.9 - 4.8]								

* CI – Confidence Interval. n = 22.126.

Source: Created by the authors, based on the 2012 Survey on the consumption of alcohol, tobacco and other drugs in Mexico City.

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Table 4. Results of the binomial logistic regression model of suicide attempt in middle and high school students of Mexico City, 2012

Exp(B)	CI* 95%	P value	Exp(B)	CI* 95%	P value
Característica sociodemográfica					
Sex			Communication with parents index		
Male ⁺			Bad	1.8 [1.5 - 2.1]	< 0.001
Female	3.1 [2.7 - 3.7]	< 0.001	Regular	1.3 [1.0 - 1.5]	0.019
			Good ⁺		
Age			Emotional problems		
15 years or less	1.6 [1.4 - 1.9]	< 0.001	Self-esteem index		
16 - 17 years ⁺			Low	1.9 [1.6 - 2.3]	< 0.001
18 years or more	1.4 [1.0 - 1.8]	0.033	Medium	1.3 [1.1 - 1.5]	0.003
Municipality			High ⁺		
Álvaro Obregón	1.2 [0.9 - 1.7]	0.152	Emotional problems		
Azcapotzalco	1.5 [1.1 - 2.1]	0.011	No ⁺		
Benito Juárez	1.1 [0.8 - 1.5]	0.688	Behavioral or learning problems	1.4 [1.1 - 1.9]	0.019
Coyoacán	1.1 [0.8 - 1.6]	0.566	Mental illness (depression, anxiety, etc.)	3.6 [2.7 - 4.9]	< 0.001
Cuajimalpa	1.1 [0.8 - 1.7]	0.456	Risk behaviors		
Cuauhtémoc	1.3 [0.9 - 1.8]	0.146	Tobacco consumption in the last month		
Gustavo A. Madero ⁺			No ⁺		
Iztacalco	1.1 [0.8 - 1.5]	0.610	Yes	1.2 [1.0 - 1.4]	0.080
Iztapalapa	1.3 [0.9 - 1.7]	0.176	Drug consumption in the last month		
Magdalena Contreras	1.2 [0.9 - 1.7]	0.245	No ⁺		
Miguel Hidalgo	1.1 [0.8 - 1.5]	0.647	Yes	1.7 [1.4 - 2.2]	0.000
Milpa Alta	1.5 [1.1 - 2.0]	0.020	Alcohol consumption in the last month		
Tláhuac	1.2 [0.8 - 1.6]	0.343	No ⁺		
Tlalpan	1.2 [0.8 - 1.7]	0.384	Yes	1.7 [1.4 - 1.9]	0.000
Venustiano Carranza	1.2 [0.9 - 1.7]	0.223	Sexual Violence		
Xochimilco	1.4 [1.0 - 1.8]	0.042	Pressured to have any type of sexual contact		
Family environment			No ⁺		
Presence of parents at home			Yes	2.6 [2.2 - 3.1]	0.000
None	1.3 [0.9 - 1.8]	0.119	Goodnes of Fit Test		
Only the father	1.2 [0.9 - 1.7]	0.288	Archer - Lemeshow Test (F(9,790))	0.5	0.891
Only the mother	1.2 [1.0 - 1.4]	0.024			
Both parents ⁺					
Family climate index					
Bad	1.5 [1.2 - 1.7]	< 0.001			
Regular	1.2 [1.0 - 1.4]	0.079			
Good ⁺					

*CI – Confidence Interval. n = 22.126

⁺Reference category.

Source: Created by the authors, based on the 2012 Survey on the consumption of alcohol, tobacco and other drugs in Mexico City.

illnesses were three times more likely to attempt suicide than those without emotional problems; those with behavioral or learning problems were also more likely to attempt suicide, and lower self-esteem was associated with a greater likelihood of attempting suicide. These results are similar to those found in other studies, where the presence of mental illnesses³⁷, low self-esteem¹, or behavioral problems³⁸ increase the risk of suicide attempt. This may be due to those people with a mental illness may have greater impulsivity or deterioration in decision-making, which could predispose them to suicidal and aggressive acts³⁷. If we consider that adolescence is characterized by being a development stage that involves major emotional, social, and physical changes that can allow the development of depressive symptoms and behavioral problems³⁹, this would cause adolescents with emotional problems to be even more susceptible to the development of suicidal behaviors.

Stressful life events or traumatic events have also been associated with suicide attempt^{30,31}. In this study, it was observed that in the occurrence of such events, the risk of suicide attempt increased more than twice if the adolescent was pressured to have sexual contact. However, there is still no consensus on such relationship. On the one hand, it is argued that this association appears indirectly since such traumatic events increase the probability that people will develop psychiatric disorders, which in turn increase the suicidal behavior prevalence⁴⁰, and on the other hand, a higher risk of suicidal behavior has been reported in adolescents who experienced some traumatic event, controlling according to psychiatric disorders⁴¹ as in this research.

A higher prevalence of suicide attempt was observed if neither or only one of the parents lived with the adolescent than if both lived with him/her, however, only a higher risk was observed if only the mother lived with the adolescent, controlling according to the rest of the variables. If the family climate was unfavorable, a greater propensity to attempt suicide was observed than if it was favorable and low levels of communication between parents and children also increase this risk. Therefore, an unfavorable family environment, with little communication, or the absence of one or both parents causes the adolescent to lack the necessary support to counteract the effects of stressful life events and/or depression that can lead to suicide attempt³⁸. For this reason, having positive family relationships and living with both parents in a favorable climate are protective factors for suicide attempt, and, therefore, completing suicide.

The tobacco, alcohol or drugs use increased the risk of suicide attempt. This effect continued after controlling according to the other variables. These relationships have been previously studied⁴² and may be based on adolescents perceiving these risk behaviors as a

solution or an outlet for stressful events in their daily lives, or because the tobacco, alcohol, or drugs use is a sign of an emotional or family problem that increases the risk of suicide attempt.

The results should be interpreted considering certain important limitations. First, the analysis was based on retrospective self-reports, thus it is possible that the attempt suicide prevalence is underestimated given its stigmatizing nature. Second, although a large number of risk factors of suicide attempt were examined, some could not be included, such as previous attempts that are an important risk factor of suicide attempt again⁴³. Third, a cross-sectional study was conducted, which failed to consider the temporality and order of occurrence of certain events (such as stressful life events or the development of an emotional problem) therefore, that causal associations between risk factors and suicide attempts should be considered with this limitation. Fourth, the suicide survey questions prevent from analyzing ideation, planning, and attempt as a process but as mutually exclusive events, which may explain why the prevalence of attempting suicide was higher (although not statistically different from the others). Fifth, regarding suicide attempts in Mexico, there is no organization that has truthful information on this problem since it is not mandatory to report it⁵, making impossible to explain why the prevalence of suicide attempt in this study was lower than in 2000 but higher than in 2006. Sixth, information on drugs, alcohol, and tobacco abuse and dependence prevent to determine whether consumption is the result of a medical diagnosis. And finally, the information on mental illnesses comes from the self-report and whose response is grouped into a single option, thus it was impossible to determine differently the effects of depression, anxiety, or other conditions in suicide attempt.

Conclusions

Given the sustained increase in suicide mortality in Mexico, it is essential to implement public health policies for the detection, treatment, and prevention of suicidal behavior in order to reduce its prevalence during adolescence⁵. National suicide prevention policies are reflected only in the *Plan Específico de Salud* (specific health plan) and the Specific Action Program for Mental Health (PAE) 2013-2018. The first one considers three lines of action to reduce and prevent suicide through the detection and timely care of mental disorders and suicidal risk in adolescents, improvements in the legal framework for suicide prevention based on scientific evidence, and the strengthening of multi-sectoral collaboration mechanisms. The second one has a guideline to promote early detection of suicidal risk in

all age groups. In this regard, it is important to identify those elements that increase the risk of triggering a suicide attempt in order to implement necessary and effective actions to prevent it⁴⁴⁻⁴⁵, and, therefore, avoid subsequent completed suicides. Finally, the presented results point to the need for direct efforts to prevent suicide attempts in women under the age of 15, with a psychiatric disorder, behavior problem, or low self-esteem, who live in an unfavorable family environment, who present risk behaviors such as tobacco, alcohol, or drug use, or who have been forced into sexual contact.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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References

- Salvo L, Melipillán R. Predictores de suicidalidad en adolescentes. *Revista chilena de neuro-psiquiatría*. 2008;46:115-23.
- OMS. Prevención del suicidio un imperativo global. Washington D.C.: OPS; 2014. 94p.
- OPS. Mortalidad por suicidio en las Américas. Informe regional. Washington D.C.: OPS; 2014. 92 p.
- Hernández HH, Flores R. El suicidio en México. *Papeles Poblac*. 2011;17:69-101.
- Borges G, Orozco R, Benjet C, Medina ME. Suicidio y conductas suicidas en México: retrospectiva y situación actual. *Salud Publica Mex*. 2010;52:292-304.
- Borges G, Rosovsky H, Gómez C, Gutiérrez R. Epidemiología del suicidio en México de 1970 a 1994. *Salud Publica Mex*. 1996;38:197-206.
- Borges G, Benjet C, Orozco R, Medina ME. The growth of suicide ideation, plan and attempt among young adults in the Mexico City metropolitan area. *Epidemiol Psychiatr Sci*. 2016;1:1-9.
- González C, Berenzon S, Tello AM, Facio D, Medina ME. Ideación suicida y características asociadas en mujeres adolescentes. *Salud Publica Mex*. 1998;40:430-7.
- Villatoro JA, Mendoza MA, Moreno M, et al. Tendencias del uso de drogas en la Ciudad de México: Encuesta de estudiantes, octubre 2012. *Salud Mental*. 2014;37(5):423-35.
- Villatoro JA, Gaytán F, Moreno M, et al. Tendencias del uso de drogas en la Ciudad de México: Encuesta de Estudiantes del 2009. *Salud Mental*. 2011;34(2):81-94.
- Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz. México: Encuesta de Consumo de Drogas en Estudiantes Ciudad de México 2012 [Internet]. 2013 [citado 2018 feb 27]. Disponible en: http://www.uade.inpsiquiatria.edu.mx/investigaciones_encuestas%20estudiantes.html.
- Villatoro J, Quiroz N, Gutiérrez ML, Díaz M, Amador N. ¿Cómo educamos a nuestros/as hijos/as? Encuesta de Maltrato Infantil y Factores Asociados 2006. Instituto Nacional de las Mujeres. Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz; México, D. F.; 2006. 168 p.
- Rosenberg M. Society and the Adolescent Self-image. Princeton: Princeton University Press; 1965. 326 p.
- González C, Andrade P, Jiménez A. Recursos psicológicos relacionados con el estrés cotidiano en una muestra de adolescentes mexicanos. *Salud Mental*. 1997;20:27-35.
- Nunnally JC, Bernstein IH. *Psychometric Theory*. 3rd ed. New York: McGraw-Hill; 1994. 701p.
- Kaiser HF. An index of factor simplicity. *Psychometrika*. 1974;39:31-6.
- Dalenius T, Hodges J. Minimum Variance Stratification. *J Am Stat Assoc*. 1959;54:88-101.
- INEGI. Nota técnica. Estratificación univariada [Internet]. 2018 [citado el 28 de octubre de 2018]. Disponible en: http://gaia.inegi.org.mx/scince2/documentos/scince/metodo_notaNecnica.pdf.
- Archer K, Lemeschow S. Goodness-of-fit test for a logistic regression model fitted using survey sample data. *Stata Journal*. 2006;6:97-105.
- Borges G, Benjet C, Medina ME, Orozco R, Nock M. Suicide ideation, plan and attempt in the Mexican Adolescent Mental Health Survey. *J Am Acad Child Adolesc Psychiatry*. 2008;47:41-52.
- González C, Villatoro J, Alcántar I, et al. Prevalencia de intento suicida en estudiantes adolescentes de la Ciudad de México: 1997 y 2000. *Salud Mental*. 2002;25:1-12.
- Hidalgo-Rasmussen C, Hidalgo-San Martín A. Comportamientos de riesgo de suicidio y calidad de vida, por género, en adolescentes mexicanos, estudiantes de preparatoria. *Ciencia & Saúde Coletiva*. 2015;20(11):3437-45.
- Silva D, Vicente B, Saldivia S, Kohn R. Conducta suicida y trastornos psiquiátricos en Chile, un estudio poblacional. *Rev. Méd. Chile*. 2013;141(10):1275-128.
- Vera-Romero O, Díaz-Vélez C. Suicidio en adolescentes de Sudamérica: un problema creciente. *Salud Pública de México*. 2012;54:363-4.
- Ventura-Juncá RA, Carvajal C, Undurraga S, Vicuña P, Egaña J, Garib MJ. Prevalencia de ideación e intento suicida en adolescentes de la Región Metropolitana de Santiago de Chile. *Revista Médica de Chile*. 2010;138(3):309-15.
- Vargas H, Tovar H, Valverde J. Prevalencia y factores asociados con el

- episodio depresivo en adolescentes de Lima Metropolitana y Callao. *Revista Peruana de Epidemiología*. 2010;14(2):1-8.
27. Silva D, Valdivia M, Vicente B, Arévalo E, Dapelo R, Soto C. Intento de suicidio y factores de riesgo en una muestra de adolescentes escolarizados de Chile. *Revista de psicopatología y psicología clínica*. 2017;22(1):33.
 28. Pérez-Olmos I, Cruz DL, Traslaviña ÁL, Ibáñez-Pinilla M. Caracterización de factores asociados con comportamiento suicida en adolescentes estudiantes de octavo grado, en tres colegios bogotanos. *Revista Colombiana de Psiquiatría*. 2012;41(1):26-47.
 29. Paniagua RE, González CM, Rueda SM. Orientación al suicidio en adolescentes en una zona de Medellín, Colombia. *Revista Facultad Nacional de Salud Pública*. 2014;32(3):314-21.
 30. Langhinrichsen-Rohling J, Friend J, Powell A. Adolescent suicide, gender, and culture: a rate and risk factor analysis. *Aggress Violent Behav*. 2009;14:402-14.
 31. Vargas HB, Saavedra JE. Factores asociados con la conducta suicida en adolescentes. *Rev Neuropsiquiatr*. 2012;75:19-28.
 32. Cañón-Buitrago SC. Factores de riesgo asociados a conductas suicidas en niños y adolescentes. *Archivos de Medicina*. 2011;11:62-7.
 33. Olweus D. *Conductas de acoso y amenazas entre escolares*. 3ª ed. Madrid: Ediciones Morata; 2006. 167 p.
 34. Klomek AB, Marrocco F, Kleinman M, Schonfeld IS, Gould MS. Bullying, Depression, and Suicidality in Adolescents. *J Am Acad Child Adolesc Psychiatry*. 2007;46:40-9.
 35. Sandoval-Atoa R, Vilela-Estradac MA, Mejiab CR, Caballero-Alvarado J. Riesgo suicida asociado a bullying y depresión en escolares de secundaria. *Rev Chil Pediatr*. 2018;89(2):208-15.
 36. Nock MK, Borges G, Bromet EJ, et al. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *Br J Psychiatry*. 2008;192:98-105.
 37. Mann JJ, Waternaux C, Haas GL, Malone KM. Toward a clinical model of suicidal behavior in psychiatric patients. *Am J Psychiatry*. 1999;156:181-9.
 38. Larraguibel M, González P, Martínez V, Valenzuela R. Factores de riesgo de la conducta suicida en niños y adolescentes. *Rev Chil Pediatr*. 2000;71:183-191.
 39. Braush AM, Muehlenkamp JJ. Body image and suicidal ideation in adolescents. *Body Image*. 2007; 4(2):207-12.
 40. Borges G, Angst J, Nock MK, Ruscio AM, Walters EE, Kessler RC. A risk index for 12-month suicide attempts in the National Comorbidity Survey Replication (NCS-R). *Psychol Med*. 2006;36:1747-57.
 41. Borges G, Benjet C, Medina ME, Orozco R, Molnar BE, Nock MK. Traumatic events and suicide-related outcomes among Mexico City adolescents. *J Child Psychol Psychiatry*. 2008;49:654-66.
 42. Bosque-Prous M, Brugal MT. Intervenciones de reducción de daños en usuarios de drogas: situación actual y recomendaciones. *Gac Sanit*. 2016;30:99-105.
 43. Pérez-Amezcuza B, Rivera-Rivera L, Atienzo EE, De Castro F, Leyva-López A, Chávez-Ayala R. Prevalencia y factores asociados a la ideación e intento suicida en adolescentes de educación media superior de la República Mexicana. *Salud Publica Mex*. 2010;52:324-33.
 44. Faurea MI, Urquidi C, Bustamante F, et al. Asociación entre la calidad de vida relacionada con la salud y riesgo suicida en adolescentes: estudio transversal. *Rev Chil Pediatr*. 2018;89(3):318-24.
 45. Dos Santos Silva RJ, Lima FA, Soares NMM, Pardono E. Suicidal Ideation and Associated Factors among Adolescents in Northeastern Brazil. *Sci World J*. 2014;2014:1-8. Doi: 10.1155/2014/450943.

