

Psychosocial Factors and Clinical Predictors of Suicide Risk in College Students

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Abstract

Suicidal behavior in youth is a multi-causal phenomenon and a global public health problem. Studies to identify risk factors have increased in recent decades, however, studies rarely examine the combined and mediating effect of multiple psychosocial and clinical factors in predicting suicidal risk in college students. This study aims to analyze the psychosocial risk factors and clinical predictors associated directly and indirectly with suicide risk in Colombian university students. 786 students between the ages of 16 and 30 (M=22.34 years; SD=4.7) from the Luis Amigó Catholic University (Colombia) participated. 72% were women and 28% men. An ad hoc socio-demographic card was used with information about the history of attempted suicide (SAS), mental disorder (HMI) and family suicide attempts (SAF). Plutchik's Suicide Risk Scale (SR), Hopelessness Scale (BHS), Beck's Anxiety Scale (BAI) and Depression Scale (BDI) and Barratt's Impulsivity Scale (BIS) were used. It was found that 22% of the college students were at risk of suicide and 9.7% had attempted suicide in the past year. Significant ($p<0.01$) and positive correlations were found between SR, SAS, HMI, SAF, BHS, BAI, BDI and BIS. Binary regression analysis showed that depression (OR=1.2) anxiety (OR=1), impulsivity (OR=1.1), suicide attempts (OR=70), mental disorder and family suicide attempts (OR=2.0; OR=3.8) explained between 45% and 68% of the suicide risk variance. The structural equation model showed that impulsivity and suicide attempt are mediating variables for suicide risk. The totality of independent variables explained 65% of suicidal risk. These findings will help to orient the design of clinical strategies for the detection, prevention and intervention of suicidal risk in university contexts.

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1. Introduction

Suicide is a human, complex, multidetermined behavioral phenomenon that is most probably the result of the interaction of several factors (psychological, biological, socio-cultural) (Assari, 2018; Gómez et al., 2019). However, these known risk factors are of little help in improving the clinical detection of suicidal behavior (Gómez- Romero et al., 2018).

Suicidal behavior encompasses a broad spectrum of psychological and behavioral signs like suicide ideation, suicide gestures and suicide attempts (Gvion & Apte, 2011; Mortier et al., 2018; Wilcox et al., 2010).

Suicide is a serious global public health issue; and in the last 50 years completed suicide rates have increased by 60% worldwide among young people (Gómez et al., 2019). According to the World Health Organization (WHO, 2018), close to 800 000 people die due to suicide every year and it is the second leading cause of death among 15 to 29 years old. There are indications that for each adult who died by suicide there may have been more than 50 attempted suicides. By 2020, the global burden of suicide will reach 2%. Likewise, 75% of suicides occur in low- and middle-income countries (Koyanagi et al., 2019; OPS, 2014; WHO, 2018).

According to the National Institute of Legal Medicine and Forensic Sciences (NILMFS, 2019), between 2009 and 2018, there were 20 832 reported suicide deaths in Colombia. The age-standardized suicide rate changed from 4.5 to 5.93 per 100 000 people which is the highest in the last 10 years. People aged 18 to 19 years old (144 reported suicide deaths, Rate: 8.4 per 100 000), 20 to 24 years old (391 reported suicide deaths, Rate: 9.1 per 100 000), 24 to 29 years old (313 reported suicide deaths, Rate: 7.6 per 100 000) represented 32% of all suicides in 2018. This data provides strong evidence that young people aged between 18 to 29 years old are at most risk of committing suicide in Colombia (Gómez et al., 2020; Santos et al., 2017; Siabato & Salamanca, 2015). Within this group, due to several related factors, college students show the highest suicide attempt and completed suicide rates (Gómez-Romero et al., 2018; Russell et al., 2019).

On the other hand, among several psychological factors, depression has shown to be the best predictor of future suicide ideation and suicide attempts in university students (Gómez et al., 2019; Mortier et al., 2018; Oquendo et al., 2014; Orri et al., 2018; Park & Jang, 2018; Siabato et al., 2017). Furthermore, it has been found that previous history of mental illness and suicide attempts inside the family group are risk factors for suicide attempts (Brent & Melhem, 2008; Gómez et al., 2002; Gvion & Apte, 2011; Santos et al., 2017; Wilcox et al., 2010). Likewise, a study with over 1408 college students concluded that previous history of suicide attempts during the last year increases the suicide risk factor by 31.46% (OR= 31.468) (Gómez et al., 2019). Additionally, previous history of mental illness and suicide attempts in first-degree relatives increases the likelihood of suicide risk by about 2.2% (OR= 2.199) and 2.1 % (OR= 2.089).

Some psychological factors related to suicidal behavior in the youth population include: anxiety, negative feelings, hopelessness, loneliness, low self-esteem, psychoactive substance misuse, lack of both internal locus of control and emotional self-efficacy (Alasaarela et al., 2017; Baca &

Aroca, 2014; Borges et al., 2018; Fernández et al., 2016; Gómez-Romero et al., 2018; Orri et al., 2018; Restrepo et al., 2018; Wilkinson et al., 2011).

Other factors that may affect students' mental health and adaptation to university contexts have also been considered in literature, including academic stress (Ramlan et al., 2020), specific learning disorders, and their association with problems of internalization and externalization of behavior (Sorrenti et al., 2019), personality and emotional management (Merlo et al., 2020a; Settineri et al., 2018), pain and chronic physical illness (Conversano, 2019; Merlo, 2019), coping styles and social support as moderating factors of stress and psychological distress (Nelson et al., 2001).

The set of these psychosocial and clinical factors associated with suicide risk have also been considered determinants for the development of different types of chronic medical conditions. Among these factors are recurrent negative feelings, symptoms of depression, anxiety, poor quality of life associated with health issues and personality disorders, among others (Conversano, 2019; Martino et al., 2019; Merlo, 2019). These psychological determinants of chronic disease may become an additional vulnerability factor for suicidal behavior in college students.

Similarly, psychosocial vulnerability factors like: loss of a close family member, early childhood traumatic events, lack of a social support system, dysfunctional parenting styles, high levels of psychological and academic stress and bullying increase the odds of a suicide attempt (Bahamón et al., 2018; Fuller-Thomson et al., 2016; Hart et al., 2017; Pérez et al., 2013; Siabato & Salamanca, 2015). Therefore, to be able to understand the clinical profile of suicidal behavior, it is essential to acknowledge the association between psychological risk factors and psychosocial vulnerability in young adult populations (Mann et al., 1999; Oquendo et al., 2004).

Although there are several psychological factors closely related to suicidal behavior, this is a promising line of research in university students due to their high risk. Likewise, this is key to understanding the relationship between risk factors and psychological predictors of suicidal behavior given the lack of studies on psychological factors related to suicide risk. Traditionally, associations between psychosocial factors and suicide risk in university students have been addressed under a cause-effect logic, obviating more complex patterns of association involving psychosocial mediations, i.e., mediating risk factors, e.g., impulsivity or history of suicide attempts, which operate as triggers between associations of psychosocial vulnerability factors and suicide risk, as reported in the study by Gomez et al. (2019).

1.2 Objectives and Hypotheses

The objective of this study is to analyze the psychosocial risk factors and clinical predictors directly and indirectly associated with suicidal behavior in university students in the city of Manizales, Colombia. The hypotheses raised are the following:

Young people with suicidal risk present significantly higher scores in the history of attempted suicide, history of mental disorder and family suicide attempts, depression, hopelessness, anxiety, impulsivity and suicidal risk, compared to those with no risk indicators.

The variables of the history of suicide attempts, the history of mental disorders and suicide attempts in the family, depression, hopelessness, anxiety, impulsivity present correlations and significant predictive effects of suicide risk.

Impulsivity and history of suicide attempts in the preceding year introduce significant mediating effects between the clinical variables of anxiety, hopelessness, depression and suicidal risk.

2. Method

2.1 Participants

A probability sampling was performed and stratified by university semester. The participants were 786 college students from Universidad Católica Luis Amigó in Manizales, Colombia. Every academic program was included: psychology school ($n=439$), Law school ($n=184$), School of Business Administration ($n=94$), international relationships school ($n=69$), accounting and economics college from the morning classes ($n=494$; 62.8%) as well as late afternoon classes ($n=291$; 37%). 61.8% of the sample population belonged to the morning classes and 37.7% belonged to the late afternoon classes. 566 subjects were females (72%) and 220 males (28%). The average age was 22.34 years old ($SD=4.7$). Age ranged from 18 to 30 years old.

2.2 Instruments

Sociodemographic Questionnaire. Participants were required to fill a sociodemographic questionnaire that included age, sex and education information. It also requested previous history of their own mental illness and suicidal attempts as well as that of their family group.

Plutchik Suicide Risk Scale, SR (Plutchik & Van Praag, 1989). This scale consists of 15 items that have been cross-validated in several populations as discriminators of patients who have made suicide attempts. The items refer to the past history of suicide attempts, the actual strength of suicidal impulses, feelings of depression and hopelessness, and other factors that have been reported to be associated with patients who have attempted suicide. This study administered the Spanish validated version by Rubio et al. (1998). The internal consistency was 0.90, test-

retest reliability 0.89, specificity and sensitivity over 88% and a 6-point cutoff score. A reliability analysis through Cronbach's alpha was performed and a 0.76 coefficient was found.

Beck Depression Inventory, BDI (Beck et al., 1979). The Beck Depression Inventory (BDI) is a 21-item on a 4-point scale from 0 (symptom absent) to 3 (severe symptoms). It is a self-reporting questionnaire for evaluating the severity of depression in normal and psychiatric populations. Scoring is achieved by adding the highest ratings for all 21 items. The minimum score is 0 and maximum score is 63. Higher scores indicate greater symptom severity. In non-clinical populations, scores above 20 indicate depression. In those diagnosed with depression, scores of 0–13 indicate minimal depression, 14–19 (mild depression), 20–28 (moderate depression) and 29–63 (severe depression). This inventory has been validated to Spanish and specificity and sensitivity levels over 70 have been found (Sanz et al., 2014). This matches cutoff scores from the original version. Its internal consistency was 0.83 and test-retest reliability ranged from 0.60 to 0.97 (Sanz et al., 2014). Cronbach's alpha value in this study was 0.85.

Beck hopelessness scale, BHS (Beck et al., 1974). This scale is a self-report instrument used to measure an individual's negative expectations regarding the future. This scale consists of 20 true-false items, and the total BHS score can range from 0-20. Nine of the items are keyed false, and eleven are keyed true with ones being assigned to negative expectations and zeros being assigned to positive expectations. The higher the score, the more hopeless feelings the respondent is thought to have. Researchers at the Center for Cognitive Therapy suggest the following guidelines for the interpretation of the BHS scores: 0-3 as with in the normal range, 4-8 as mild hopelessness, 9-14 as moderate hopelessness, and greater than 14 as severe hopelessness (Beck et al., 1974). Studies of the factor structure of the BHS have identified 3 factors: (a) Feelings about the Future, (b) Loss of Motivation, (c) Future Expectations (Beck & Steer, 1989; Beck et al., 1974; Gómez et al., 2019). The BHS revealed an internal consistency ranging from 0.82 to 0.92 and test-retest reliability from 0.60 to 0.69 (Aliaga et al., 2006; Mikulic et al., 2009; Rueda et al., 2018). Cronbach's alpha value in this study was 0.79.

Beck Anxiety Inventory, BAI (Beck & Steer, 1993). It consists of 21 items with a Likert scale ranging from 0 to 3 and raw scores ranging from 0 to 63. It measures the severity of anxiety in adults and adolescents. As the items in the BAI describe the emotional, physiological, and cognitive symptoms of anxiety but not depression, it can discriminate anxiety from depression. The BAI scores are classified as minimal anxiety (0 to 7), mild anxiety (8 to 15), moderate anxiety (16 to 25), and severe anxiety (30 to 63). It was validated to Spanish in clinical and non-clinical settings (internal consistency ≥ 0.85) (Magán et al., 2008; Sanz et al., 2012). A previous validation study in academic settings found an internal consistency over 0.88 (Sanz & Navarro,

2003). This scale measures pathological anxiety in non-clinical settings (young college students) (Antúnez & Vinet, 2012; Cova et al., 2007). Cronbach's alpha value in this study was 0.91.

Barratt Impulsiveness Scale, v.11, BIS-11 (Patton et al., 1995). The BIS-11 is composed of 30 items with Likert-type questions in which participants report the frequency of different behaviors (1 if rarely or never, 2 if occasionally, 3 if often or 4 if almost always or always). It measures impulsiveness, and three primary factors have been identified: Cognitive, motor and non-planned impulsiveness. A previous systematic review suggested a cutoff score over 74 (global impulsiveness) in psychological studies. Cronbach's alpha value in this study was 0.75 in the Global score.

2.3 Ethical aspects

According to the 1090 Act from 1990 and resolution number 008430 from 1993 in Colombia, this research complies with fundamental ethical principles: respect, intimacy and a persons' dignity. Likewise, confidentiality and anonymity rights are protected as specified in law articles 26 and 50. This research project was approved by the Ethics Committee of Universidad Católica Luis Amigó.

2.4 Statistical Procedure

The analyses were conducted on IBM SPSS Statistics for Windows (v. 25.0) (IBM Corporation, 2017). First, a sociodemographic description of the sample was performed. Second, a reliability analysis of the instruments was carried out. Univariate descriptive analysis was performed to the research variables (suicide risk factor, depression indexes, anxiety, impulsiveness, hopelessness) according to the instruments and then as a function of sociodemographic variables. Third, a comparative analysis was conducted between the suicide risk factor, psychological, social and sociodemographic variables through Mann-Whitney test due to non-normal data distribution according to the Kolmogorov – Smirnov test ($p < 0.05$). Moreover, effect sizes were estimated through eta-squared (η^2). Procedures and interpretation were performed as suggested by others (Fritz et al., 2012). Then, an analysis through Spearman's Rank correlation coefficient was carried out. Finally, a binary logistic regression was performed and the suicide risk factor was the dependent variable. A structural equation modelling analysis was performed to estimate the final direct and indirect size effect among the variables in observation. Structural equation modelling was done through Amos software for Windows (v. 24.0) (IBM Corporation, 2017).

3. Results

The suicide risk factor was identified through the Plutchik Suicide Risk Scale and results suggest that out of 786 college students, 173 of them (22%) scored for being at risk of suicide. 123 were

females (21.7%) and 50 were males (22.7%). One of the participants had made 13 suicide attempts during the same period.

The Beck Depression Inventory (BDI) found an indicator for severe depression 1.4% ($n=11$) moderate depression 10.9% ($n= 86$) and mild depression 15% ($n=188$). Through the BHS, results suggest that 77.9% of the sample ($n= 612$) reported some degree of hopelessness. Mild hopelessness ($n=546$; 69.5%), moderate hopelessness ($n=56$; 7.1%), and severe hopelessness ($n=10$; 1.3%). The Beck Anxiety Inventory (BAI) reported that 79.1% of the sample ($n=622$) had mild anxiety, moderate anxiety 14.9% ($n=117$), and severe anxiety 6% ($n=47$). The Barratt Impulsiveness Scale (BIS) found a global impulsiveness factor of 70.9% ($n=557$). Likewise, 22.8% of the sample ($n=179$) reported that they had first-degree relatives with previous history of mental illness and 23% ($n=181$) reported first-degree relatives who had attempted suicide attempts in the last two years.

Table 1 displays comparisons among groups, suicide risk factor to no risk considering every research variable. Through non-parametric methods, average value, standard deviation, average ranges and median value were found. Z value (Mann-Whitney U test) and p-value are also shown. Students who showed suicide risk scored significantly higher ($p < 0.001$) in depression (BDI), hopelessness (BHS), anxiety (BAI) and general impulsiveness (BIS). Effect sizes (η^2) show that statistical differences are independent from the effect size due to values higher than 0.039 (Fritz et al., 2012).

Table 1. Differences among students according to suicide risk, depression, hopelessness, anxiety, impulsiveness, previous history of mental illness and suicide attempt in the family and suicide attempt in students.

Variables	Suicide Risk ($n=173$; 22%)				No Risk ($n=613$; 78%)				Z	p	η^2
	M	SD	Ar	Me	M	SD	Ar	Me			
BDI	15.25	9.19	596.57	15.00	5.23	4.64	336.19	4.00	-13.36	0.00	0.23
BHS	6.99	3.34	529.58	6.00	4.79	1.96	355.09	4.00	-9.10	0.00	0.11
BAI	22.44	12.09	559.07	20.00	11.66	9.64	346.77	9.00	-10.87	0.00	0.15
BIS	85.57	9.09	548.19	85.00	77.14	8.51	349.84	77.00	-10.15	0.00	0.13
HMI	1.39	0.49	458.47	1.00	1.18	0.39	375.16	1.00	-5.87	0.00	0.04
SAF	1.42	0.49	466.56	1.00	1.18	0.38	372.88	1.00	-6.57	0.00	0.06
SAS	1.37	0.48	500.89	1.00	1.02	0.14	363.19	1.00	-13.76	0.00	0.24

Note: M=Mean; SD= Standard Deviation; Ar= Average Range; Me= Median; Z= Mann-Whitney U test; η^2 = Effect size through eta-squared; p= Statistical significance value; BDI=Depression; BHS=Hopelessness; BAI=Anxiety; BIS=Global Impulsiveness; HMI=History of mental illness in the family, SAF=Suicide attempt in the family; SAS= Suicide attempt in students.

Correlational analysis performed through Spearman's rank correlation coefficient is shown in table 2. Statistically significant positive differences were found between suicide risk (SR), history of mental illness in the family (HMI), suicide attempts in the family (SAF), Suicide attempts in students (SAS), Depression (BDI), Hopelessness (BHS), Anxiety (BAI) and Global Impulsiveness (BIS) ($p < 0.001$).

Table 2. Spearman`s Correlation between research variables

	1	2	3	4	5	6	7	8
1. SR		.418**	.216**	.288**	.622**	.354**	.471**	.460**
2. SAS			.130**	.118**	.180**	.142**	.109**	.120**
3. HMI				.308**	.113**	.029	.132**	.087*
4. SAF					.099**	.037	.118**	.045
5. BDI						.380**	.505**	.406**
6. BHS							.212**	.275**
7. BAI								.399**
8. BIS								

*. Significant Correlation 0.05. (Bilaterally)

**.. Significant Correlation 0.01. (Bilaterally)

Note: SR= Suicide Risk; SAS= Suicide attempt in students; HMI=History of mental illness in the family; SAF=Suicide attempt in the family; BDI=Depression; BHS=Hopelessness; BAI=Anxiety; BIS=Global Impulsiveness

To be able to identify the proportion of variance of suicide risk explained by these variables, a binary logistic regression model was performed. The suicide risk factor was assumed as the dependent variable and anxiety, depression, impulsiveness, history of mental illness and suicide attempts in the family and suicide attempts by students were the independent variables (non-categorical) (see table 3). The latter was assumed in order not to lose information.

This model had a good fit (Hosmer-Lemeshow Test=3.792; $df=8$; $p=0.875$) and shows that independent variables in table 3 explain between 45% (Cox & Snell $R^2=0.446$) to 68% (Nagelkerke $R^2=0.685$) the variance of the suicide risk factor. The log of verisimilitude-2 was 364.117. Positive beta (β) coefficients indicate that these variables predict suicide risk, thus, associated to suicide behavior in college students.

Depression increases the suicide risk factor by 1.2% (OR= 1.165 CI 95%= 1.117–1.215), anxiety = 1% (OR=1.045; CI 95%= 1.019–1.072), impulsiveness= 1.1% (OR=1.079; CI 95%= 1.045–1.114). Likewise, history of suicide attempts in first-degree relatives increases the suicide risk by 3.8% (OR=3.807; CI 95%=2.098–6.909), history of mental illness in the family= 2%

(OR=1.918; IC 95%=1.040–3.537). Finally, previous suicide attempts in the last year increases suicide risk by about 70% (OR= 69.632; CI 95%= 28.087–172.632). Hopelessness was excluded from the final analysis because it failed to reach statistical significance (see table 3).

Table 3. Binary logistic regression model (Forward: Wald)

Independent Variables	β	SE	χ^2 Wald	df	p	OR	CI 95% OR	
							Lower	Upper
Depression	0.153	0.021	51.395	1	0.000	1.165	1.117	1.215
Anxiety	0.044	0.013	11.651	1	0.001	1.045	1.019	1.072
Impulsiveness	0.076	0.016	21.384	1	0.000	1.079	1.045	1.114
Family Mental illness	0.651	0.312	4.356	1	0.037	1.918	1.040	3.537
Family Suicide attempt	1.337	0.304	19.325	1	0.000	3.807	2.098	6.909
Student suicide attempt	4.243	0.463	83.903	1	0.000	69.632	28.087	172.632

Note: β = Beta Coefficient; SE= standard error; Wald= constraint power measure; df= degree of freedom; p= Statistical significance value; OR= Odds Ratio; CI 95% OR = OR 95% confidence interval.

To calculate the direct and indirect effect of the independent variables on suicide risk, a structural equation model is proposed through the weighted least squares method due to variables not meeting univariate normality (Byrne, 2013).

The goodness of fit test was performed using chi square (X^2), comparative fit index (IFI, CFI), goodness of fit index (GFI), parsimony normed fit index (PNFI), root mean square error approximation (RMSEA), root mean square error (RMSE). This model had a good absolute fit (X^2 (df)=7.059 (9); $p=0.631>0.05$). Likewise, it had a good comparative fit which can be deducted through the CFI, PNFI and the tucker-lewis index (TLI) (CFI=1.0>0.90; PNFI=0.987>0.90; IFI=1.0>0.90; TLI=1.0>0.90). It has also shown both a good GFI, adjusted goodness of fit index (AGFI) and an optimal RMSE (GFI=0.998>0.90; AGFI=0.99>0.90; RMSEA=0.000<0.08). Findings suggest that the proposed model shows a good fit to the data (McArdle & Nesselroade, 2014).

Results have shown that anxiety, hopelessness, depression, and the history of mental illness in first degree relatives explain 22% ($R^2=0.22$; CI 95%=0.171–0.276; $p=0.001$) of impulsiveness variance, 10% of the variance of previous history of suicide attempt in the family ($R^2=0.102$; CI 95%=0.060–0.158; $p=0.001$), and 6% the variance of previous history of suicide attempts in the students ($R^2=0.058$; CI 95%=0.027– 0.109; $p=0.001$) (Figure 1). In addition, every independent variable explains 65% the variance of suicide risk in students.

Figure 1. Structural equation model of suicide risk in College Students

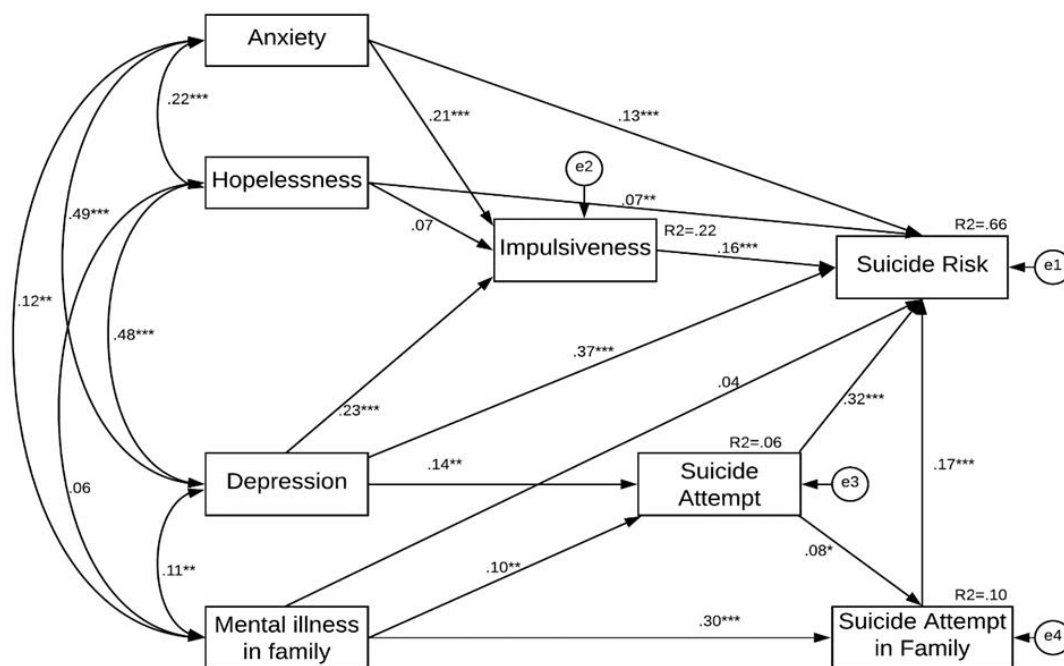


Table 4 shows standardized direct, indirect and total effects of every research variable. Both depression (0.459), and suicide attempt in the last year (0.333) contributed the most important direct and total effects on suicide risk. Furthermore, depression showed the highest indirect effect on suicide risk (0.085).

Table 4. Total effects, Standardized direct, indirect and total Effects of the predictive variable on outcome variables.

		<i>Suicide Attempt</i>			<i>Suicide attempt in family</i>			<i>Impulsiveness</i>			<i>Suicide Risk</i>		
		<i>Effects</i>	<i>CI 95%</i>		<i>Effects</i>	<i>CI 95%</i>		<i>Effects</i>	<i>CI 95%</i>		<i>Effects</i>	<i>CI 95%</i>	
			Lower	upper		Lower	upper		Lower	upper		Lower	Upper
Mental Illness in family	Total	0.103**	0.022	0.178	0.307***	0.229	0.386	----	----	----	0.124***	0.069	0.174
	Direct	0.103**	0.022	0.178	0.299***	0.221	0.38	----	----	----	0.039	-0.006	0.082
	Indirect	0.008*	0.000	0.021	----	----	----	----	----	----	0.085***	0.052	0.119
Depression	Total	0.141**	0.043	0.237	0.011*	0.001	0.028	0.232***	0.148	0.315	0.459***	0.391	0.526
	Direct	0.141**	0.043	0.237	----	----	----	0.232***	0.148	0.315	0.375***	0.313	0.438
	Indirect	0.011*	0.001	0.028	----	----	----	----	----	----	0.085***	0.048	0.119
Hopelessness	Total	----	----	----	----	----	----	0.067	-0.004	0.141	0.08**	0.024	0.135
	Direct	----	----	----	----	----	----	0.067	-0.004	0.141	0.069**	0.016	0.121
	Indirect	----	----	----	----	----	----	----	----	----	0.011	-0.001	0.024
Anxiety	Total	----	----	----	----	----	----	0.211***	0.138	0.281	0.16***	0.102	0.219
	Direct	----	----	----	----	----	----	0.211***	0.138	0.281	0.126***	0.07	0.186
	Indirect	----	----	----	----	----	----	----	----	----	0.034***	0.02	0.05
Suicide Attempt	Total	----	----	----	0.081*	0.006	0.156	----	----	----	0.333***	0.273	0.388
	Direct	----	----	----	0.081*	0.006	0.156	----	----	----	0.32***	0.261	0.373
	Indirect	----	----	----	----	----	----	----	----	----	0.014*	0.001	0.028
Suicide Attempt in family	Total	----	----	----	----	----	----	----	----	----	0.17***	0.122	0.216
	Direct	----	----	----	----	----	----	----	----	----	0.17***	0.122	0.216
	Indirect	----	----	----	----	----	----	----	----	----	----	----	----
Impulsiveness	Total	----	----	----	----	----	----	----	----	----	0.163***	0.113	0.212
	Direct	----	----	----	----	----	----	----	----	----	0.163***	0.113	0.212
	Indirect	----	----	----	----	----	----	----	----	----	----	----	----

Note: *p< 0.05; **p< 0.01; ***p< 0.001

4. Discussion

This study aimed to analyze the main risk factors and clinical predictors associated to suicide behavior among Colombian college students. In order to determine the predictive value of both psychological, family and sociodemographic variables on suicide risk, this study reports a 22% suicide risk and a 9.7% history of suicide attempts in college students the last year. Likewise, 27.3% of the sample presented symptomatic indicators of depression (specificity of 1.4% with severe symptoms), 77.9% showed hopelessness (specificity of 1.3% with severe hopelessness), 79.1% showed anxiety (6% with severe symptoms), and 70.9% of the sample also exhibited impulsiveness.

These results are in line with previous studies that have found that 25% of college students present a suicide risk, suicide ideation, suicide attempts, but also symptomatic indicators of depression, anxiety, hopelessness, loneliness and negative perceptions of family and social support (Gómez et al., 2019, 2020; Gómez-Romero et al., 2018; McMahon et al., 2010; O'Beaglaioich et al., 2020; Siabato et al., 2017; Siabato & Salamanca, 2015).

The comparative analysis has shown that students with suicide risk scored higher (higher effect sizes) in depression, hopelessness, anxiety, impulsiveness, history of mental illness and suicide attempts in the family and a history of suicide attempts when compared to non-risk students. Our findings agree with other studies that have reported the relationship between self-harming behavior in youth and environmental factors like mood disorders which highly predict suicide risk (Cramer & Kapusta, 2017; Klonsky et al., 2013; McMahon et al., 2010; Miché et al., 2018).

On the other hand, depression showed the largest direct and total effect size when predicting suicide risk. This is in line with previous research findings that state that depression is the main predictor of suicide risk in young college students (Alasaarela et al., 2017; Baca & Aroca, 2014; Mortier et al., 2018; Siabato & Salamanca, 2015; Siabato et al., 2017; Wilkinson et al., 2011). In this regard, the greater the severity of the symptoms (depression), the greater the suicide attempt risk.

This study has shown that previous history of mental illness and suicide attempts in first degree relatives was significantly correlated with suicide risk. Binary regression analysis showed that previous history of suicide attempts in the family increased suicide risk 3.8% and history of mental illness in the family increased it by 2%.

Others have found that young students with a previous history of suicide attempts in the family exhibit higher suicide risk and depression levels but also are more exposed to psychosocial stress (Baca & Aroca, 2014; Gómez et al., 2019). Similarly, other studies have highlighted the association between the history of suicide attempts and actual suicide in the family with suicide

ideation and suicide attempts in young people, which broadens the study of underlying biopsychosocial mechanisms like genetic, imitative and social influences (Asarnow et al., 2008; Dhingra et al., 2015; Goldston et al., 2016; O'Connor et al., 2012).

Findings also suggest significant positive correlations between suicide risk, history of suicide attempt, depression, hopelessness, anxiety and global impulsiveness. Likewise, regression analysis showed that depression increases the suicide risk factor 1.2%, anxiety 1%, impulsiveness 1.1%, and a history of suicide attempts during the previous year increases suicide risk to 70%.

Recent studies have noticed that mood disorders, previous suicide attempts, family dysfunction, substance abuse and psychological stress highly predict suicide behavior in young students (Ballard et al., 2016; Dilillo et al., 2015; Gómez et al., 2019; Hamza et al., 2012; O'Connor & Nock, 2014).

A previous work ($n= 4\ 772$) found that students with a history of at least one suicide attempt when compared to students with suicide ideation were more prone to report they had been exposed to self-harming behavior in relatives, being diagnosed with depression ($OR=3.63$), anxiety ($OR= 2.20$) and behavior disorders ($OR=2.90$). Other related risk factors included being a woman, impulsiveness, reckless behavior, emotional dysregulation, adverse experiences in life, body dissatisfaction, hopelessness and drug use (Mars et al., 2018).

Thereby, previous history of suicide attempts in college students increase the odds of suicide risk ($OR=70$), which is in line with recent studies that found that the number of suicide attempts is a strong predictor of suicide (Lima et al., 2017; Watkins & Meyer, 2013). These findings are also consistent with the structural equation model as showing that the history of suicide attempts is a mediator variable between depression, mental illness in the family and suicide risk. Thus, previous suicide attempts are not only robust predictors of suicidal behavior, but also, mediate between family comorbidity and clinical symptoms closely related to suicidal behavior in college students.

In general, psychological factors like depression, anxiety, hopelessness, impulsiveness and family factors related to dysfunctional patterns (suicide attempts) strongly predict suicide risk in college students as can be seen in correlation analysis, binary regression analysis and structural equation modeling.

This study has also reported that both previous suicide attempts and impulsiveness are mediators between anxiety, depression and hopelessness when predicting suicide risk. Others have found that impulsiveness is a risk factor of suicide attempts among young adolescents (Auerbach et al., 2017; Borges et al., 2018; Dougherty et al., 2009; Franklin et al., 2017; Orri et al., 2018).

Our results are also in accordance with other works that have reported that impulsiveness mediates between anxiety and suicidal behavior (Cha et al., 2018; Gvion & Apter, 2011; Zouk et al., 2006). However, other works have indicated that impulsiveness is associated to non-suicidal self-harming behaviors (Cipriano et al., 2017). It has even been proposed that impulsive suicide attempts are less lethal (May & Klonsky, 2016) when compared to planned, premeditated behaviors that usually end in death (Lennon, 2019).

Additional studies have identified impulsivity as a risk factor facilitating the transition from ideation to suicide attempts (Auerbach et al., 2017). Impulsivity responses have also been found to increase with the number of suicide attempts in youth (Kasen et al., 2011). For this reason, impulsivity is a strong marker of risk for suicide, particularly for suicidal ideation and attempts. Wang et al. (2015) reported that impulsivity moderates the severity of depression in the relationship between hopelessness and suicidal ideation. They found that patients with higher impulsivity were more likely to develop suicidal ideation even if they had high or low levels of depression.

The proposed empirical model shows that impulsivity and previous suicide attempts mediate the relationship between clinical symptoms of depression, anxiety and hopelessness and suicidal risk. In this regard, interpersonal psychological theory of suicidal behavior suggests that impulsivity and the number of previous suicide attempts are factors linked to an individual's ability to commit suicide, especially during youth (Hadzic et al., 2019; Joiner, 2005; Jordan et al., 2018; Van Orden et al., 2010). In this sense, impulsivity and the number of suicide attempts reduce the fear of death and increase the likelihood of suicidal behavior in youth (Joiner, 2005; Van Orden et al., 2010). The impulsive act is calculated by the suicidal person to be fatal but it also occurs under stress, emotional dysregulation and usually under mood disorders like depression which is in line with the empirical model presented in this study (Schneidman, 1981).

The set of psychosocial and clinical predictors of suicidal risk reported in this study support the stress-diathesis model, considering that suicidal behavior is the result of the interaction of multiple causal factors (Abela & Sullivan, 2003; Mann et al., 1999; Oquendo et al., 2004). The vulnerability factors associated with suicide risk have components that are biologically disposed and associated psychosocial factors, including family history of mental disorder and suicide attempts, deficits in inhibitory control, impulsivity, hopelessness, and associated psychopathology that, in addition to exposure to adverse life events, psychosocial stress, low emotional and social self-efficacy, and poor psychological resources, among others, may increase the risk and likelihood of a suicide attempt in young adults at college (Gomez et al., 2019).

5. Conclusions

In this study, it was proven that the suicide risk is the result of the direct and indirect effect of multiple psychosocial and clinical factors, among them, anxiety, hopelessness, depression, impulsiveness, individual and family history of suicide attempts and mental disorder. These findings could well be considered novel because they are not reported in an integrated way in other studies, nor do they pose mediation factors between psychological variables and suicidal risk. Likewise, the findings presented and the framework of theoretical reflection proposed validate the idea that suicidal behavior, as a whole, is multicausal and multidetermined.

These results have important implications for the approach of suicidal behavior and the development of clinical strategies for the detection, prevention and intervention of suicidal risk and other mental health problems in university contexts. These strategies include group counseling to strengthen students' psychological well-being (Amodeo et al., 2017), the development of mindfulness programs (Pintado, 2019), and fostering emotional self-efficacy and resilience to psychosocial stress events (Maddux & Kleiman, 2016; Merlo et al., 2020b). It also highlights the importance of positive psychology-based interventions to promote mental health in universities, which would allow recognition of the psychological and social resources available to young people, beyond psychiatric diagnoses and psychosocial vulnerabilities (Esposito et al., 2020; Maddux, 2016; Shin & Lyubomirsky, 2016).

6. Limitations

The findings of this study must be interpreted in the light of several limitations. First, being a cross-sectional study, it was not possible to determine the impact over time that the psychosocial and clinical variables evaluated have on suicide risk in university students. For future studies, the use of longitudinal methodologies is recommended, in order to corroborate these findings and provide additional evidence on the predictors of suicidal behavior in university students.

Another limitation is that by not using a clinical sample, the results cannot be generalized to people with psychiatric diagnoses. For future studies, it is recommended to delimit the criteria of inclusion of the sample with respect to psychosocial, clinical and risk profiles, and from there to analyze the main risk factors and predictors of suicidal behavior.

A third limitation is that all of the questionnaires used were obtained through self-report, so they are not free of biases that could lead to interpretations and results with a certain probability of error. For future studies it is advisable to use key informants, in order to contrast the self-reports of university students with the hetero reports.

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