

# Suicidal Risk and its Association with Anxiety, Depression and Impulsivity According to Sex in Colombian Adolescents

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## Abstract

Suicide is a multicausal phenomenon, with a higher incidence in adolescents. Studies to identify risk factors have increased in recent decades and are useful for prevention and intervention. However, studies rarely examine the effects of multiple psychological factors in predicting suicidal risk. The aim of this study was to analyze the effect of anxiety, depression, and impulsivity in the prediction of suicidal risk in adolescents from municipalities in southeastern Antioquia (Colombia). A quantitative, non-experimental, cross-sectional study was conducted with the participation of 354 adolescents between 14 and 18 years of age ( $M=15.58$ ,  $SD=1.22$ ; 57.1% female). Plutchik's suicide risk scale (SRS), Beck's depression (BDI) and anxiety (BAI), and Barratt's impulsivity (BIS) were used. A suicidal risk factor of 15.5% and significant correlations were found between SRS, AIS, BDI, BAI, and BIS. Women scored significantly higher than men on suicide risk, depression, and anxiety. Binary regression analysis showed that depression ( $OR=1.1$ ), anxiety ( $OR=1$ ), and impulsivity ( $OR=1.1$ ) explained between 24% ( $R^2$  Cox and Snell) and 42% ( $R^2$  Nagelkerke) of the variance in suicidal risk. It is concluded that in women, impulsivity, when associated with anxious and depressive symptoms, increases the risk of suicide; while for men this risk is greater when it is mainly related to depression and to a lesser extent with anxiety. These findings contribute to the formulation of public policies on suicide prevention in school contexts.

*Keywords:* depression, anxiety, impulsivity, suicidal risk, suicide attempt.

## Resumen

*Riesgo suicida y su asociación con ansiedad, depresión e impulsividad según sexo en adolescentes colombianos.* El suicidio es un fenómeno multicausal, con mayor incidencia en adolescentes. Los estudios para identificar factores de riesgo se han incrementado en las últimas décadas y son útiles para la prevención e intervención. Sin embargo, rara vez los estudios analizan los efectos de múltiples factores psicológicos en la predicción del riesgo suicida. El objetivo de este estudio fue analizar el efecto de la ansiedad, la depresión y la impulsividad en la predicción del riesgo suicida en adolescentes de municipios del suroeste antioqueño (Colombia). Se trató de un estudio cuantitativo, no experimental, de corte transversal, con la participación de 354 adolescentes entre 14 y 18 años ( $M=15,58$ ;  $DE=1,22$ ; 57,1% mujeres). Se utilizaron las escalas de riesgo de suicidio de Plutchik (SRS), depresión (BDI) y ansiedad (BAI) de Beck e impulsividad (BIS) de Barratt. Se encontró un factor de riesgo suicida del 15,5% y correlaciones entre SRS, AIS, BDI, BAI y BIS. Las mujeres obtuvieron puntuaciones significativamente más altas que los hombres en riesgo de suicidio, depresión y ansiedad. El análisis de regresión binaria mostró que la depresión ( $OR=1,1$ ), la ansiedad ( $OR=1$ ) y la impulsividad ( $OR=1,1$ ) explicaban entre el 24% ( $R^2$  Cox and Snell) y el 42% ( $R^2$  Nagelkerke) de la varianza del riesgo suicida. Se concluye que en las mujeres la impulsividad, cuando está asociada con síntomas ansiosos y depresivos, incrementa el riesgo suicida; en tanto que para los hombres dicho riesgo es mayor cuando está relacionado principalmente con depresión y en menor proporción con ansiedad. Estos hallazgos contribuyen a la formulación de políticas públicas en la prevención del suicidio en contextos escolares.

*Palabras clave:* depresión, ansiedad, impulsividad, riesgo suicida, intento de suicidio.

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Efforts to identify risk factors for suicidal behavior will always be a considerable challenge for researchers and clinicians, given the complexity of the psychological, familial, social, and cultural variables involved in their explanation, particularly in the adolescent population (Qaddoura & Dardas, 2022; Rasing et al., 2019). It is also important to consider that the cognitive, emotional, behavioral and social changes that are triggered from puberty (Marceau et al., 2019), mean that the system related to these changes be the same linked to the adolescent's vulnerability to experiencing symptoms to experiencing emotional and affective symptoms associated with suicidal risk.

The emotional cascade model is a trans-diagnostic theoretical perspective that explains the interrelationship among impulsivity, anxiety, depression, and suicidal risk. The emotional cascade model highlights that the rumination of negative and catastrophic thoughts can trigger intense negative emotions. This, in turn, leads to an influx of emotional distress in response to stressful stimuli. Consequently, the elevated negative emotional thoughts contribute to higher levels of negative affect, characterized by symptoms of anxiety and depression. This dysfunctional feedback loop perpetuates an emotional cascade, culminating in impulsive and dysregulated behaviors (Qaddoura & Dardas, 2022; Selby et al., 2008).

Adolescents who exhibit intrapersonal anxiety, impulsivity, and emotional dysregulation, have been reported to experience a significant negative emotion, which may contribute to emotional cascade experiences fueled by intense rumination and high negative affect that increase suicide risk (Thullen et al., 2016).

In particular, suicidal ideation in adolescents is associated with depression (Im et al., 2017; Lew et al., 2019; Qaddoura & Dardas, 2022; Vancampfort et al., 2019), especially with symptoms of loneliness, probably because feeling lonely is associated with hopelessness and difficulties in obtaining social support in times of high stress (Smith et al., 2021), moreover, it is a common node in both suicidal ideation and depression; on the other hand, connection with others, specifically peers, is a protective aspect for the promotion of positive affect in adolescents and an essential depression and suicide prevention variable (Gijzen et al., 2021).

In contrast to the above, in a previous study with a clinical sample of adolescents, results explained that depression and impulsivity did not predict suicide attempts, whereas, in the non-clinical population, this could be explained by general self-injurious tendencies, aspects that merit further research (Rockstroh et al., 2021). These findings indicate that there would be differentiating aspects between those with ideation and those with a higher risk of suicide attempt (Klonsky & May, 2014).

Recent studies have found that adolescents who reported suicidal intent within the past 12 months have also exhibited impulsive self-injurious behaviors, which are closely associated with high levels of anxiety (Wang et al., 2022). Furthermore, there is a documented link between emotional dysregulation issues and suicidal intent among individuals with anxiety and depression (Wiebenga et al., 2022). Additionally, it has been observed that adolescents who transition from suicidal ideation to actual suicide attempts often have a history of stressful life events, leading to desensitization to pain, fear, and thoughts of death (Klonsky & May, 2015; Pham et al., 2021). This desensitization contributes to an increased capacity for engaging in suicidal behaviors (Van Orden et al., 2010).

In addition to the complexity of the interactions between emotional and affective symptoms and suicidal behavior, high rates of suicide have also been found in different latitudes around the world that account for the magnitude of the problem. In Vietnam, the figures range from 8.1% to 22%, being higher in adolescent females (Hum-

phreys et al., 2015; Pham et al., 2021; Zeanah et al., 2009). The rates are similar in other countries/areas, including Laos (1.8%), Indonesia (2.3%), Kiribati (20.5%), Ghana (13.8%), the Middle East (between 6.3% and 9.4%), and Latin America and the Caribbean (between 4.6% and 13.4%) (Smith et al., 2021).

In Colombia, as of November 2022, there was an increase in the number of suicides compared to the same period in 2021, from 277 to 346 cases in adolescents between 15 and 19 years of age (National Institute of Legal Medicine and Forensic Sciences [INMLCF], 2022), and Antioquia was positioned as the department with the highest number of suicides in Colombia, registering 443 cases (INMLCF, 2020). These figures show the magnitude of the problem in the Colombian context, which is why it has been considered a priority problem for public health care, which in turn merits identifying the associated risk factors to guide prevention actions.

Previous research has identified several risk factors associated with suicide in Colombian adolescents, including gender, limited access to education, exposure to domestic violence (Suárez et al., 2018), and strained communication and trust within the parent-child relationship (Suárez et al., 2019).

Depending on sex, a higher risk of suicide attempt has been reported in adolescent girls compared to men, possibly because girls show more sensitivity to the lack of social support, while culturally, males tend to promote greater independence (Wang et al., 2020). However, another study reported a higher risk of suicide attempt in men in rural areas given that they present greater intensity of emotional psychological symptoms (Chen et al., 2014). Furthermore, it has been documented those adolescent women who previously demonstrated suicidal behavior had presented more deliberate self-harm, impulsivity, aggressiveness and mental health problems compared to men (Lawrence et al., 2015; Muehlenkamp et al., 2012; Musci et al., 2022). Also highlighted is the phenomenon of the "gender paradox" of suicide, in which suicidal attempts and deliberate self-harm are more common in females, but completed suicide is more common in males (Lee et al., 2019).

While recent studies have highlighted the significance of family factors in relation to suicidal risk (Pulido et al., 2022), the exploration of the specific associations between suicidal risk, depression, anxiety, and impulsivity has primarily focused on young university students (Gómez et al., 2019; Gómez, 2020). To date, only one study has investigated these relationships in Colombian adolescents (Gómez et al., 2020). However, this study was conducted with a limited sample of 179 adolescents aged 14 to 17 years from the department of Caldas, and it did not include an examination of anxiety as a variable nor explore the independent effects of gender.

Even though there has been interest in analyzing the factors associated with suicidal behavior in adolescents, the variables that are associated with the risk of suicidal behavior in adolescents have not been sufficiently examined, especially in the Colombian context; In addition, diverse results have been reported on the risk factors for suicide in men and women, which deserves clarification. In this sense, the objective of this work was to determine the effect of depression, anxiety and impulsivity on suicide risk in the total population and by sex in Colombian adolescents. For this purpose, it was an empirical-observational, cross-sectional study with a non-experimental design. The following were hypothesized: (H1) Adolescents with suicidal risk have greater symptoms of depression, anxiety, and impulsivity compared to adolescents without risk. (H2) There are significant differences in depression, anxiety, impulsivity and suicidal risk depending on sex. (H3) Depression, anxiety and impulsivity have a direct effect on suicidal risk.

## Method

### Participants

A non-probability sample was used to select 427 adolescents attending school in southeastern Antioquia (Colombia), who were contacted through the directors of educational institutions in the municipalities of Jericó, Tarso, Támesis and Pueblo Rico in the department of Antioquia (Colombia). Two educational institutions were selected per municipality and the instruments were applied to adolescents in grades nine to eleven. The sample was selected considering that adolescents have one of the highest rates of attempted and completed suicide (Gómez, 2021; INMLCF, 2020).

A total of 73 students were excluded from the study for the following reasons: parental consent was not obtained, or the students were absent on the day of data collection. The participation rate was 82.86%, resulting in a final sample of 354 adolescents. Of the adolescents, 23.2% were from rural areas and 76.8% from urban areas, 57.1% were female. Age ranged from 14 to 18 years, with the following distribution: 14 years: 22% ( $n = 78$ ), 15 years: 28.2% ( $n = 100$ ), 16 years: 28.5% ( $n = 101$ ), 17 years: 11.6% ( $n = 41$ ) and 18 years: 9.6% ( $n = 34$ ). The mean age was 15.58 years ( $SD = 1.22$ ). All adolescents are connected to the educational system in different grades: ninth ( $n = 121$ , 34.2%), tenth ( $n = 127$ , 35.9%) and eleventh ( $n = 106$ , 29.9%).

Regarding the distribution of participants by sex in each academic group, 36.2% ( $n = 55$ ) of the males were in ninth grade, 36.2% ( $n = 55$ ) in tenth grade, and 27.6% ( $n = 42$ ) in eleventh grade. Among the females, 32.7% ( $n = 66$ ) were in ninth grade, 37.6% ( $n = 76$ ) were in tenth grade, and 29.7% ( $n = 60$ ) were in eleventh grade. The distribution of males and females by grade was homogeneous ( $\chi^2 = 0.491$ ,  $df = 2$ ,  $p = 0.783$ ).

Regards of socioeconomic status, 65.9% of the sample was classified as belonging to the very low (15.3%) and low (50.6%) socioeconomic status categories, while 34.2% were classified as belonging to the middle-low (32.2%) and middle (2.0%) status categories. No statistically significant differences were observed in socioeconomic status when considering sex (male/female) ( $\chi^2 = 2.812$ ,  $df = 4$ ,  $p = 0.590$ ) and age ( $\chi^2 = 19.459$ ,  $df = 16$ ,  $p = 0.246$ ) of adolescents. Regarding family structure, 59.3% of the adolescents belonged to nuclear families, 21.8% to single-parent families and 16.9% to extended families. The remaining 2% come from households with friends (0.9%) or reconstituted families (1.1%).

### Measures

*Sociodemographic form.* Researchers used an ad hoc sociodemographic form to collect information on age, sex, rural or urban origin, socioeconomic stratum, origin, family type, and school grade.

*Plutchik Suicide Risk Scale (SRS; Plutchik & Van Praag, 1989).* This instrument assesses risk of suicide attempt, hopelessness, and depression (e.g., "Have you ever tried to take your own life?"). The version used in this study was the Spanish version (Rubio et al., 1998), which consists of 15 items with "yes" or "no" response alternatives. The score for affirmative responses is one for a maximum total of 15 and a cut-off point of 6 for suicidal risk. Confirmatory factor analysis (CFA) with a one-factor model using generalized least squares yielded acceptable goodness of fit indices ( $\chi^2 / df = 1.037$ ,  $GFI = .970$ ,  $AGFI = .953$ ,  $TLI = .984$ ,  $CFI = .988$ ,  $RMSEA = .010$  [CI 90% .000-.032]). The internal consistency analysis for the present study was .80 (Cronbach's alpha) and .82 (Omega) for the total scale.

*Barratt Impulsiveness Scale Version 11 (BIS-11; Patton et al., 1995).* The instrument consists of 30 items grouped into three subscales: cognitive impulsivity (e.g., "My thoughts can be very fast"), motor impulsivity (e.g., "I do things without thinking"), and unplanned impulsivity (e.g., "I am more interested in the present than in the future") with response options (rarely or never, occasionally, often and always, or almost always). The subscale score is the sum of the items of each subscale, and the total score is the sum of all items. There is no cut-off point for the total scale. A CFA was performed with a one-factor model, using the generalized least squares method. Acceptable goodness of fit indices were obtained ( $\chi^2 / df = 1.050$ ,  $GFI = .927$ ,  $AGFI = .908$ ,  $TLI = .933$ ,  $CFI = .943$ ,  $RMSEA = .012$  [CI 90% .000-.023]). The internal consistency analysis for the present study was .81 (Cronbach's alpha) and .84 (Omega) for the total scale.

*Beck Depression Inventory (BDI; Beck et al., 1979).* The instrument used in this study consists of 21 items designed to assess the presence and severity of depression in individuals aged 13 years and older (e.g., "I feel so sad or unhappy that I can't stand it"). Psychological and cognitive symptoms are assessed with 15 items, while the remaining six items focus on somatic and vegetative symptoms (Schotte et al., 1997). Each item is answered on a scale from 0 to 3, and scores range from 0 to 63. This instrument has been adapted and validated for Spanish (Sanz et al., 2014), demonstrating sensitivity and specificity ( $> .70$ ) to identify depressive symptoms using the cutoffs of the original version. In the CFA for the present sample with a one-factor model, acceptable goodness of fit indices were found ( $\chi^2 / df = 1.095$ ,  $GFI = .952$ ,  $AGFI = .932$ ,  $TLI = .937$ ,  $CFI = .951$ ,  $RMSEA = .016$  [CI 90% .000-.030]). Internal consistency analysis revealed a Cronbach's alpha of .90 and an omega coefficient of .91 for the total scale in the present study.

*Beck Anxiety Inventory (BAI; Beck et al., 1988).* This instrument consists of 21 items designed to assess anxiety symptoms experienced in the past week and at the present time (e.g., "inability to relax" or "fear of the worst"). Each item is scored on a scale of 0 ("not at all"), 1 ("mildly, it does not bother me much"), 2 ("moderately, it was very unpleasant but I could bear it"), and 3 ("severely, I could hardly bear it"). The total score is the sum of all items, with the highest score selected if multiple responses were given for a single item. In the CFA performed on the present sample using a one-factor model, acceptable goodness of fit indices were observed ( $\chi^2 / df = 1.230$ ,  $GFI = .948$ ,  $AGFI = .923$ ,  $TLI = .873$ ,  $CFI = .905$ ,  $RMSEA = .026$  [90% CI .009-.037]). Internal consistency analysis for the present study yielded a Cronbach's alpha coefficient of .90 and an omega coefficient of .93 for the total scale.

### Procedure and ethical considerations

The study and data collection procedures were presented to the directors of the educational institutions, who informed the teachers and facilitated access to the students in the classrooms. Informed consent was also obtained from parents for adolescents to participate in the study and give their assent. The instruments were administered using a pencil and paper procedure in the classrooms, in medium sized groups (approximately 20 adolescents). The administration was supervised by the researchers and two research assistants.

Considering the policy 1090/2006 and Resolution 008430/1993, this study complied with the principles and procedures of ethical research (respect for the dignity and confidentiality of persons as mentioned in articles 26 and 50). The study was funded [05020299123]; APICSA Colombia [202101] and Universidad de Medellín [26010003]; and endorsed by the ethics committee [65450] of Universidad Católica Luis Amigó, and COETIKA, Colombia [20211104].

## Statistical procedure

Researchers used SPSS software version 25 (IBM Corporation, 2017a) and the Amos add-on version 24.0 (IBM Corporation, 2017b) for data analysis. A sociodemographic description of the sample was performed, followed by confirmatory factor analysis (CFA) of the measurement instruments, and, subsequently, internal consistency was analyzed using Cronbach's alpha and Omega coefficients (McDonald, 1999). Chi-square values ( $\chi^2 / df$ ), goodness-of-fit index ( $GFI \geq .90$ ) and its corresponding corrected ( $AGFI \geq .90$ ), Tucker - Lewis index ( $TLI \geq .90$ ), comparative fit index ( $CFI \geq .90$ ) and root mean square residual of approximation ( $RMSEA \leq .08$ ) were reported (Byrne, 2016; McArdle & Nesselroade, 2014).

Subsequently, it was performed a descriptive univariate analysis of the suicidal risk, depression, anxiety, and impulsivity variables according to the instruments applied. The normality of the data was verified by means of the Kolmogorov-Smirnov test, which showed that the variables did not follow a normal distribution ( $p > .05$ ).

A comparative analysis was then performed between adolescents with and without suicidal risk, and by sex (male/female) according to the psychological variables under study. The nonparametric Mann-Whitney U test was used. Since nonparametric statistics were used, in addition to the mean and standard deviation, the median, the z values of the Mann-Whitney U comparison test, and the significance value p were reported. The effect size was estimated in R Studio using the eta-squared statistic ( $\eta^2$ ). Researchers followed the procedure and interpretation established by Fritz et al. (2012): small effect (.01), medium effect (.06), and large effect (.14).

Subsequently, a correlation analysis was conducted using Spearman's Rho coefficient. To assess the strength of the correlations, the following values were considered: a small correlation was defined as  $r = 0.1$  to  $r < 0.30$ , an intermediate correlation as  $r = 0.30$  to  $r < 0.50$ , and a high correlation as  $r \geq 0.50$  (Cohen, 1988). A binary logistic regression analysis was conducted using the input method to identify the variables with the highest predictive value for suicidal risk in the total population and according to sex (men/women).

## Results

Based on the Plutchik scale, it was found that, of the 354 adolescents, 15.5% presented indicators of suicidal risk. In relation to the other variables, using the Beck Depression Inventory (BDI), a symptomatic indicator of major depression was identified in 2.3%, moderate depression in 7.1% and mild depression in 14.4%. The remaining 76.3% reported no symptomatic indicators for depression. Regarding the level of anxiety (BAI), 7.6% reported indicators of severe anxiety, 17.5% moderate anxiety, and 74.9% mild anxiety.

Table 1 shows the indicators of suicide risk, depression and anxiety in men and women. Suicide risk was found in 19.31% of women and 10.53% of men. Among women, 31.2% reported some symptoms of depression and 27.7% reported moderate to severe symptoms of anxiety. In contrast, 13.8% of men reported symptoms of depression and 21.7% reported moderate to severe symptoms of anxiety.

Table 2 presents the comparative analysis between the groups with suicidal risk and those who did not present risk in relation to the different study variables. It was identified that adolescents at risk of suicide presented significantly ( $p < .001$ ) higher scores in depression, anxiety, and impulsivity.

This trend was similar for men and women. Further analysis revealed that male adolescents at risk for suicide had higher scores on depression ( $z = -3.561$ ,  $p < 0.001$ ,  $n^2 = 0.036$ ), anxiety ( $z = -3.302$ ,  $p < 0.001$ ,  $n^2 = 0.031$ ), and impulsivity ( $z = -3.268$ ,  $p < 0.001$ ,  $n^2 = 0.030$ ) compared to the no risk group. In contrast, female adolescents at risk for suicide had higher scores on depression ( $z = -6.445$ ,  $p < 0.001$ ,  $n^2 = 0.117$ ), anxiety ( $z = -4.459$ ,  $p < 0.001$ ,  $n^2 = 0.056$ ), and impulsivity ( $z = -5.718$ ,  $p < 0.001$ ,  $n^2 = 0.092$ ) compared to the no-risk group. The effect sizes ( $n^2$ ) of statistical significance of the differences between the suicide risk and non-suicide risk groups on the depression, anxiety, and impulsivity variables were larger for women than for men.

Table 2. Comparative analysis between groups with and without suicidal risk according to depression, anxiety, impulsivity and suicide attempt variables.

Variables	Suicidal risk			Without suicidal risk			z	p	n <sup>2</sup>
	M	DE	Me	M	DE	Me			
Depression	14.76	10.21	13.0	4.36	5.30	3.0	-7.608	<.001	.16
Anxiety	23.93	13.67	57.0	12.95	11.16	45.0	-5.716	<.001	.09
Impulsivity	58.55	11.86	23.0	46.08	11.62	10.0	-6.578	<.001	.12

Note: M = Mean; SD = Standard deviation; Me = Median; Z = Mann-Whitney U value Test; n<sup>2</sup> = eta Square estimates the size of the effect; p = statistical significance.

Table 3 shows the comparative analysis of the study variables according to sex. It was found that women presented significantly higher scores than men in suicidal risk, depression, and anxiety. When assessing the effect size of significant sex differences, a small effect size was identified.

In the total sample, using Spearman's Rho coefficient, statistically significant correlations ( $p < .001$ ) of positive sign were found between suicidal risk and the variables of depression ( $\rho = .607$ ,  $p < .001$ ), anxiety ( $\rho = .501$ ,  $p < .001$ ) and impulsivity ( $\rho = .391$ ,  $p < .001$ ). Table 4 shows the correlations between variables in men and women. The correlations between suicidal risk, depression, anxiety, and impulsivity

Table 1. Indicators of suicidal risk, depression and anxiety.

Variables	Risk indicators	Total		Women		Men	
		n	%	n	%	n	%
Suicidal risk	Without risk	299	84.46	163	80.69	136	89.47
	Risk	55	15.54	39	19.31	16	10.53
Depression	Without symptoms	270	76.27	139	68.81	131	86.18
	Mild symptoms	51	14.41	37	18.32	14	9.21
	Moderate symptoms	25	7.06	19	9.41	6	3.95
	Severe symptoms	8	2.26	7	3.47	1	.66
Anxiety	Mild symptoms	265	74.86	146	72.28	119	78.29
	Moderate symptoms	62	17.51	39	19.31	23	15.13
	Severe symptoms	27	7.63	17	8.42	10	6.58

Table 3. Comparative analysis between men and women according to depression, anxiety and impulsivity variables.

Variables	Men			Women			z	p	n <sup>2</sup>
	M	DE	Me	M	DE	Me			
Suicidal risk	2.07	2.43	1.0	2.99	2.86	2.0	-3.221	<.001	.029
Depression	4.26	5.74	2.0	7.27	8.13	4.0	-3.847	<.001	.042
Anxiety	13.39	12.34	9.0	15.60	12.09	13.0	-2.115	.034	.013
Impulsivity	48.20	11.74	47.0	47.87	13.05	47.0	-.570	.568	.001

Note: M = Mean; SD = Standard deviation; Me = Median; Z = Mann-Whitney U value Test; n<sup>2</sup> = eta Square estimates the size of the effect; p = statistical significance.

Table 4. Spearman's correlation coefficient (Rho) between study variables

Correlations	Suicidal risk	Depression	Anxiety	Impulsivity
Suicidal risk	---	.560****	.440**	.234**
Depression	.623***	---	.356***	.191*
Anxiety	.526***	.501***	---	.276**
Impulsivity	.510***	.440***	.423***	---

Note: The correlations in the upper matrix correspond to men and the lower diagonal to women.

\*p < .05, \*\*p < .01, \*\*\*p < .001

ity were significant in both sexes. However, the correlation coefficients were stronger in women than in men.

In order to identify the joint effect of the independent variables on suicidal risk, three binary logistic regression models were estimated. The suicide risk factor was used as the dependent variable, and the variables of depression, anxiety and impulsivity were placed as independent variables. Model 1 is with the total population, model 2 with the male group and model 3 with the female group (See Table 5). The results of model 1 show that the independent variables explained between 24% (R<sup>2</sup> Cox and Snell=.244) and 42% (R<sup>2</sup> Nagelkerke=.422) of the suicidal risk factor. Depression was found to increase the odds of suicide risk by 14.6% (OR= 1.146, 95% CI= 1.093–1.201), anxiety by 3.7% (OR=1.037, 95% CI= 1.009–1.067) and impulsivity by 5.3% (OR=1.053, 95% CI= 1.019–1.089). All effects were statistically significant. In men, depression increased the odds of suicide risk by 16.9%, and anxiety increased it by only 5%, whereas in women depression increased the odds of suicide risk by 13.2%, anxiety by 2.9%, and impulsivity by 5.5%.

## Discussion

The present study aimed to determine the effect of depression, anxiety, and impulsivity on suicidal risk in the total population and by sex in Colombian adolescents. First of all, it is important to highlight that the researchers found clinically significant indicators of major depression in 2.3%, moderate depression in 7.1%, and mild depression in 14.4%. As for the level of anxiety, 7.6% of the adolescents reported indicators of severe anxiety, 17.5% moderate, and 74.9% mild. The percentages of depression and anxiety indicators found in the evaluated sample are similar to that reported in other studies on adolescents with and without suicidal risk (Arenas-Landgrave et al., 2012; Ehlers et al., 2023; Humphreys et al., 2015; Moreno et al., 2014; Pham et al., 2021; Silva et al., 2017; Zeanah et al., 2009).

In relation to the first hypothesis, support was found in the results since it was identified that adolescents at risk of suicide presented, significantly higher scores in depression, anxiety, and impulsivity compared to those without risk indicators. These findings are consistent with previous studies (Wang et al., 2022; Wiebenga et al., 2022) documenting a greater presence of anxious and depressive symptoms in adolescents with suicidal intent. This link between anxiety and depression with suicidal risk is in line with the empirical evidence that has frequently reported the association between these problems in the adolescent population (Cummings et al., 2014; Gili et al., 2019; López-Steinmetz et al., 2020), which could be explained by transdiagnostic processes associated with impulsivity, difficulties in emotional regulation and information processing.

Regarding differences by sex, the second hypothesis was partially confirmed, given that higher levels of anxiety, depression, impulsivity and suicidal risk were found in women compared to men, consistent with findings from previous studies (Lynn et al., 2022; Wang et al., 2023); while in impulsivity no significant differences were observed, which could be explained

Table 5. Binary logistic regression analysis between psychological variables and suicide risk in the total population and by sex (male/female).

Independent variables	β	SE	χ <sup>2</sup> Valid	p	OR	CI 95% OR		R <sup>2</sup> Cox and Snell	R <sup>2</sup> Nagelkerke
						Lower	Upper		
Model 1: Total									
Depression	.136	.024	31.993	<.001	1.146	1.093	1.201	.244	.422
Anxiety	.037	.014	6.733	<.001	1.037	1.009	1.067		
Impulsivity	.052	.017	9.400	<.001	1.053	1.019	1.089		
Model 2: Men									
Depression	.156	.043	13.001	<.001	1.169	1.074	1.272	.191	.389
Anxiety	.049	.023	4.495	.034	1.050	1.004	1.099		
Impulsivity	.050	.030	2.706	.100	1.051	.99	1.116		
Model 3: Women									
Depression	.124	.030	17.152	<.001	1.132	1.068	1.200	.267	.428
Anxiety	.029	.019	2.347	.126	1.029	.992	1.068		
Impulsivity	.053	.021	6.655	.010	1.055	1.013	1.098		

Note: β = beta coefficient; SE = Standard Error; χ<sup>2</sup>Valid = contrast power statistic; df = degrees of freedom; p = level of significance; OR = Odds Ratio o result of the regression equation -Exp. (β); CI 95% OR = Confidence Interval of OR at 95%.

because emotional impulsivity tends to occur in women and more of a cognitive and behavioral type in men (Connolly et al., 2020; Wang et al., 2020). This indicates that in the female sex, there is more presence of internalized type symptomatology that would indicate a greater propensity to experience high negative affect and to evidence emotional dysregulation as well as overcontrolled behavioral patterns as a way of coping with stressful events. Furthermore, women present affective and emotional symptoms associated with suicide attempts when they perceive loss of social support more than men. They tend to be biased towards negative stimuli, which makes them more likely to experience negative affect and have greater suicidal ideation (Ding et al., 2022; Wang et al., 2020; Zhang et al., 2023).

Regarding the third hypothesis, the analysis revealed statistically significant correlations and predictive effects between suicidal risk and the variables of depression, anxiety, and impulsivity, indicating that higher levels of anxious, depressive symptoms, and impulsivity were associated with an increased risk of suicide in the evaluated adolescents. These results could be explained by the emotional cascade model, given that when adolescents there are associations of anxious and depressive symptoms that configure negative affectivity, as well as impulsive behaviors, they may experience emotional cascades fueled by ruminative thoughts that would put them at greater risk of suicide (Qaddoura & Dardas, 2022; Selby et al., 2008; Thullen et al., 2016). On the other hand, these findings are different from those referred to by Rockstroh et al. (2021), who did not find such an association.

This phenomenon could be attributed to a heightened reactivity to negative emotions, which may contribute to engaging in risk-taking behaviors without fully considering the potential consequences. Additionally, previous studies have indicated that individuals who engage in self-injurious behaviors demonstrate higher levels of impulsivity compared to those who do not attempt self-injury (Glenn & Klonsky, 2010).

Research has documented that impulsivity and inadequate inhibitory control reduce self-efficacy for emotional management, particularly of negative affect, which can lead to self-injurious and suicidal behaviors (Gómez, 2021; Klonsky et al., 2013). Additionally, the findings found in the correlation and prediction analyses could be explained by the fact adolescents with anxious and depressive symptoms show a greater tendency to impulsivity given reduced cognitive skills in planning and problem-solving, as well as in regulating negative affect, which would put them at suicidal risk (Janis & Nock, 2009; Lockwood et al., 2020; Peterson & Fischer, 2012).

In this regard, the inclination to act impulsively and thoughtlessly, experience feelings of hopelessness and negative affect, along with other associated biopsychosocial factors, increases the risk of suicide in the presence of traumatic events (Arenas-Landgrave et al., 2012; Gómez, 2020; Gómez et al., 2020; Koyama et al., 2020; Madge et al., 2011). However, some studies have not found a predictive role for depression and impulsivity in relation to suicidal risk, which necessitates further investigation (Silva et al., 2013; Valdivia et al., 2015). Accumulated evidence has also shown that high levels of impulsivity facilitate the transition from suicidal ideation to suicidal acts due to the lack of premeditation and reflection when facing environmental demands (Klonsky & May, 2010). Therefore, it could be hypothesized that in the sample of adolescents evaluated in the present study, difficulties in reflective thinking, combined with negative affectivity and a history of suicide attempts, increase the likelihood of transitioning from suicidal ideation to actual suicide attempts.

This research presents several limitations. Previous studies have established a connection between dysfunctional family relationships and suicide risk in adolescents (Suárez et al., 2018; 2019). However, this study did not collect data on this aspect, preventing an independent examination of the relationship between the variables of interest and the family variable. Future studies should consider including this variable to control for its effect in the analyses. As a cross-sectional study, it was not possible to assess the lon-

gitudinal impact of psychological variables on suicidal risk in adolescents. Therefore, the explanations are derived solely from statistical correlations and predictive analyses. Additionally, the sample consisted of adolescents from the central region of Colombia, limiting the generalizability of the findings to populations with similar sociodemographic characteristics. Future studies should aim to include samples from diverse regions with varying cultural and relational characteristics. Also, new research could consider the analysis of subgroups among adolescence and childhood from rural schools.

At a clinical level, it is necessary to consider for the evaluation and prevention of suicide that in women, impulsivity, when associated with anxious and depressive symptoms, increases the risk of suicide; while for men this risk is greater when it is mainly related to depression and to a lesser extent with anxiety. At an educational level, the findings suggest the importance of strengthening emotional and social coping strategies in school environments as resources to promote life skills in adolescents. At the same time, our study contributes as evidence for the formulation of public policies in the promotion and prevention in the fields of health and education.

In conclusion, the findings of the present study constitute an input based on empirical evidence on the explanation of the factors associated with suicidal risk, and highlight the importance of developing prevention actions aimed not only at managing emotions but also at providing coping resources directed towards reflective thinking, especially if we take into account that in this period of the life cycle, adolescents have the capacity for critical thinking.

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## Conflict of interest

No potential conflict of interest was reported by the authors.

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