

Risk of Suicide in Adolescents with Symptoms of Eating Disorders and Depression

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Abstract

Objective: The aim of the present study was to determine the risk of suicide in adolescents with symptoms of eating disorders and depression.

Methods: A population-based, cross-sectional study was conducted with 1379 students of public schools aged 10 to 17 years. The following evaluation tools were employed: A socio-demographic questionnaire, Eating Attitudes Test (EAT-26), Bulimic Investigatory Test of Edinburgh (BITE), Children's depression inventory (CDI) and the Mini International Neuropsychiatric Interview (M.I.N.I. – Brazilian version 5.0.0). Data analysis involved one-dimensional and two-dimensional tables with absolute and relative frequencies as well as the calculation of odds ratios (OR) and respective 95% confidence intervals associated with the levels described using Pearson's chi-square test. In the multivariate analysis, a binary logistic regression model was adjusted, including variables with a p-value <0.05 in the binary analysis as possible explanatory variables.

Results: Through the ORs, it was estimated that the probability of an adolescent in the population analysed of being at risk of suicide was higher when the adolescent was older than 11 years, of the female gender, had symptoms of an eating disorder and had depressive symptoms.

Conclusion: The risk of suicide is not restricted to clinical samples of adolescents with eating disorders, but can also be detected in non-clinical samples. Moreover, the risk is higher among adolescents with symptoms of both eating disorders and depression.

Keywords: Eating disorders; Suicide; Adolescent; Depression

Introduction

Suicide is an important public health problem [1] and one of the main causes of death among individuals with eating disorders [2], as such disorders share numerous risk factors for suicide [3], such as purging, depression, substance abuse, anxiety and impulsiveness [4].

Eating disorders are among the most common disorders associated with the onset of adolescence, especially among girls [5], and represent a life risk that affects physical, emotional, behavioural and social development in adolescents [6]. In some cases, depression seems to aggravate the severity of eating disorders [7,8]. Thus, depression may be an important link between eating disorders and suicide in adolescents, which may even exclude the direct influence of such disorders on suicidal behaviour in this population [9].

Studies that investigate suicidal behaviour among adolescents with eating disorders [8,10-12], including depression [8,13], have been conducted involving adolescents diagnosed with eating disorders without offering information on individuals with only some symptoms (no conclusive diagnosis). However, it is important to recognize suicidal behaviour such individuals, as adolescents in the subclinical phase are more frequent than those with a conclusive diagnosis of an eating disorder [14]. Moreover, previous studies only offer information on suicidal ideation, which demonstrates that knowledge on the correlates of the risk of suicide in adolescents with eating disorders is limited, since the risk of suicide encompasses both thoughts (suicidal ideation) as well as planning a suicide attempt and is manifested in different manners [15]. Thus, identifying the risk of suicide is fundamental to patient management and the prevention of such events [16].

Thus, the question arises as to the extent of the risk of suicide among adolescents with simultaneous symptoms of both eating disorders and depression. The aim of the present study was to determine the risk of

suicide in adolescents with concomitant symptoms of eating disorders and depression, since the determination of depressive symptoms may be significant in the evaluation of the risk of suicide in adolescents with eating disorders.

Materials and Methods

Design and sample

A population-based, cross-sectional study was conducted during a four-month period in 2014 in the city of Recife (northeast Brazil) involving individuals aged 10 to 17 years.

The sample size was calculated based on the population of students enrolled in the state-run public education system in Recife in the target age group. According to the State of Pernambuco Secretary of Education, 85,149 students between 10 and 17 years of age were enrolled in this public system in 2013. The EPI-INFO program (version 7) was used to determine the sample size based on a 3.0% error, 95.0% reliability and 33.1% expected proportion of symptoms of eating disorders [14], totalling 936 adolescents. A cluster sampling

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Variable	N	%
Eat-26^(a)		
Positive	351	25.5
Negative	1028	74.5
Bite^(b) – symptoms		
None	931	67.5
Medium score	404	29.3
High score	44	3.2
Bite^(b) – severity		
Non-significant	1313	95.2
Significant	61	4.4
Strong intensity	5	0.4
Total	1379	100.0

(a): EAT-26 - Eating Attitudes Test.
 (b): BITE - Bulimic Investigatory Test of Edinburgh.

Table 1: Distribution of adolescent analysed according to clinical data.

was employed, this number was multiplied by 1.2 due to the design effect, resulting in 1123, to which 20% was added to compensate for possible dropouts without compromising the representativeness of the sample. Thus, the total number of adolescents to be evaluated was 1347. However, 1379 adolescents were evaluated, as no adolescents who agreed to participate in the study (through a statement of informed consent) were excluded.

Procedures and ethical considerations

Eighteen public schools were randomly selected from a list provided by the Pernambuco State Secretary of Education to participate in the present study. The principals of the schools were first contacted, received clarifications regarding the objectives of the study and granted official authorization for the participation of their schools. The assessment tools were administered in the school setting during regular school hours. Prior to administration, statements of informed consent were sent to the parents/guardians of the students in compliance with the norms stipulated in Resolution 466 of December 12th, 2012 of the National Board of Health of the Brazilian Health Ministry regarding studies involving human subjects. Each adolescent also signed a statement of consent agreeing to participate. This study received approval from the Human Research Ethics Committee of the Federal University of Pernambuco, Brazil.

Measures

Socio-economic and demographic data on each participant, along with data regarding symptoms of eating disorders, depressive symptoms and the risk of suicide, were acquired using different questionnaires.

Eating disorders

Eating Attitudes Test (EAT-26): While EAT-26 does not allow a diagnosis of eating disorders; it assists in the detection of clinical cases in populations at high risk and the identification of individuals with abnormal concerns regarding eating and weight. EAT-26 is widely used in screening studies for the early identification of symptoms of eating disorders. EAT-26 [17] has been translated and validated in Portuguese [18] and adapted to the adolescent population [19], demonstrating internal consistency of 0.82.

Bulimic Investigatory Test of Edinburgh (BITE): The BITE was used for the identification of symptoms of bulimia nervosa [20]. The Brazilian version of this questionnaire was translated into Portuguese [21] and adapted for use on Brazilian adolescents [22], with internal consistency of 0.76. BITE was developed by Henderson and Freeman in 1987 for the screening and evaluation of the severity of bulimia nervosa

based on the evaluation of cognitive and behavioural aspects. BITE furnishes results on two scales: one on symptoms (30 yes/no items with the score ranging from 0 to 30) and another on severity (three dimensional items). These two scores are summed to obtain the total score. On the symptoms scale, a high score (≥ 20) indicates compulsive eating behaviour with considerable possibility of bulimia, medium scores (10 to 19 points) suggest an unusual eating pattern that requires an evaluation through a clinical interview and scores lower than 10 points indicate an eating practice within the limits of normality. On the severity scale, a score of >5 is considered clinically significant and ≥ 10 indicates a high degree of severity.

Depressive symptoms: The Children's depression inventory (CDI) was used for the identification of depressive symptoms [23]. The CDI was proposed by Kovacs in 1983 and has been adapted for use on the Brazilian population [24], with internal consistency of 0.80. This 27-item self-report scale is widely used in epidemiological studies [25] for the identification of symptoms of depression among individuals seven to 17 years of age.

Risk of suicide: The Mini International Neuropsychiatric Interview (M.I.N.I. - Brazilian version 5.0.0) - Module C was used to evaluate the risk of suicide. The adolescents were identified as either "at risk of suicide" or "with no risk of suicide". The M.I.N.I. 5.0.0 constitutes a short, standardized interview for a diagnostic classification compatible with the criteria of the DSM-IV and was developed by researchers of the Pitié-Salpêtrière Hospital in Paris and the University of Florida in the USA. The M.I.N.I. 5.0.0 has been validated for use in Brazil by Amorim [26]. This interview has satisfactory reliability and validity and can be used for the rapid selection of homogeneous populations in epidemiological studies.

Data analysis

The data were entered into a databank with the aid of the Statistical Package for the Social Sciences (SPSS) version 21. Descriptive and inferential statistics were used for the data analysis. Descriptive analysis was used to characterise the sample based on the calculation of measures of central tendency and dispersion for the variables of interest. Inferential statistics were used to analyse associations between categorical variables using Pearson's chi-square test. Odds ratios (OR) and respective confidence intervals (CI) were calculated to determine the strength of associations between the independent variables and outcome (risk of suicide). 5% was used as the margin of error and 95% was used for the confidence interval.

Results

In the present study, 65.5% of the adolescents were female. Mean age was 13.80 years (standard deviation: 1.76 years) and median age was 14 years.

Table 1 shows that 25% of the 1379 adolescents surveyed were considered positive for inadequate eating behaviour based on EAT-26 and 29.3% has a medium score for bulimia nervosa. On the BITE severity scale, only 0.4% was classified with highly intensive severity.

Table 2 shows that the prevalence of the risk of suicide was much higher among the adolescents who had a positive EAT-26 and high BITE symptoms score. With the exception of the BITE severity score, all other variables exhibited a significant association with the risk of suicide ($p < 0.001$).

Table 3 displays the relationships between each independent variable and the response variable in the logistic regression analysis.

Variable	Risk of suicide (MINI)				Total		p-value	OR (95% CI)
	Yes		No		n	%		
	n	%	n	%	n	%		
EAT-26^(c)								
Positive	150	42.7	201	57.3	351	100	p ^(a) < 0.001*	2.22 (1.72 to 2.86)
Negative	259	25.2	769	74.8	1028	100		1.00
BITE^(d) – Symptoms								
None	205	22.0	726	78.0	931	100	p ^(a) < 0.001*	1.00
Medium score	179	44.3	225	55.7	404	100		2.82 (2.19 to 3.62)
High score	25	56.8	19	43.2	44	100		4.66 (2.52 to 8.63)
BITE^(d) – Severity								
Non-significant	383	29.2	930	70.8	1313	100	p ^(b) = 0.104	**
Significant	23	37.7	38	62.3	61	100		**
Strong intensity	3	60.0	2	40.0	5	100		**
Total group	409	29.7	970	70.3	1379	100		

(*): Significant association to 5.0% level
(**): Not possible to determine due to frequencies of nulls and very low scores
(a): Pearson's chi-square test
(b): Fisher's exact test
(c): EAT-26 - Eating Attitudes Test
(d): BITE - Bulimic Investigatory Test of Edinburgh

Table 2: Evaluation of risk of suicide according to clinical data.

Variable	Bivariate results		Adjusted multivariate results	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age group				
10 to 11	1.00	p ^(a) = 0.003*	1.00	0.003*
12 to 13	1.64 (1.02 to 2.61)		1.78 (1.09 to 2.92)	0.022*
14 to 15	2.10 (1.34 to 3.31)		2.29 (1.42 to 3.71)	0.001*
16 to 17	2.27 (1.38 to 3.72)		2.41 (1.42 to 4.08)	0.001*
Sex				
Male	1.00	p ^(a) < 0.001*	1.00	<0.001*
Female	2.06 (1.59 to 2.68)		1.81 (1.37 to 2.38)	
EAT-26^(b)				
Positive	2.22 (1.72 to 2.86)	p ^(a) < 0.001*	1.58 (1.20 to 2.10)	0.001*
Negative	1.00		1.00	
BITE^(c) – Symptoms				
None	1.00	p ^(a) < 0.001*	1.00	<0.001*
Medium score	2.82 (2.19 to 3.62)		2.18 (1.67 to 2.84)	<0.001*
High score	4.66 (2.52 to 8.63)		1.89 (0.97 to 3.68)	0.060
Children's Depression Inventory				
Positive	3.40 (2.52 to 4.59)	p ^(a) < 0.001*	2.67 (1.92 to 3.71)	<0.001*
Negative	1.00		1.00	

(*): Significant association to 5.0% level
(a): Pearson's chi-square test
(b): EAT-26 - Eating Attitudes Test
(c): BITE - Bulimic Investigatory Test of Edinburgh

Table 3: Results of multivariate logistic regression for percentage with risk of suicide.

Bivariate analysis was performed first using Pearson's chi-square test for the selection of variables for the adjustment of the logistic regression model. All five variables were incorporated: age group, sex, EAT-26 scale, BITE scales and CDI were significant ($p \leq 0.05$). The logistic regression model for the risk of suicide was calculated considering input variables with a maximum p-value of 0.05. Through the ORs, it was estimated that the probability of an adolescent in the population analysed of being at risk of suicide was higher when the adolescent was older than 11 years, of the female gender, had inadequate eating pattern, had symptoms of bulimia nervosa and had depressive symptoms. The model was accepted ($p < 0.001$). The Lemeshow test demonstrated the fit of the data to the model ($p = 0.580$) and the rate of correct classification was 70.3%.

Tables 4 and 5 display the estimate percentage probabilities of the risk of suicide based on the regression model. In the presence of both inadequate eating behaviour and depressive symptoms, the risk of suicide would be 61.9%. In the case of positive symptoms for bulimia nervosa and depressive symptoms, the probability would be 63.4%.

Discussion

In the present study, the risk of suicide was found to be high among adolescents with symptoms of eating disorders and could be aggravated by depressive symptoms.

Symptoms of eating disorders in a sample of adolescents

Among the total of adolescents surveyed, 44.5% exhibited

EAT-26 ^(a)	Children's Depression Inventory	
	Positive	Negative
Positive	61.9	35.3
Negative	46.4	22.5

(a): EAT-26 - Eating Attitudes Test

Table 4: Risk of suicide according to possible risk factors: EAT-26 and Children's Depression Inventory evaluated through logistic regression model (95% CI).

BITE ^(a) – Symptoms	Children's Depression Inventory	
	Positive	Negative
Positive	63.4	38.9
Negative	40.5	20.0

(a): BITE - Bulimic Investigatory Test of Edinburgh

Table 5: Risk of suicide according to possible risk factors: BITE symptoms subscale and Children's Depression Inventory evaluated through logistic regression model (95% CI).

symptoms of eating disorders, which are common in adolescence, especially non-specified disorders [27]. The emergence of such symptoms in adolescence may be explained by characteristics of an intrapersonal order [28], such as the increased vulnerability and sensitivity in this phase of human development, which also includes a predisposition to risks and imprudent behaviour. Observations suggest the proneness to take on risks and dangerous behaviour in adolescence may be explained by the immaturity of the neurocortical systems, particularly the prefrontal cortex, which is not capable of altering the perception and evaluation of risk and reward, leading to changes in the social and affective processing of the brain [29]. Thus, adolescents are often vulnerable to pressure from means of communication, the social environment [30] and family environment [31]. The influence of the media and one's social surroundings are related to the cult of slimness, which leads many adolescents to idealise the perfect body in their minds. When this body is more distanced from their actual body, there is a greater possibility of conflict [32]. In the family environment, excessive control of food, the application of rigorous eating rules and the individualisation of the eating process has a positive association to the emergence of eating disorders [31].

Risk of suicide in adolescents with symptoms of eating disorders

Significant associations between the risk of suicide and symptoms of eating disorders were found in the population studied using both screening scales, with the exception of the BITE severity subscale. This indicates that the risk of suicide is not restricted to clinical samples of adolescents with eating disorders, but can also be found in non-clinical samples.

The risk of suicide was found in the majority of adolescents with symptoms of eating disorders. Few studies that related suicidal behaviour with eating disorders in adolescence [8-11] and eating disorders seem to lead to a greater risk of suicide than any other psychiatric problem [33].

It is well documented in the literature that suicide rates are higher among patients with anorexia nervosa [2,3]. In recent years, however, the slight reduction in these rates has been attributed to the better detection of cases that need treatment, the use of improved diagnostic criteria, the reduction in the stigma of receiving treatment for psychiatric disorders and the wider offer of specialised services for the treatment of eating disorders [33].

Effective treatment reduces the risk of suicide in patients [34]. However, patients with anorexia nervosa seem to be more exposed to consummate suicide, as such individuals experience lethal suicide

attempts combined with physical health compromised by the somatic complications of severe food restriction [35,36]. Some theories on suicidal behaviour can help understand the greater lethality of attempted suicide among patients with anorexia nervosa. The theory put forth by Joiner requires a combination of three factors for suicidal behaviour: a feeling of being alone, feeling to be a burden to others and the acquired capacity to endure pain, which, in anorexia nervosa, emerges through extreme food restriction, leading to an increase in the ability to support pain [37].

In the present study, adolescents with a medium score on the BITE symptoms subscale (presence of unusual eating patterns) exhibited a risk of suicide and, among those with a high score (considerable possibility of bulimia nervosa), the risk of suicide was higher. The suicide rates among individuals with bulimia nervosa are lower in comparison to those with anorexia nervosa. Patients with bulimia nervosa avoid lethal methods in their suicide attempts and methods that may cause disfigurement or pain. Such patients prefer less lethal methods, such as a drug overdose or the inhalation of toxic fumes, in contrast to individuals with anorexia nervosa, who be accustomed to painful experiences throughout the course of the illness and consequently use more lethal methods during a suicide attempt [37]. However, the rates of attempted suicide are greater mainly in cases in which patients with bulimia nervosa use multiple purging behaviours [38], which are more severe [39]. In the present study, adolescents with strong symptoms of bulimia nervosa were at a high risk of suicide. Attempted suicide in such individuals is also associated with specific personalities traits and substance abuse [40]. There is evidence that the eating compulsion in bulimia nervosa increases the release of dopamine in neural reward circuits, which stimulate impulsive behaviour in patients with bulimia nervosa [41,42]. This may be potentiated by substance use and abuse [43], which leads to a greater propensity among such patients to become involved in suicidal acts.

Furthermore, individuals with bulimia nervosa hide the disorder and avoid professional help. Most often, purging episodes are hidden and accompanied by feelings of intense shame and guilt as well as a desire for self-punishment [44]. As a result, 50% to 70% of adolescent patients are diagnosed with atypical or partial eating disorders, thereby delaying the proper diagnosis and adequate treatment, which could cause the aggravation of the illness and consequently an increase in the rates of mortality [45] and suicide attempts [40], as the risk of suicide is also related to the symptoms and diagnostic severity of eating disorders [39].

Risk of suicide among adolescents with symptoms of eating disorders and depression

Depressive symptoms were detected in 15.4% of the adolescents surveyed. In this subgroup, the prevalence of the risk of suicide was 57.9% among those with symptoms of both eating disorders and depression. Based on the odds ratios, the probability of an adolescent in the population studied being at risk of suicide was higher if the individual had concomitant symptoms of eating disorders and depression. Those with a high score on the BITE symptoms subscale had a 1.26-fold greater chance of the risk of suicide than those with depressive symptoms alone. This may be related to the severity of symptoms of eating disorders, which increases the risk of suicide [39].

The regression model revealed that the overlapping of factors increases the odds of the risk of suicide. In the concomitant presence of symptoms of eating disorders and depression, the chance would be 61.9% based on EAT-26 and 63.4% based on the BITE scale. On the other

hand, under the “best scenario”, the absence of symptoms of eating disorders and depression considerably reduced the probability of the risk of suicide in the population surveyed. According to some authors, depression in adolescence is among the main risk factors and plays a fundamental role in the development of suicidal behaviour [46,47] and is one of the factors that have been most related to suicide in adolescence [48]. Clinically depressed adolescents account for between one and two thirds of suicides in this phase of life [47].

It is currently known that depression is the comorbidity linked to eating disorders, affecting 25 to 52% of individuals with anorexia and bulimia [49,50]. However, the relationship between these disorders is complex. Several theories have been developed in an attempt to clarify this relationship: 1) The fact that serotonergic functioning in individuals with depression and eating disorders are similar, with dysfunction in the transmission of serotonin, especially among individuals with severe eating disorders; and 2) the issue that eating disorders may cause depressive symptoms as a result of changes induced in the monoaminergic systems due to the restricted diet, which is characteristic of anorexia nervosa, and due to compulsive eating followed by purging as a compensatory behaviour, which is typical in bulimia nervosa [51]. On the other hand, anorexia and bulimia nervosa can exert a negative effect on one's social life, thereby increasing the risk of depression [52].

Limitations

Some limitations of the present investigation should be considered. The study demonstrates the existence of a relationship between the risk of suicide and eating disorders, independently of the characteristics of adolescence, but the cross-sectional design does not allow the definition of the cause-and-effect relationship of the variables analysed. Moreover, the assessment procedure with the M.I.N.I. interview may have been influenced by the brief administration of the questionnaire and embarrassment on the part of the respondent, who may have omitted information, despite the favourable environment in which the interview took place and the psychometric adequacy of the questionnaire. Finally, no other known risk factors for an increase in the risk of suicide among adolescents were investigated, such as a family history of suicide.

Nonetheless, the present findings are reliable due to the methodological rigour and statistical analyses employed. Moreover, this study overcame some limitations found in previous investigations, as this is the first population-based study to investigate the relationship between symptoms of eating disorders and the risk of suicide among adolescents while also considering depressive symptoms.

Conclusion

The risk of suicide is not restricted to clinical samples of adolescents with eating disorders and can also be detected in non-clinical samples. The risk is higher among adolescents with symptoms of both eating disorders and depression, with a 61.9% probability for those with positive results on the EAT-26 scale and a 63.4% probability for those with positive results on the BITE scale. Thus, greater attention should be given to individuals with symptoms of eating disorders and depression, as these factors combined can increase the risk of suicide. Therefore, inadequate eating behaviour among adolescents should be investigated to guide future suicide prevention strategies.

Disclosure of interest

The authors declare that they have no competing interest.

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