Original article

Depression rating scales as screening tools for depression in high school students

Escalas psicométricas como instrumentos de rastreamento para depressão em estudantes do ensino médio

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Abstract

Background: Depression is a major cause of suicide among adolescents. Therefore, it is crucial to find suitable depression screening tools for this population. **Objective:** To evaluate the use of depression rating scales as screening tools for depression in a sample of Brazilian high school students. **Methods:** A cross--sectional study. Three scales (BDI, CES-D, and CRS) and a screening test for general psychiatric symptoms (SRQ) were administered to a sample of 503 high school students aged between 15 to 17 years. The results were compared to those obtained with the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). **Results:** The prevalence of major depression using DSM-IV criteria was 10.9%. Adolescents with major depression had significantly higher (p = 0.001) scores in the SRQ and in the three scales analyzed compared to the group without depression. The sensitivity and specificity of BDI, CES-D, and CRS were 0.77 and 0.70, 0.75 and 0.73, and 0.82 and 0.71, respectively, to screen for major depression (ROC curve). The best cutoff values to suggest depression were 9 for BDI, 10 for CSR, and 14 for CES-D. The frequency of depressive symptoms was higher in girls (approximately 2:1). **Discussion:** The present findings support the use of the BDI, the CES-D and the CRS only for screening or as an additional symptomatic evaluation of depression in high school student. The difference in scale scores between boys and girls warns against the use of the same cutoff values for both sexes.

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Keywords: Depression, adolescent, scales, diagnosis, prevalence.

Resumo

Contexto: A depressão é uma importante causa de suicídio em adolescentes. Portanto, são necessários instrumentos adequados para o rastreamento da depressão nessa população. **Objetivo:** Avaliar escalas de depressão como instrumentos de rastreamento para depressão em estudantes brasileiros do ensino médio. **Métodos:** Estudo transversal. Três escalas (BDI, CES-D, e CRS) e um teste para avaliar sintomas psiquiátricos gerais (SRQ) foram aplicados individualmente a 503 estudantes do ensino médio com idades entre 15 e 17 anos. Os resultados foram comparados aos obtidos com os critérios de depressão maior do manual diagnóstico e estatístico de transtornos mentais (DSM-IV). **Resultados:** A prevalência de depressão maior utilizando-se os critérios do DSM-IV foi de 10,9%. Adolescentes com depressão maior apresentaram escores significativamente mais altos (p = 0,001) no SRQ e nas três escalas avaliadas em comparação ao grupo sem depressão. A sensibilidade e a especificidade para identificar depressão pelo BDI, CES-D e CRS foram, respectivamente, 0,77 e 0,70, 0,75 e 0,73 e 0,82 e 0,71 (curva ROC). Os melhores pontos de corte foram 9 para o BDI, 10 para a CRS e 14 para a CES-D. A frequência de sintomas depressivos foi maior em meninas (aproximadamente 2:1). **Conclusão:** Esses achados indicam o uso do BDI, da CES-D e da CRS apenas para o rastreamento, ou como uma avaliação sintomática adicional, da depressão em estudantes do ensino médio. A diferença entre meninos e meninas com relação aos escores nas escalas alerta contra o uso dos mesmos valores de corte para ambos os sexos.

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Palavras-chave: Depressão, adolescente, escalas, diagnóstico, prevalência.

Introduction

The prevalence of depression has increased since the second half of the 20th century, while age at onset has dropped[1,2]. Depression is currently one of the most important causes of suicide among young adults and adolescents, together with poor academic performance, drug abuse and addiction[3].

In Brazil, suicide is the third leading cause of death among adolescents, second only to traffic accidents and homicide[4]. A community-based epidemiological survey in Brazil has identified a prevalence of 10.9% for major depression in adults[5]. However, to our knowledge, there have been no studies to estimate the rate of depressive disorders during late adolescence (15 to 17 years) in this country[1]. In fact, there is a dearth of studies on depression in this age group. One previous study[6] has found that approximately one in eight (12.7%) of children or adolescents has a psychiatric disorder[6]. A study of pregnant adolescents[7] points out that this figure could be even higher, about 14.7%[8].

It may be useful to screen for depression in adolescents, and self--report scales can be advantageously used for that purpose. The Beck Depression Inventory (BDI) has been recently applied to pregnant teenagers[9], as well as in a primary care setting[10]. This measure correlated well with the prevalence of depression determined by clinical interviews[11]. The Center for Epidemiologic Studies Depression Scale (CES-D) was studied in a Brazilian sample of college students (aged between 17 and 39 years). The results showed a similar performance for this scale in college students as that encountered in previous studies involving the general population[12].

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The purpose of this study was to evaluate the value of depression self-report scales – Beck Depression Inventory (BDI), Carroll Rating Scale (CRS) and Center for Epidemiological Studies for Depression (CES-D) – as screening tools for major depression in high school students.

Methods

A cross-sectional study was carried out with high school students in the city of Porto Alegre, southern Brazil. The population included the 451,605 students enrolled in state and private high schools at the time of the study. The size of the sample – 503 students – was defined in a pilot study and calculated based on official estimates issued by the State Department of Education to detect a prevalence between 10 and 14% of depressive symptoms, with an error of 10% and a 95% confidence interval (95% CI).

Seven public schools and two private schools were randomly chosen taking into account the rate of public to private schools in the state. The participating students were also randomly selected. The only exclusion criterion was being younger than 15 years of age or older than 17 years of age. There were no refusals to participate.

Instruments

Center of Epidemiologic Studies-depression (CES-D): the CES-D is a self-rating 20-item scale designed to measure symptoms of depression in community populations. Respondents rate items by recalling the past week and using a four-point response scale[12,13]. This instrument has been validated and translated into Brazilian Portuguese[12].

Beck Depression Inventory (BDI): a self-report, 21-item instrument that evaluates depressive symptoms in the weeks preceding its use. It has been translated/validated into Brazilian Portuguese[14,15].

Carroll Rating Scale (CRS): a self-rating instrument for depression, closely matching the information content and specific items of the Hamilton rating scale for depression[13].

Self-Report Questionnaire (SRQ-20): the SRQ-20 was developed by the World Health Organization (WHO) to evaluate common mental disorders in developing countries. The scale includes 20 dichotomous (yes/no) items that evaluate several aspects of mental health[16].

The instruments were given in a room provided by the school exclusively for that purpose. Each student was interviewed individually for 30 to 40 minutes and the BDI[17], CES-D[13], and CRS[18] were administered. Major depression was assessed by DSM-IV criteria by a senior child and adolescent psychiatrist and trained interviewers (medical students). General psychiatric symptoms were evaluated using the SRQ-20, with cutoff values of 7 for males and 8 for females to indicate suspicion of mental disorder as an alternative criterion to evaluate whether dysphoria, and not only major depression could possibly affect rating scale scores[19]. Brazilian Association of Market Institutes criteria were used to determine social class[20].

All investigators received training in the administration of the DSM-IV to screen major depression (kappa agreement coefficient > 0.85)[21].

Statistical analysis

The Student's *t* test was used for comparisons between parametric data, and the chi-square test for categories. Two-factor ANOVA was employed to compare depression scores between groups with control for sex. The diagnostic power of the scales to screen major depression (DSM-IV) was determined based on sensitivity and specificity calculations. The best sensitivity and specificity to identify major depression were defined by receiver operating characteristic (ROC) curve. Statistical analyses were carried out with the Statistical Package for the Social Sciences (SPSS version 18.0) and Epi-Info.

The parents of all participants were notified for consent. The investigation was approved by the Research and Ethics Committee at the authors' institution (protocol no. 93-036) and by the participating schools.

Results

Of 503 adolescents, 60 (11.9%) met DSM-IV criteria for major depression, whereas 382 (75.9%) did not fulfill depression criteria, and 61 (12.2%) were classified as having depression due to other causes, mixed episodes, bereavement, or could not be classified.

The main characteristics of the sample according to the presence or absence of major depression appear in table 1. For the overall sample, mean BDI score (±SD) was 8.01 ± 7.94; CES-D and CRS scores were 11.75 ± 9.80 and 9.46 ± 6.91, respectively. The score of the screening test for general psychiatric symptoms (SRQ-20) was 5.60 ± 3.40.

Female adolescents had higher mean scores in all scales (Table 2). Age, schooling (Student's *t* test, p > 0.005) and social class (chi-square test, p > 0.05) were similar in students with major depression and in non-depressed participants, while sex (chi-square test, p = 0.002) and report of previous neurological/psychiatric disorder (chi-square test, p = 0.005) were significantly different (Table 1).

Diagnostic value of scales

According to ROC analysis, the best cutoff points to identify major depression were 9 for the BDI (sensitivity = 0.72; specificity = 0.74); 14 for the CES-D (sensitivity = 0.73; specificity = 0.76); and 10 for the CRS (sensitivity = 0.78; specificity = 0.74) (Figure 1). The prevalence of depression according to either the DSM-IV or the depression scales under study was similar, ranging from 25 to 32% in males and 39 to 45% in females.

Table 1. Demographic and clinical characteristics and mean depression scales of high-school adolescents with or without major depression according to the DSM-IV criteria

Variable	Depressed (n = 60)	Nondepressed (n = 382)
Age (mean ± SD)	16.017 ± 0.813	16.065 ± 0.844
Sex (n,%)		
Male	13 (21.7%)*	168 (44%)*
Female	47 (78.3%)	214 (56%)
Social class† (n,%)		
A	20 (33.3%)	123 (32.5%)
B	14 (23.3%)	123 (32.5%)
C+D	26 (43.3%)	132 (34.9%)
Schooling (mean ± SD)	8.600 ± 0.741	8.766 ± 0.821
Parental marital status (n,%)		
Married	42 (70%)	248 (65.3%)
Divorced	15 (25%)	106 (27.9%)
Single	03 (5%)	026 (6.8%)
Parental occupation (n,%)		
Currently employed	57 (96.6%)	368 (97.1%)
Unemployed	02 (3.4%)	011 (2.9%)
History of psychiatric or neurological disorder (n,%)		
Yes	13 (21.7%)‡	033 (8.7%)‡
No	47 (78.3%)	348 (91.3%)
Scales (mean ± SD)		
BDI	14.18 ± 8.5	6.18 ± 6.84§
CES-D	19.53 ± 10.37	9.54 ± 8.25§
CRS	15.63 ± 7.49	7.55 ± 5.43§
SRQ	7.66 ± 3.54	3.72 ± 2.90§

BDI: Beck Depression Inventory; CES-D: Center for Epidemiological Studies for Depression; CRS: Carroll Rating Scale; SD: Standard Deviation; SRQ: Self-Report Questionnaire.
* Chi-square = 9.773; p = 0.002.
† Social class defined according to Associação Brasileira de Institutos de Pesquisa de Mercado (ABIPEME)[12].
‡ Chi-square = 8.044; p = 0.005.
§ p = 0.0001.

Table 2. Mean scores of BDI, CES-D and CRS according to sex*

Scales	Boys (n = 192)	Girls (n = 311)	IC 95%	p
BDI	6.32 ± 7.17	9.06 ± 8.22	-4.61 to -1.54	0.0001
CES-D	9.47 ± 8.84	13.5 ± 10.10	-5.10 to -1.34	0.001
CRS	7.67 ± 5.62	10.57 ± 7.40	-3.84 to -0.10	0.001
SRQ	3.61 ± 3.14	5.20 ± 3.42	-2.19 to -0.10	0.001

BDI: Beck Depression Inventory; CES-D: Center for Epidemiological Studies for Depression; CRS: Carroll Rating Scale; IC 95%: 95% confidence interval.
* Controlled for sex: Beck Depression Inventory (BDI); Carroll Rating Scale (CRS); Center for Epidemiological Studies for Depression (CES-D); Self-report Questionnaire (SRQ).
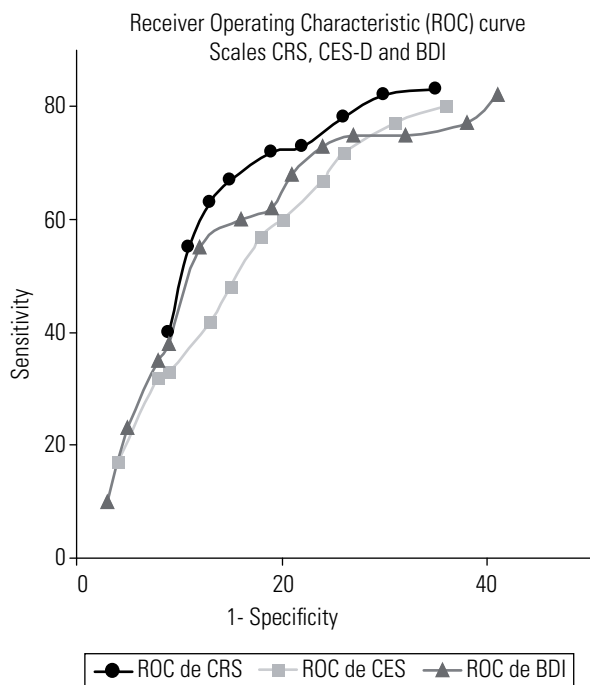
Figure 1. Receiver operating characteristic (ROC) curves for Carroll Rating Scale (CRS), Center for Epidemiological Studies for Depression (CES-D), and Beck Depression Inventory (BDI).

Discussion

In our sample, the prevalence of major depression was similar to that detected in other studies[22]. Our findings also suggest that the BDI, CRS, and CES-D depression rating scales may be useful as an adjunct tool to screen for major depression episodes as defined by DSM-IV criteria in adolescents. The mean BDI score was 8, similar to the results reported by other studies[11,23]. The mean CES-D score was 12, slightly lower than those observed by other investigators (ranging from 15.5 in boys to 18.1 in girls for CES-D)[24,25]. Also, mean CRS was 9.5, lower than the 17 reported by the only study published so far using CRS in adolescents[26].

The sensitivity and specificity achieved by these scales was not sufficient to warrant their use in clinical practice without the support of other diagnostic tools: taking into consideration the best cutoff values identified on ROC analysis, sensitivity ranged from 0.72 to 0.78 and specificity from 0.74 to 0.76 (Figure 1, which may explain their limited use as screening tests for depression[27]. The CRS, which had the best sensitivity and specificity (0.78 and 0.74, respectively), has seldom been used to diagnose depression in adolescents[26].

The fact that female adolescents scored higher than male adolescents may be reflecting two situations. First, depression is more prevalent in female adolescents[23,28]. Second, and probably more importantly, there are gender-biased items in these scales (for ins-

tance: fear, loneliness, crying, weight loss, fatigue, dizziness, suicide ideation, irritation and appetite loss) that are known to have greater value for girls. This aspect should be carefully considered in the selection of cutoff values[29,30].

The evaluation of the diagnostic properties of depression rating scales using semi-structured interviews[31], such as the schedule for affective disorders and schizophrenia epidemiological version for school-age children (K-SADS) and the DSM, as gold standard[32], has shown the limited clinical applicability of these scales for diagnosing depression. One aspect to consider is whether this poor diagnostic performance results from limitations inherent to the scales, or to the gold standards themselves, particularly the DSM-IIIR and DSM-IV, since they are not specifically designed to assess depression in children and adolescents[33]. In fact, that would underscore the applicability of these scales for depression screening before the onset of a diagnostic procedure.

A high rate of individuals screened positive for major depression using both the cutoff points suggested in the literature (10 for BDI and CRS, and 16 for CES-D) and those suggested in this study (9 for BDI, 10 for CRS, and 14 for CES-D). Thus, according to our results, one-third of the sample would be at risk for a depressive syndrome or, at least, mild symptoms of depression. Although a similar prevalence of depressive symptoms has been detected in other investigations[25,28,34,35], our results differ significantly from previous reports in the literature regarding the diagnosis of major depression in the adolescent population (ranging from 0.4% to 8.3%)[23,36]. A possible explanation for the increased depression rates in our sample could be the fact that the rating scales were more likely to estimate general psychiatric symptoms rather than depression itself. Studies of depression in adolescents found that only 13% to 25% of individuals initially identified as depressed by the CES-D actually had depression[37]. In adolescents, the presence of comorbidities, especially anxiety and conduct disorder, could also result in increased scores. The diagnostic inaccuracy in evaluating major depression is associated with the low specificity observed in our sample. This effect may be explained by the amount of anxiety or behavior disorders experienced by adolescents with depression. Moreover, adolescents seem to frequently experience affective instability as well, which may lead to an exaggerated self-perception while answering depression instrument questions[38].

One limitation of this study is the fact that it was conducted exclusively with high school adolescents from Porto Alegre. Therefore, even though the sample was representative, our findings cannot be generalized to the overall population of Brazilian adolescents. In addition, one of the instruments has not been fully validated for use in Brazilian adolescents (CRS), and the use of cutoff values from other countries may not be adequate for this specific population, since people from different cultures usually have different understanding and expectations.

Conclusion

In our sample, the prevalence of major depression was similar to that reported in other studies. The present findings do not support the use of the BDI, the CES-D or the CRS alone to diagnose depression in high school students, only for screening or as an additional symptomatic evaluation. The difference in scale scores between boys and girls warns against the use of the same cutoff values for both sexes. Additional longitudinal investigations in similar settings are needed to confirm the present findings.

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