PEDIATRICS®
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

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Pediatrics 2005;116;78
DOI: 10.1542/peds.2004-1537

Adverse Health Consequences That Co-occur With Depression: A Longitudinal Study of Black Adolescent Females

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ABSTRACT. ***Objective.*** **The purpose of this study was to identify adverse health consequences that may co-occur with depression among black female adolescents.**

Methods. **Adolescents were recruited from high-risk neighborhoods in Birmingham, Alabama. The sample comprised 460 black female adolescents (aged 14–18 years) who completed assessments at baseline and at 6 and 12 months. Only adolescents who consistently scored above the threshold for depression at all 3 assessments (n = 76) or below the threshold at all 3 assessments (n = 174) were included (N = 250) in the data analysis. Within this sample, adolescents who were depressed were compared with those who were not depressed with respect to the following health consequences: low self-esteem, emotional abuse, physical abuse, verbal abuse, poor body image, and antisocial behavior.**

Results. **Using generalized estimating equations and controlling for covariates, depressed adolescents were 5.3 times more likely to report low self-esteem, 4.3 times more likely to report emotional abuse, 3.7 times more likely to report being physically abused, and almost 3 times as likely to report being verbally abused. Furthermore, depressed adolescents were more than twice as likely to report poor body image and nearly twice as likely to report engaging in antisocial behaviors.**

Conclusions. **The findings suggest that a broad range of adverse health consequences may accompany depression among black female adolescents. Physicians need to be alert to the co-occurrence of depression and low self-esteem; emotional, physical, and verbal abuse; poor body image; and antisocial behaviors among this population.** ***Pediatrics*** **2005;116:78–81;** ***adolescent depression, adolescent health, adolescent sexual behavior, adverse outcomes, black.***

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Accepted for publication Oct 14, 2004.
doi:10.1542/peds.2004-1537
No conflict of interest declared.

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ABBREVIATIONS. CES-D, Center for Epidemiological Studies Depression Scale; GEE, generalized estimating equations.

One of the most consistent findings in the adolescent literature is the higher prevalence of depression among girls compared with boys.[1–5] Moreover, this gender difference in prevalence rates continues into adulthood.[6] Few studies, however, have examined the association between black female adolescents' depression and the co-occurrence of adverse health consequences.

Depression has been associated with diverse adverse health consequences, including greater use of alcohol,[7] increased sexually transmitted disease/HIV-related behaviors,[8,9] eating disorders,[10] sexual and physical abuse, and poor school performance.[11] The relationship between adolescent depression and adverse health consequences has been examined primarily in clinic-based samples. Although these studies consistently document a relationship between depression and adolescents' adverse health consequences, the findings are limited by the clinical nature of these samples. Furthermore, most studies that have examined these relationships have used a cross-sectional research design with a single assessment point. Given the high prevalence of depressive symptoms among black female adolescents,[12] investigations that include a broader community representation of adolescents and that incorporate repeated measures designs are needed. Accordingly, the purpose of this study was to identify prospectively adverse health consequences that may co-occur with depression among a diverse sample of black female adolescents.

METHODS

Study Sample

From December 1996 through April 1999, project recruiters screened teens in adolescent school health classes, girls clubs, and medical clinics to determine their eligibility for participation in an sexually transmitted disease/HIV prevention trial. Adolescents were eligible to participate in the study when they were black girls, were between the ages of 14 and 18 at the time of enrollment, were sexually active in the previous 6 months, and provided written informed consent. More than half of the teens screened, 609 (53.9%), were eligible, and of these, 522 (85.7%) agreed to participate in the study. The majority of eligible teens who did not participate in the study were unavailable because of conflicts with their employment schedules.

Study Design

The present study was part of a larger, intervention study. The study was designed to test for co-occurrences over 3 waves of data collection. Co-occurrence suggests that adolescents experience depression and any of the assessed adverse health outcomes simultaneously. Rather than an academic pursuit of determining cause and effect, we were concerned with identifying adverse health consequences that may accompany depression among black female adolescents.

A total of 460 adolescents completed baseline plus 6- and 12-month follow-up assessments. For providing a robust basis for comparing depressed with nondepressed adolescents, adolescents with depression scores that were "mixed" (ie, depressed at one time point but not another) were not included in the analysis. Thus, the analytic sample was composed of adolescents who were characterized into 2 groups: (1) consistently depressed at baseline and 6- and 12-month assessments ($n = 76$) and (2) consistently not depressed at the baseline and 6- and 12-month assessments ($n = 174$). This design allowed for a comparison of adverse health outcomes (occurring 1, 2, or 3 times during the 12-month period of observation) between adolescents who were consistently depressed versus those who were consistently not depressed. Thus, depression may be viewed (in the context of this design) as a stable construct and the adverse health outcomes as constructs that were free to vary. This design enabled us to identify forms of psychosocial burden that may accompany depression among black female adolescents.

Measures

Depression

Depression was assessed by using the Center for Epidemiological Studies Depression Scale (CES-D).[13–15] The CES-D is 1 of the most frequently used self-report scales developed specifically as a screening instrument for depression in the general population. The instrument is not a psychiatric diagnostic tool and, thus, does not measure the presence of clinical depression. However, individuals who are classified as being depressed by the CES-D and are not clinically depressed are nonetheless likely to experience substantial psychosocial dysfunction.[16] Thus, in this study, depression is considered a form of psychosocial impairment (ie, depressed affect) rather than clinical depression.

The CES-D has been shown to have desirable psychometric properties, including good internal consistency, acceptable test-retest reliability, and a high correlation with clinical diagnosis of depression.[14,17–20] Although originally designed as a dimensional assessment of depression in adults, the instrument has also been used to screen for depression in children and adolescents,[21–23] in whom it has similar psychometric properties to those shown in adults.[24] The CES-D has demonstrated the ability to discriminate children with depressive disorders from those without psychopathology,[22,23] to be valid for black individuals, to discriminate depressive disorders from other forms of psychopathology,[24,25] and to have substantial correlations with other self-report measures of depressive symptoms and clinical ratings of depression, supporting the scale's validity.

The present study used the brief version of the CES-D. This version has 8 items and is highly correlated ($r = 0.93$) with the full 20-item scale. Sample items included, "I felt that I could not shake off the blues even with help from my family and friends," and, "I thought my life had been a failure." Adolescents report the frequency with which they experienced 8 depressive symptoms during the 7 days before assessments on a 4-point Likert scale ranging from 0 (<1 day) to 3 (5–7 days). A composite score is calculated by summing item responses (range: 0–24). Adolescents were categorized according to the recommended criterion for depression, with adolescents who had composite scores of ≥7 being defined as depressed and adolescents with scores <7 defined as not depressed.[26] The internal consistency of the scale with the present sample of black female adolescents was 0.83 and 0.87, respectively, for the 6- and 12-month follow-up assessments.

Adverse Health Consequences

The survey assessed a range of psychosocial burdens, including reports of verbal, emotional, and physical abuse in the past 6 months (eg, "In the past 6 months, has a boyfriend verbally abused you?"); antisocial behavior; self-esteem; and body image. Antisocial behavior was defined as having ever hit a teacher, been arrested, or been in a gang (eg, "Have you ever been in a gang?"). Adolescents who reported any of these behaviors were categorized as engaging in antisocial behavior.

Self-esteem was assessed using the Rosenberg self-esteem scale.[27] This scale has been used widely with diverse populations (including black female adolescents) and has demonstrated satisfactory internal consistency in the present study ($\alpha = .79$). The distribution of self-esteem scores was markedly skewed; thus, adolescents were classified as having "high" or "low" self-esteem on the basis of a median split of the distribution of self-esteem scores.

Body image was assessed using a modified version of the Ben-Tovim Walker Body Attitudes Questionnaire.[28] The body image scale had acceptable internal consistency ($\alpha = .71$). The distribution of body image scores was also skewed; thus, adolescents were classified as having "good" or "poor" perceptions of their body image on the basis of a median split of the distribution of body image scores. The median split was computed for the sample of 250 adolescents.

Sociodemographic Characteristics

The survey also assessed sociodemographic characteristics such as age, education, and whether the adolescent's family received government assistance.

Data Analysis

The multivariate technique of generalized estimating equations (GEE)[29–31] was used to examine the relationships between subsequent reported depression and reported adverse health outcomes while accounting for the longitudinal design of the study. Because adolescents were assessed at 2 points during the follow-up period, an autoregressive correlation structure was used to control for the correlation between assessments of reported depression and reported adverse health outcomes at any number of the 3 assessment periods. A separate GEE model was constructed for each adverse health outcome considered. Each analysis yielded a single odds ratio estimate for depressed adolescents who reported 1 or more occurrence of any given adverse health outcome compared with nondepressed adolescents. In addition, because the present study was part of a larger, intervention study, we controlled statistically for treatment condition in each GEE model. Analyses were performed using Stata statistical software package, version 7.[32]

RESULTS

Characteristics of the Sample

Table 1 displays characteristics of the adolescents on the basis of data collected at the baseline assessment.

Identification of Sociodemographic Covariates

In baseline univariate analyses, depression was not associated with age, school attendance, dropping out of school, or socioeconomic status; however, age and family income have been previously identified

TABLE 1. Sample Characteristics at Baseline ($N = 250$)

Sample Characteristics	%	*n*
Currently attending school	83.2	208
Living arrangements		
With father and mother	31.4	64
With single parent, relative, or boyfriend	68.6	140
Currently in a relationship	84.8	212
Anyone in family currently receiving AFDC	15.7	39
Currently holding a paying job	18.5	46
Multiple sex partners in past 6 mo	10.0	25
Biologically confirmed STDs (gonorrhea, trichomonas, or chlamydia)	29.2	71

AFDC indicates Aid to Families With Dependent Children; STD, sexually transmitted disease.

as being associated with depression and adverse health outcomes[18] and therefore were included in all GEE models as covariates. Temporary Assistance to Needy Families was assessed as a measure of socioeconomic status at baseline as well as at 6 and 12 months. Although this measure remains generally stable over time, GEE analyses included the Temporary Assistance to Needy Families measure collected at the 6- and 12-month periods. Finally, treatment condition was included as a covariate to control for potential effects of the intervention versus comparison treatments.

GEE Analyses

Adolescents who were classified as being depressed, relative to those who were classified as not being depressed, were significantly more likely to report each of the adverse health consequences assessed during the 12-month observation period. Depression was most strongly associated with adolescents' reporting low self-esteem. Compared with adolescents who were not depressed, depressed adolescents were ~5.3 times more likely to report low self-esteem ($P = .0001$). Furthermore, adolescents who reported being depressed were 4.3 times more likely to report the experience of emotional abuse during the 12-month follow-up ($P = .001$), >3 times as likely to report the experience of physical abuse ($P = .002$), and almost 3 times as likely to report the experience of verbal abuse ($P = .007$). Depressed adolescents were more than twice as likely to report poor body image ($P = .0001$) and 1.8 times as likely to report engaging in antisocial behaviors ($P = .025$; Table 2).

DISCUSSION

The findings corroborate and extend the research literature by identifying several adverse health consequences that may accompany depression among black female adolescents. Although depression may enhance adolescents' vulnerability for any or all of these health consequences, these various health consequences may also exacerbate existing depression. From a clinical perspective, however, separating cause and effect may be less important than understanding that relatively stable levels of depression among black female adolescents suggests 2 clear opportunities for intervention: (1) intervention designed to alleviate depression and (2) intervention designed to address the adverse health consequences (eg, low self-esteem, poor body image, forms of being abused, antisocial behavior).

TABLE 2. Multivariable Analyses Using GEE to Examine the Association Between Depression and Adverse Health Outcomes During the 12-Month Follow-up Period

Psychosocial Burdens	Multivariable Analyses		*P*
	AOR*	95% CI	
Low self-esteem	5.31	3.29–8.55	.0001
Emotional abuse	4.28	1.88–9.71	.001
Physical abuse	3.72	1.62–8.53	.002
Verbal abuse	2.84	1.33–6.07	.007
Poor body image	2.26	1.48–3.45	.0001
Antisocial behavior	1.81	1.08–3.03	.025

AOR indicates adjusted odds ratio; CI, confidence interval.
* Adolescents in the "no depression" group are the referent for calculation of the AOR. Adjusted by adolescents' age, group assignment (intervention or comparison), and socioeconomic status.

Increasing evidence suggests that mental disorders are often present at or near the time when adolescents experience adverse health outcomes such as the forms of psychosocial burden identified in this study. Whether psychopathology is preexistent, cooccurs with adverse health outcomes, or is 1 of its consequences is a complex question that awaits additional, more detailed, study. Nonetheless, evidence suggests that most adverse health outcomes do not occur alone; rather, they often cluster with other adverse health outcomes and psychopathology.[33,34] Thus, future research should investigate other forms of psychosocial burden and various forms of health risk behavior that may accompany depression among black female adolescents.

Pediatricians, adolescent medicine specialists, and family practitioners have an integral role to play in adolescent health promotion[35,36] as they are primarily responsible for providing care to adolescents. Moreover, pediatricians can assess adverse health outcomes and provide adolescents with preventive education, risk-reduction counseling, and referral for a more detailed psychiatric evaluation and specialized counseling.[37–42] Specifically, findings from this study suggest that screening for depression is a critically important practice because depression may serve as a marker of other mental health problems (eg, low self-esteem, poor body image), abuse (eg, emotional, verbal, or physical abuse from a boyfriend), or antisocial behaviors. To the extent that these forms of psychosocial burden may, in turn, lead adolescents to engage in health risk behaviors, depression may indeed spawn a cascade effect that culminates in negative health status. Because the CES-D is only an 8-item measure, it can be easily incorporated into clinical protocols, as either a self-administered instrument or an interview during the intake procedure or comprehensive medical history, thus allowing clinicians to screen adolescents efficiently in general medical settings.

Limitations

The present study is not without limitations. Several studies report a modest relationship between the CES-D and a diagnosis of depression from a structured clinical interview.[15,43] Adolescents with scores above the CES-D criterion may not meet diagnostic criteria for a "clinical case"; however, there are likely important psychological differences between those who score above and below the cutoff. Second, the CES-D assessed frequency of depressive symptoms over a 7-day period before completing each of the 3 assessments. Therefore, the CES-D may not be a valid measure of depressive symptoms during the entire follow-up period when adverse health outcomes may have occurred. Recent evidence, however, suggests that depressive symptoms are relatively stable throughout adolescence.[44] Finally, the findings may not be generalized to other racial/

ethnic groups. Additional research is needed to corroborate these findings with diverse adolescent populations.

CONCLUSIONS

Within the limitations of the study, the findings provide insight into clinical and preventive issues related to depression among black female adolescents. Adverse health consequences may accompany adolescents' depression. Physicians need to be alert to the occurrence of depression among this population and the potential significance of these symptoms, in particular, their co-occurrence with various forms of psychosocial burdens.

ACKNOWLEDGMENT

This study was supported by a grant from the Center for Mental Health Research on AIDS, National Institute of Mental Health (1R01 MH54412).

REFERENCES

1. Wichstrom L. The emergence of gender difference in depressed mood during adolescence: the role of intensified gender socialization. *Dev Psychol.* 1999;232–245
2. Rutter M. The developmental psychopathology of depression: issues and perspectives. In: Rutter M, Izard CE, Read PB, eds. *Depression in Young People*. NY: Guilford Press; 1986:3–30Clinical and Developmental Perspectives. New York
3. Kandel DB, Davies M. Epidemiology of depressed mood in adolescents. An empirical study. *Arch Gen Psychiatry.* 1982;39:1205–1212
4. Verhulst FC, Prince J, Vervuurt-Poot C, de Jonge J. Mental health in Dutch adolescents: self-reported competencies and problems for ages 11–18. *Acta Psychiatr Scand.* 1989;80(suppl 356):1–47
5. Compas B, Oppedisano G, Connor JK, et al. Gender differences in depressive symptoms in adolescence: comparison of national samples of clinically referred and nonreferred youths. *J Consult Clin Psychol.* 1997;617–626
6. Nolen-Hoeksema S. Sex differences in unipolar depression: evidence and theory. *Psychol Bull.* 1987;101:259–282
7. Goodman E, Huang B. Socioeconomic status, depressive symptoms, and adolescent substance use. *Arch Pediatr Adolesc Med.* 2002;156:448–453
8. Ramrakha S, Caspi A, Dickson N, Moffitt TE, Paul C. Psychiatric disorders and risky sexual behaviour in young adulthood: cross sectional study in a birth cohort. *BMJ.* 2000;321:263–266
9. Shrier LA, Harris SK, Beardslee WR. Temporal associations between depressive symptoms and self-reported sexually transmitted disease among adolescents. *Arch Pediatric Adolesc Med.* 2002;156:599–606
10. Newman DL, Moffitt TE, Caspi A, Magdol L, Silva PA, Stanton WR. Psychiatric disorder in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from age 11 to 21. *J Abnorm Psychol.* 1996;107:305–311
11. Glied S, Pine DS. Consequences and correlates of adolescent depression. *Arch Pediatr Adolesc Med.* 2002;156:1009–1014
12. Wight RG, SepÚlveda JE, Aneshensel CS. Depressive symptoms: how do adolescents compare with adults? *J Adolesc Health.* 2004;34:314–323
13. Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. *Appl Psychol Measur.* 1977;1:385–401
14. Radloff LS. The use of the Center for Epidemiologic Studies Depression Scale in adolescents and young adults. *J Youth Adolesc.* 1991;20:149–166
15. Roberts RE, Vernon SW. The Center for Epidemiologic Studies Depression Scale: its use in a community sample. *Am J Psychiatry.* 1983;140:41–46
16. Gotlib IH, Lewinsohn PM, Seeley JR. Symptoms versus a diagnosis of depression: differences in psychosocial functioning. *J Consult Clin Psychol.* 1995;63:90–100
17. Lewinsohn PM, Seeley JR, Roberts RE, Allen NB. Center for Epidemiological Studies Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults. *Psychol Aging.* 1977;12:277–287
18. Myers JK, Weissman MM. Use of a self-report symptom scale to detect depression in a community sample. *Am J Psychiatry.* 1980;137:1081–1084
19. Zimmerman M, Coryell W. Screening for major depressive disorder in the community: a comparison of measures. *Psychol Assess.* 1994;6:71–74
20. Rushton JL, Forcier M, Schectman RM. Epidemiology of depressive symptoms in the national longitudinal study of adolescent health. *J Am Acad Child Adolesc Psychiatry.* 2002;41:199–205
21. Garrison CZ, Jackson KL, Marsteller F, McKeown RE, Addy CL. A longitudinal study of depressive symptomatology in young adolescents. *J Am Acad Child Adolesc Psychiatry.* 1991;29:581–585
22. Prescott CA, McArdle JJ, Hishinuma ES. Prediction of major depression and dysthymia from CES-D scores among ethnic minority adolescents. *J Am Acad Child Adolesc Psychiatry.* 1998;37:495–503
23. Roberts N, Vargo B, Ferguson HB. Measurement of anxiety and depression in children and adolescents. *Psychiatr Clin North Am.* 1990;12:837–860
24. Roberts RE, Andrews JA, Lewinsohn PM, Hops H. Assessment of depression in adolescents using the Center for Epidemiologic Studies Depression Scale. *Psychol Assess.* 1990;2:122–128
25. Berkman LF, Berkman CS, Kasl S, et al. Depressive symptoms in relation to physical health and functioning in the elderly. *Am J Epidemiol.* 1986;124:372–388
26. Melchior LA, Huba GJ, Brown VB, Reback CJ. A short depression index for women. *Educ Psychol Measur.* 1993;53:1117–1125
27. Rosenberg M. *Society and the Adolescent Self-Image.* Princeton, NJ: Princeton University Press; 1965
28. Ben-Tovim D, Walker M. The development of the Ben-Tovim Walker Body Attitudes Questionnaire (BAQ), a new measure of women's attitudes towards their own bodies. *Psychol Med.* 1991;21:775–784
29. Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika.* 1986;73:13–22
30. Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. *Biometrics.* 1986;42:121–130
31. Kleinbaum DG, Klein M. *Logistic Regression*. 2nd ed. New York, NY: Springer; 2002
32. *Stata Statistical Software* [computer software]. Release 7.0. College Station, TX: Stata Corporation; 2001
33. DiClemente RJ, Hansen W, Ponton L, eds. *Handbook of Adolescent Health Risk Behavior*. New York, NY: Plenum Publishing Corporation; 1996
34. Ponton L, DiClemente RJ. Adolescent risk-taking behavior: an overview. In: Kalogerakis M, Ratner R, Ponton L, Rosner R, Weinstock R, Sarles R, eds. *Textbook of Adolescent Psychiatry.* Washington, DC: American Psychiatric Association; 2003:93–100
35. Irwin CE. Topical areas of interest for promoting health: from the perspective of the physician. In: Millstein SG, Petersen AC, Nightingale EO, eds. *Promoting the Health of Adolescents*. New York, NY: Oxford University Press; 1993:328–332
36. Fisher M. Adolescent health assessment and promotion in office and school settings. *Adolesc Med.* 1999;10:71–86, vi
37. Klein JD. The National Longitudinal Study on Adolescent Health: preliminary results: great expectations. *JAMA.* 1997;278:864–865
38. Green M, Palfrey JS, Clarke EM. *Bright Future: Guidelines for Health Supervision of Infants, Children, and Adolescents.* Arlington, VA: National Center for Education in Maternal and Child Health; 1994
39. American Medical Association. *Guidelines for Adolescent Preventive Services*. Chicago, IL: American Medical Association; 1994
40. Millstein SG, Nightingale EO, Petersen AC, Mortimer AM, Hamburg DA. Promoting the healthy development of adolescents. *JAMA.* 1993;269:1413–1415
41. DiClemente RJ, Ponton LE, Hansen W. New directions for adolescent risk prevention and health promotion research and interventions. In: DiClemente RJ, Hansen W, Ponton LE, eds. *Handbook of Adolescent Health Risk Behavior*. New York, NY: Plenum; 1996:413–420
42. DiClemente RJ. The psychological basis of health promotion for adolescents. In: Fisher M, Juszczak L, Klerman LV, eds. *Prevention Issues in Adolescent Health Care*. Philadelphia, PA: Hanley & Belfus, Inc; 1999:13–22
43. Breslau N. Depressive symptoms, major depression, and generalized anxiety: a comparison of self-reports on CES-D and results from diagnostic interviews. *Psychiatry Res.* 1985;15:219–229
44. Orvaschel H, Lewinsohn PM, Seeley JR. Continuity of psychopathology in a community sample of adolescents. *J Am Acad Child Adolesc Psychiatry.* 1995;34:1525–1535

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