

Depressive Symptoms and Health-Related Quality of Life in Early Pregnancy

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OBJECTIVE: Depressive symptoms can be associated with lower health-related quality of life in late pregnancy. Few studies have quantified the effect of depressive symptoms in early pregnancy or among a racially and economically diverse group. Our goal was to estimate the independent association of depressive symptoms with health-related quality of life among a diverse group of women in early pregnancy.

METHODS: We conducted a cross-sectional study of 175 pregnant women receiving prenatal care in a community and university-based setting. We related the presence of depressive symptoms, defined as a Center for Epidemiologic Studies Depression Scale score of 16 or more to health-related quality of life scores from the 8 Medical Outcomes Study Short Form domains: Physical Functioning, Role-Physical, Bodily Pain, Vitality, General Health, Social Functioning, Role-Emotional, and Mental Health. Quantile regression was used to measure the independent association of depressive symptoms with each of the 8 domains.

RESULTS: The study sample was 49% African American, 38% white, and 11% Asian. Mean (\pm standard deviation) gestational age was 14 ± 6 weeks. The prevalence of depressive symptoms was 15%. Women with depressive symptoms had significantly lower health-related quality of life scores in all domains except Physical Functioning.

After adjustment for sociodemographic, clinical, and social support factors, depressive symptoms were associated with health-related quality of life scores that were 30 points lower in Role-Physical, 19 points lower in Bodily Pain, 10 points lower in General Health, and 56 points lower in Role-Emotional.

CONCLUSION: Women in early pregnancy with depressive symptoms have poor health-related quality of life. Early identification and management of depressive symptoms in pregnant women may improve their sense of well-being.

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LEVEL OF EVIDENCE: II-2

Pregnancy is a common event among reproductive-age women and is often thought to be a time of happiness for the expectant mother. However, studies suggest that physical functioning and perceptions of well-being among women in the latter stages of pregnancy and the puerperium is lower compared with the prepregnancy period.^{1–4} Haas and colleagues³ reported lower physical functioning and poorer perceptions of health among women in the second and third trimesters of pregnancy compared with their prepregnancy state. Studies also suggest that depressive symptoms are highly prevalent during late pregnancy and the postpartum period.^{2,5–7} Zayas and colleagues⁵ found that 50% of pregnant women in the third trimester had depressive symptomatology. A meta-analysis⁷ found depression rates of 12% and 14% in the second and third trimesters, respectively.

Despite the documentation of poorer functioning and prevalent depressive symptomatology, only a few studies have examined the association of depressive symptoms with health-related quality of life in pregnancy. These studies, however, have limited generalizability, because most analyses were conducted among white, middle-class samples^{1,8,9} or in late pregnancy. Fewer data exist for racially and economically diverse samples² or among women in the first or

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second trimesters of pregnancy. Because obstetrician-gynecologists are the primary physicians providing care to reproductive-age women, it is important for them not only to be aware of the prevalence of depressive symptoms but also to have knowledge of the potential effect of depressive symptoms on health-related quality of life and the need for timely intervention.

As shown in the conceptual model (Fig. 1), our hypothesis was that depressive symptoms have an independent association with health-related quality of life in early pregnancy. Our objectives were to 1) estimate the prevalence of depressive symptoms in early pregnancy and 2) describe differences in health-related quality of life among women with and without depressive symptoms. If significant differences were found, our final objective was to identify confounding factors (patient characteristics, clinical factors, social support) that might account for these differences or estimate the independent association of depressive symptoms with health-related quality of life. If depressive symptoms are independently associated with health-related quality of life, obstetricians would need to focus on medical therapy or appropriate mental health referrals.

PATIENTS AND METHODS

We conducted a cross-sectional study of 175 women in early pregnancy to estimate the prevalence of depressive symptoms and the association of depressive symptoms with health-related quality of life. This

analysis was conducted as part of the Health status in Pregnancy Study, a longitudinal study of functional health status during pregnancy among a diverse sample of pregnant women in Baltimore City. The Institutional Review Board of the Johns Hopkins University School of Medicine approved the study.

All women presenting for care at 2 outpatient settings in Baltimore city at a gestational age of 20 weeks or less were eligible for inclusion in the study. Women were recruited over a 10-month period between July 24, 2004, and May 31, 2005. Written informed consent was obtained from each participant by a trained interviewer. One clinic was located on the university campus. The second clinic was located in the surrounding community within 2 miles of the university hospital. These clinics provide prenatal care to a racially diverse population and include women with Medicaid and commercial insurance.

Gestational age at recruitment was based on the last menstrual period (LMP), first trimester ultrasound assessment if it had already been obtained, or both. Gestational age was later confirmed through a review of the electronic medical record and was based on either the obstetrician's assessment of the LMP or both the LMP and obstetric ultrasound assessment. If there was a discrepancy between the gestational age by LMP and ultrasonography, the gestational age determined by ultrasonography was assigned to the participant.

Health-related quality of life was measured using the Medical Outcomes Study Short Form-36 Health

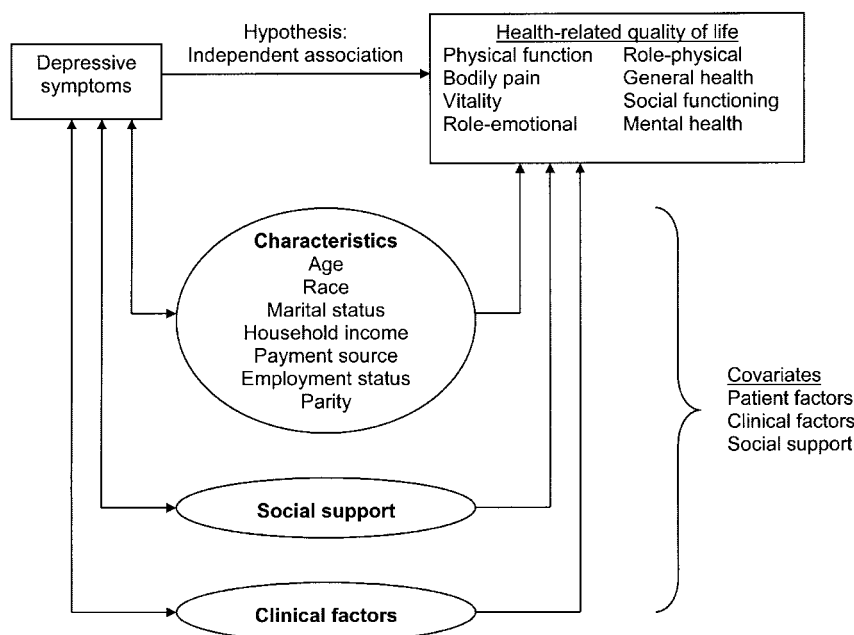


Fig. 1. Conceptual model, incorporating sociodemographic characteristics, clinical factors, and social support, as covariates for the association of depressive symptomatology with health-related quality of life in early pregnancy.

Nicholson. *Quality of Life in Early Pregnancy*. *Obstet Gynecol* 2006.



Survey (SF-36), a multidimensional measure of health status designed for self or interviewer administration.¹⁰ The SF-36 has been established as a reliable and valid instrument of functional status and is widely used in health outcomes research. The survey measures perceptions of Physical Functioning, Role-Physical, Bodily Pain, General Health, Vitality, Role-Emotional, Social Functioning, and Mental Health (Table 1). Physical Functioning assesses limitations in physical activities because of health problems. Role-Physical assesses problems with daily activities as a result of physical health, while Role-Emotional assesses problems with activities as a result of emotional problems. Vitality measures perception of fatigue or energy. Bodily Pain measures the extent of this symptom. General Health measures perception of health based on both physical and emotional limitations and well-being. Social Functioning measures limitations in social activities because of physical or emotional problems. Mental Health measures psychological well-being and distress. Survey responses are based on a 5-point scale. These absolute scores are then transformed into a score of 0–100, with higher scores indicating better functioning or well-being. A score of 100 represents optimal health.

The independent variable, depressive symptomatology, was measured using the Center for Epidemiologic Studies Depression (CES-D) Scale. The Center for Epidemiologic Studies Depression is a 20-item self-report instrument developed by the National Institute of Mental Health to assess depressive symptoms from samples drawn from communities.¹¹ The reliability and validity of the Center for Epidemiologic Studies Depression in diverse populations are well established.^{11,12} There is internal consistency for the Center for Epidemiologic Studies Depression in both the general population (Cronbach's alpha = 0.84)¹¹ and among postpartum women (0.88–0.91).¹³ The scale allows respondents to indicate the presence

of depressive symptoms, such as sadness, crying, hopelessness, or changes in appetite or sleep. The Center for Epidemiologic Studies Depression has a sensitivity of 80–90% in primary care settings with a cutoff of 16 or more. Prior studies have used the Center for Epidemiologic Studies Depression in pregnancy with a moderate sensitivity of 80%¹⁴ and a specificity of 98–99%.^{14,15} Items on the Center for Epidemiologic Studies Depression are rated on a zero-to-three point response scale. A total score is determined by summing the ratings across all 20 items, with possible scores ranging between 0 and 60. The standard threshold of 16 or greater has been used as an indicator of clinically significant elevations in depressive symptomatology in community samples as well as in pregnant women¹³. Forty to fifty percent of persons with scores at or above 16 would be classified as clinically depressed¹⁶

Sociodemographic and clinical variables were obtained from electronic patient records. Sociodemographic variables included maternal age, race (white, black, Asian, Hispanic, other), payment source (Medicaid, commercial insurance), marital status (married, single); employment status at time of survey (employed, unemployed), and total household income (\$35,000 or more; < \$35,000).

Clinical factors included parity (none, one, two or more deliveries); gestational age; complications of current pregnancy, including hypertensive disease (chronic, pregnancy-induced hypertension); pregestational diabetes mellitus; heart disease; sexually transmitted disease (gonorrhea, *Chlamydia*, syphilis, hepatitis B); vaginal bleeding; cervical abnormalities; renal disease or pyelonephritis; depression, and asthma. We also included information on past medical conditions including chronic hypertension; heart disease; diabetes mellitus; sexually transmitted disease, infertility; renal disease; depression and asthma. We also included information on previous birth outcomes,

Table 1. Domains in the Medical Outcomes Short Form 36 Questionnaire¹⁰

| HRQoL Dimensions | Definition | Number of Items |
|----------------------|---|-----------------|
| Physical functioning | Extent to which health interferes with a variety of physical activities | 10 |
| Role-physical | Problems with work or other daily activities as a result of physical health | 4 |
| Bodily pain | Extent of bodily pain and related limitations | 2 |
| General health | Personal evaluation of general health | 5 |
| Vitality | Perception of degree of fatigue or energy | 4 |
| Social functioning | Extent to which health interferes with normal social activities | 2 |
| Role-emotional | Problems with work or other activities as a result of emotional problems | 3 |
| Mental health | General mood, psychological well-being, or distress | 5 |

Urol, health-related quality of life.

From Ware JE Jr, Snow KK, Kosinski M, Gandek B. *SF-36 Health Survey Manual and Interpretation Guide*. Boston (MA): The Health Institute, New England Medical Center; 1993. Copyright © 2000, 2002 by Quality Metric Incorporated and Medical Outcomes Trust. SF-36v2 is a trademark of Quality Metric Incorporated. SF-36® is a registered trademark of Medical Outcomes Trust.



including prior preterm birth or spontaneous abortion (none compared with one or more).

We developed three questions modified from the Norbeck Social Support Questionnaire¹⁷ to determine the presence and degree of social support. We asked 1) “do you get emotional support from your spouse/boyfriend/significant other?” 2) “how much of your support is provided by your spouse/boyfriend/significant other?;” 3) “Who provides most of your emotional support?”

We compared sociodemographic and clinical factors between women with and without depressive symptoms using the χ^2 statistic. We compared the mean for continuous variables (maternal age; gestational age, body mass index) using the *t* test. Based on an alpha of 0.05, there was 80% power to detect a 25% difference in sociodemographic characteristics between the two groups. Because the functional status scores were not normally distributed, we used the Wilcoxon rank-sum test in bivariate analysis to determine significant differences in median functional status scores between women with and without depressive symptoms. With an alpha of 0.05, there was over 80% power to detect a six point difference or higher in health-related quality of life scores in women with and without depressive symptomatology. We used quantile regression models to estimate unadjusted median regression coefficients and 95% confidence intervals for the relationship of each sociodemographic, clinical variable and social support measure to each of the eight functional status domains. Potential collinearity between sociodemographic variables was examined using a correlation matrix and the variance inflation factor.

We estimated the independent association of depression with health-related quality of life using quantile regression models,¹⁸ adjusting for factors related to both depressive symptoms and the eight domains of health status from the bivariate analysis or factors from clinical experience that are known to be clinically related to depression and functional status. Separate quantile regression models were developed for each of the eight dimensions of functional status. In a stepwise fashion, potential confounding variables were added to the model: sociodemographic variables first (age, race, marital status, education, household income, payment source, and employment status); then clinical factors (gestational age, parity, none compared with one or more prior medical conditions; none compared with one or more current medical conditions; none compared with one or more prior preterm births or spontaneous abortions); and finally the presence and extent of social support. Each β

coefficient and 95% (CI) from the quantile regression models were then transformed into adjusted medians and 95% confidence intervals for ease of interpretation. *P*s 0.05 were considered significant. All analyses were conducted using STATA statistical software (Release 8).

RESULTS

Of the 221 potential eligible participants, 175 women agreed to participate and completed the survey for a participation rate of 79%. Twenty-seven women (15%) of the study sample was classified as having elevated depressive symptomatology as evidenced by a Center for Epidemiologic Studies Depression score of 16 or greater. The mean age of the population was 28 ± 6.2 years. The majority of women were African-American (49%), followed by Whites (38%), Asians (11%) and others (2%). Sixty-eight percent of subjects had commercial health insurance and 64% were employed at the time of the survey. Over half of the women were married and 87% had completed more than 12 years of education. Sixty-four percent of the women were multiparous (one or more prior pregnancies), while 36% were nulliparous. Twenty-seven percent of the sample had one or more current medical conditions, while 28% had one or more past medical conditions. The average gestational age at data collection was 14.6 ± 6.4 weeks.

There were statistically significant differences in sociodemographic factors, social support, and clinical factors among women with and without depressive symptoms (Table 2). Seventy percent of women with depressive symptoms were black compared with 44% of women without depressive symptoms. Twenty-six percent of women with depressive symptoms were on Medicaid compared with 20% without depressive symptoms. There were modest differences in the amount of social support between the two groups. A larger percentage of women with depressive symptoms received the majority of their emotional support from someone other than their significant other compared with women without depressive symptoms. Women with depressive symptoms were more likely to be single and to have one or more chronic medical conditions.

Women with elevated depressive symptoms had statistically significantly lower scores in Role-Physical, General Health, Bodily Pain, and Vitality compared with women without depressive symptoms (Table 3). Statistically significantly lower scores in Social Functioning, Role-Emotional, and Mental Health were also found among women with depressive symptoms compared with women without depressive symptoms.



Table 2. Sociodemographics, Social Support, and Clinical Factors by Depression Status (N = 175)

| Characteristics | Depression Status | | P |
|---|--|--|------|
| | No Depressive Symptoms (CES-D < 16) (n = 148) | Depressive symptoms (CES-D ≥ 16) (n = 27) | |
| Age (y) | 28.8 ± 6.5 | 27.3 ± 6.4 | .3 |
| Race | | | .04* |
| White | 60 (41) | 5 (19) | |
| African American | 66 (44) | 19 (70) | |
| Other | 21 (15) | 3 (10) | |
| Payment source | | | .04* |
| Commercial | 119 (80) | 20 (74) | |
| Medicaid | 28 (18) | 7 (26) | |
| Employment status | | | .04* |
| Employed | 45 (31) | 10 (37) | |
| Not Employed | 103 (69) | 17 (63) | |
| Education (y) | | | .4 |
| < 12 | 18 (12) | 4 (15) | |
| ≥ 12 | 130 (88) | 23 (85) | |
| Marital status | | | .02* |
| Married | 93 (62) | 11 (41) | |
| Single | 55 (37) | 15 (56) | |
| Support by significant other | 141 (95) | 26 (96) | .04* |
| Amount of support by significant other | | | .04* |
| Little or moderate | 29 (20) | 5 (19) | |
| A great deal | 119 (80) | 22 (81) | |
| Most support other than significant other | 71 (48) | 16 (59) | .03* |
| Parity | | | .2 |
| No prior deliveries | 18 (32) | 12 (44) | |
| One prior delivery | 52 (35) | 51 (9) | |
| Two or more deliveries | 48 (32) | 10 (37) | |
| ≥ 1 Chronic conditions [†] | 28 (19) | 11 (41) | .01 |
| ≥ 1 Current conditions [‡] | 25 (17) | 7 (26) | .2 |
| Prior preterm birth or spontaneous abortion | 47 (32) | 6 (22) | .3 |
| Gestational age (mo) | 13.4 ± 6.0 | 14.7 ± 6.1 | .3 |
| Body mass index | 26.6 ± 7.8 | 29.2 ± 13.4 | .1 |

CES-D, Center for Epidemiological Studies of Depression.

Values are mean ± standard deviation or n (%). Center for Epidemiological Studies of Depression scores 16 or more indicate higher depressive symptomatology; scores less than 16 indicate lower depressive symptomatology.

* P values less than .05 are considered significant.

[†] Diabetes (3), chronic hypertension (8), heart disease (5), urinary tract infection or pyelonephritis (11), asthma (12).

[‡] Chronic hypertension (3), heart disease, gonorrhea (3), chlamydia (4), herpes (1), bacterial vaginosis (1), vaginal bleeding (7), cervical dysplasia (2), asthma (1), urinary tract infection or pyelonephritis (9), others (2).

Table 4 shows the adjusted median health-related quality of life scores for each domain among women without depressive symptoms and the unadjusted and adjusted median health-related quality of life scores and 95% confidence intervals for women with depressive symptomatology. Even after adjustment for sociodemographic, clinical, and social support factors, women with depressive symptoms in early pregnancy had significantly poorer health-related quality of life relative to women without depressive symptoms. Depressive symptoms were associated with median scores that were 30 points lower in Role-Physical, 19 points lower in Bodily Pain, 10 points lower in General Health, and 56 points lower in Role-Emo-

tional compared with scores in women without depressive symptoms.

Several sociodemographic and clinical variables were associated with women's perception of their functional status. African-American race was associated with statistically significant lower health-related quality of life scores: Scores were 15 points lower in Physical Functioning, 11 points lower in General Health, 13 points lower in Vitality, and 7 points lower in Social Functioning compared with whites (Table 5). The presence of social support by a significant other was significantly associated with higher functioning in Role-Physical, General Health, and Mental Health. A great deal of support was associated with significantly



Table 3. Median Health-Related Quality of Life Scores in Early Pregnancy by Depression Status

| HRQoL Domains | Depression Status | | P* |
|----------------------|--|------------------------------------|---------------------|
| | Nondepressed (CES-D < 16) (n = 148) | Depressed (CES-D ≥ 16) (n = 27) | |
| Physical Functioning | 85 | 75 | .2 |
| Role-Physical | 75 | 25 | .006 [†] |
| Bodily Pain | 74 | 62 | .01 [†] |
| General Health | 77 | 67 | .001 [†] |
| Vitality | 45 | 25 | < .001 [†] |
| Social Functioning | 88 | 50 | < .001 [†] |
| Role-Emotional | 90 | 50 | < .001 [†] |
| Mental Health | 84 | 60 | < .001 [†] |

HRQoL, health-related quality of life; CES-D, Center for Epidemiological Studies of Depression.

Center for Epidemiological Studies of Depression scores 16 or more indicate higher depressive symptomatology; scores less than 16 indicate lower depressive symptomatology.

* P value is derived from the Wilcoxon rank sum test of comparison of medians.

[†] Denotes that the median health-related quality of life score in women with depressive symptoms compared with women with no depressive symptoms is statistically significantly different at $P < .05$.

Table 4. Association of Depressive Symptomatology with Health-Related Quality of Life in Early Pregnancy

| HRQoL Domains | Depression Status | | |
|----------------------|--|--|------------------------------|
| | Pregnant Women Without Depressive Symptomatology (Reference)* | Pregnant Women With Depressive Symptomatology | |
| | Adjusted Median | Unadjusted Median [†] | Adjusted Median [‡] |
| Physical Functioning | 79 | 75 (61–88) | 69 (45–93) |
| Role-Physical | 62 | 24 (10–46) | 32 (8–50) |
| Bodily Pain | 76 | 62 (48–75) | 57 (44–71) |
| General Health | 77 | 67 (58–75) | 66 (55–78) |
| Vitality | 45 | 25 (14–37) | 34 (20–47) |
| Social Functioning | 83 | 50 (20–80) | 47 (36–59) |
| Role-Emotional | 90 | 20 (11–30) | 34 (17–51) |
| Mental Health | 83 | 60 (50–70) | 61 (50–72) |

Values in parentheses are 95% confidence intervals.

* Data represent adjusted median health-related quality of life scores for each health-related quality of life domain among women *without* depressive symptoms after adjustment for race, age, gestational age, marital status, employment status, source of payment, years of education, household income, presence and quantity of social support, past medical conditions, current medical conditions, parity, and body mass index in the multiple linear regression models.

[†] Data represent the unadjusted median health-related quality of life score and 95% confidence interval for each health-related quality of life domain among women with depressive symptoms.

[‡] Data represent adjusted median health-related quality of life score and 95% confidence interval for each health-related quality of life domain among women *with* depressive symptoms after adjustment for participant characteristics.

higher scores in Social Functioning and Mental Health. Multiparity was associated with higher scores in Role-Physical and Social Functioning compared with nulliparity. One or more current conditions was associated with worse bodily pain (–14 points).

DISCUSSION

This study provides a comprehensive analysis of the magnitude of association of maternal depressive symptoms on all 8 dimensions of health-related quality of life. We estimated the prevalence of depressive symptoms and identified significant differences in

health-related quality of life according to the presence of depressive symptoms. We then carefully described the association between depressive symptoms and health-related quality of life, adjusting for potential confounders.

Recent studies emphasize the importance of health-related quality of life within the broader context of maternal health and pregnancy outcomes. Lower physical and social functioning in pregnancy has been linked to an increased risk of preterm birth.^{19,20} Poor emotional functioning has been associated with an increase in primary care visits and



Table 5. The Association of Sociodemographic, Social Support, and Clinical Characteristics With Health-Related Quality of Life in Multivariate Analysis

| Characteristics | Health-Related Quality of Life Domains | | | | | | | | | |
|------------------------------|--|-----------------|----------------|----------------|----------------|------------------|--------------|---------------|--|--|
| | PF | RP | BP | GH | Vit | SF | RE | MH | | |
| African American | -15* (-22, -8) | -28* (-41, -15) | -10 (-33, 12) | -11* (-19, -3) | -13* (-28, -3) | -7* (-8, -6) | -8 (-24, 7) | 3 (-3, 9) | | |
| Income < \$35 K | -13 (-19, -7) | -8 (-18, 3) | -11 (-26, 17) | -10* (-17, -3) | -3 (-12, 7) | -4* (-5, -3) | 2 (-14, 10) | -9* (-15, -4) | | |
| Social support by | | | | | | | | | | |
| significant other | -13 (-27, 0.2) | 30* (6, 55) | -9 (-27, 7) | 9* (5, 15) | 5 (-3, 15) | -4 (-4.6, 3.7) | 2 (-8, 19) | 14* (12, 16) | | |
| Great deal of support | -0.4 (-3, 2.5) | -0.2 (-6, 5) | 4 (-5, 13) | 3 (-0.9, 6) | 6 (-4, 13) | 4* (3.9, 4.3) | 13 (-7, 29) | 6* (3, 9) | | |
| Support other than | | | | | | | | | | |
| significant other† | -0. (-12, 11) | -0.2 (-8, 5) | -6 (-16, 3) | 0.8 (-7, 0.9) | -2 (-7, 11) | -3 (-4, 13) | -9 (-5, 24) | -2 (-3, 8) | | |
| ≥ 2 prior deliveries | -3 (-9, 3) | 18* (7, 30) | 5 (-17, 24) | 4 (-3, 11) | 0.6 (-10, 11) | 17* (16, 18) | -7 (-22, 6) | 2 (-3, 7) | | |
| ≥ 1 prior chronic conditions | 6 (-0.5, 2) | 8 (-24, 17) | 0.9 (-19, 21) | 1.8 (-5, 9) | -3 (-14, 7) | 0.03 (-0.2, 0.2) | -3 (-17, 11) | 3 (-2, 8) | | |
| ≥ 1 current conditions | -6 (-13, -0.6) | -0.3 (-12, 11) | -14 (-22, -6)* | -2 (-9, 4) | 2 (-8, 13) | -0.09 (-9, 7) | -1 (-2, 19) | 5 (-5, 11) | | |

PF, Physical Functioning; RP, Role-Physical; BP, Bodily Pain; GH, General Health; Vit, Vitality; SF, Social Functioning; RE, Role-Emotional; MH, Mental Health.

Unemployed status and unknown income were not significantly associated with any health-related quality of life domain and are therefore not included in table. Each beta coefficient represents the absolute difference in the health-related quality of life score for women with the characteristic of interest compared with women without the characteristic of interest.

* $P < .05$.

† Significant other refers to boyfriend or spouse.



resource use.²¹ In particular, poor maternal physical or emotional functioning could lead to an increase in prenatal visits or fetal testing. The offspring of women with depressive symptoms in pregnancy have been shown to have worse access to and receipt of health care services.²²

The prevalence of depressive symptoms (15%) in our sample is similar to some earlier reported rates at similar points in pregnancy. One study reported a prevalence of 15% among Swedish women in the first and second trimesters of pregnancy. Another study reported a prevalence rate of 12% in women during the 4 weeks before conception. Bennett and associates reported a much lower prevalence of 7% in the first trimester, based on a pooled analysis from several studies.⁷ Our findings confirm that depressive symptoms are prevalent in early pregnancy among a diverse population and suggest the need for effective and efficient screening measures.¹⁵

Our results also suggest that the extension of prenatal guidelines to include early screening for depressive symptomatology may be warranted in some populations. Prior studies using the CES-D³ or other instruments^{2,5,23} suggest that the prevalence of depressive symptoms increases in the third trimester. Zayas and colleagues,⁵ for example, reported that 50% of their sample had depressive symptomatology. Haas and associates³ reported rates of 17% in late pregnancy. Because the study is cross-sectional, we are unable to speculate on the relationship of depressive symptoms in early pregnancy with symptoms later in pregnancy.

Our analysis emphasizes the importance of socio-demographic characteristics, social support, and clinical conditions on health-related quality of life and suggests potential pathways for the association between depressive symptomatology and health-related quality of life. Sociodemographic characteristics, such as race and income, are linked to depression and psychosocial stressors and are reported to affect the immune system, potentially leading to chronic disease²⁴ or poor pregnancy outcomes.²⁵ Depression has been shown to be associated with a decrease in natural killer cell activity and lymphocyte proliferation.²⁶ This process could also lead to alterations in physical functioning during pregnancy and affect women's perception of their physical and social functioning. Chronic conditions in early pregnancy might also lead to alterations in immune status and lower health-related quality of life. Alternatively, sociodemographic factors might affect neuroendocrine pathways²⁷ during pregnancy, leading to hormonal fluctuations, lower social functioning, and poor perceptions

of emotional health. With the potential effect of psychosocial factors on biologic mechanisms, physicians may often need to combine referrals for medical treatment for depressive symptoms with assistance with psychosocial interventions. Treatment efficacy will be important to ensure improvement in maternal depressive symptomatology and functional health status.

We found support for our hypothesis that depressive symptoms are independently associated with all dimensions of health-related quality of life. This finding can assist physicians in their approach to the expectant mother who has been screened and newly identified with depressive symptomatology. For example, the physician can refer the expectant mother to a mental health provider for definitive diagnosis and treatment. Effective systems for timely referral will be required. Obstetricians might also develop partnerships with specific mental health clinicians (eg, psychiatrists, psychologists, or psychiatric social workers) in their communities to better facilitate referrals. In this fashion, women can obtain perinatal and mental health services in a collaborative, interdisciplinary setting.²⁸ Enhanced obstetric training in the recognition of depressive symptoms and options for care will be central to the appropriate referral for medical intervention.

Although 18% of the study sample had 1 or more current medical conditions, we did not find that these medical conditions had a substantial effect on dimensions of health-related quality of life in early pregnancy. The lack of a significant effect may be due to the small number of participants with current medical conditions. It may be that the effect of pregnancy-specific conditions on health-related quality of life is cumulative and increases over the entire course of pregnancy rather than during the early stages. Alternatively, women may expect to experience symptoms related to medical conditions or some physical discomfort during pregnancy, with the result that it does not influence their perception of their health-related quality of life.

There are several limitations to this study. We chose to examine the prevalence and effect of depressive symptomatology rather than the diagnosis of clinical depression. However, subclinical depression, as a consequence of its high prevalence, is a significant clinical problem as manifested by its effect on health service use and social morbidity among adults in the general population.²⁹ Additionally, we believe that most obstetricians would more reliably be able to detect depressive symptoms rather than to confirm the diagnosis of depression. Therefore, the use of



depressive symptoms in this study may be more relevant to daily obstetric practice. There are certain factors that we were unable fully to adjust for in the multivariate models, such as a history of domestic violence. Also, we are unable to determine cause and effect due to the cross-sectional nature of the study. Finally, our results may not be entirely generalizable, because we had a high percentage of African-American women and women with 12 years or more of education.

Notwithstanding these limitations, our work broadens the understanding of the effect of depressive symptoms on health-related quality of life in early pregnancy among a racially and economically diverse sample of women. This work underscores the importance of identifying depressive symptoms in early pregnancy, the independent association of depressive symptomatology with health-related quality of life, and potential opportunities for physician training and intervention. Further study is needed to determine whether the assessment and treatment of depressive symptoms in early pregnancy can reduce depressive symptoms later in pregnancy. Future studies might prospectively evaluate the effect of depressive symptoms on biologic mechanisms of pregnancy and perinatal outcomes.

REFERENCES

- Hueston WJ, Kasik-Miller S. Changes in functional health status during normal pregnancy. *J Fam Pract* 1998;47:209-12.
- McKee MD, Cunningham M, Jankowski KR, Zayas L. Health-related functional status in pregnancy: relationship to depression and social support in a multi-ethnic population. *Obstet Gynecol* 2001;97:988-93.
- Haas JS, Jackson RA, Fuentes-Afflick E, Stewart AL, Dean ML, Brawarsky P, et al. Changes in the health status of women during and after pregnancy. *J Gen Intern Med* 2005;20:45-51.
- Otchet F, Carey MS, Adam L. General health and psychological symptom status in pregnancy and the puerperium: what is normal? *Obstet Gynecol* 1999;94:935-41.
- Zayas LH, Cunningham M, McKee MD, Jankowski KR. Depression and negative life events among pregnant African-American and Hispanic women. *Womens Health Issues* 2002;12:16-22.
- Howell EA, Mora PA, Horowitz CR, Leventhal H. Racial and ethnic differences in the factors associated with postpartum depressive symptoms. *Obstet Gynecol* 2005;105:1442-50.
- Bennett HA, Einarson A, Taddio A, Koren G, Einarson TR. Prevalence of depression during pregnancy: systematic review. *Obstet Gynecol* 2004;103:698-709.
- Maloni JA, Park S, Anthony MK, Musil CM. Measurement of antepartum depressive symptoms during high-risk pregnancy. *Res Nurs Health* 2005;28:16-26.
- Josefsson A, Berg G, Nordin C, Sydsjo G. Prevalence of depressive symptoms in late pregnancy and postpartum. *Acta Obstet Gynecol Scand* 2001;80:251-5.
- Ware JE, Jr., Snow KK, Kosinski M, Gandek B. SF-36 Health Survey Manual and Interpretation Guide. Boston (MA): The Health Institute, New England Medical Center; 1993.
- Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385-401.
- Roberts RE. Reliability of the CES-D Scale in different ethnic contexts. *Psychiatry Res* 1980;2:125-34.
- Marcus SM, Flynn HA, Blow FC, Barry KL. Depressive symptoms among pregnant women screened in obstetrics settings. *J Womens Health (Larchmt)* 2003;12:373-80.
- Chen H, Chan YH 3rd, Tan KH, Lee T. Depressive symptomatology in pregnancy - a Singaporean perspective. *Soc Psychiatry Psychiatr Epidemiol* 2004;39:975-9.
- Gaynes BN, Gavin N, Meltzer-Brody S, Lohr KN, Swinson T, Gartlehner G, et al. Perinatal depression: prevalence, screening accuracy, and screening outcomes. *Evid Rep Technol Assess (Summ)* 2005:1-8.
- Weissman MM, Sholomskas D, Pottenger M, Prusoff BA, Locke BZ. Assessing depressive symptoms in five psychiatric populations: a validation study. *Am J Epidemiol* 1977;106:203-14.
- Norbeck JS, Lindsey AM, Carrieri VL. Further Development of the Norbeck Social Support Questionnaire: normative data and validity testing. *Nursing Res* 1983;32:4-9.
- Glanz SA, Slinker B. *Primer of applied regression and analysis of variance*. New York: McGraw-Hill; 1990.
- Goldenberg RL, Culhane JF. Prepregnancy health status and the risk of preterm delivery. *Arch Pediatr Adolesc Med* 2005;159:89-90.
- Haas JS, Meneses V, McCormick MC. Outcomes and health status of socially disadvantaged women during pregnancy. *J Womens Health Gen Based Med* 1999;8:547-53.
- Druss BG, Rosenheck RA, Sledge WH. Health and disability costs of depressive illness in a major U.S. corporation. *Am J Psychiatry* 2000;157:1274-8.
- Minkovitz CS, Strobino D, Scharfstein D, Hou W, Miller T, Mistry KB, et al. Maternal depressive symptoms and children's receipt of health care in the first 3 years of life. *Pediatrics* 2005;115:306-14.
- Gotlib IH, Whiffen VE, Mount JH, Milne K, Cordy NI. Prevalence rates and demographic characteristics associated with depression in pregnancy and the postpartum. *J Consult Clin Psychol* 1989;57:269-74.
- Pratt LA, Ford DE, Crum RM, Armenian HK, Gallo JJ, Eaton WW. Depression, psychotropic medication and risk of myocardial infarction. Prospective data from the Baltimore ECA follow-up. *Circulation* 1996;94:3123-9.
- Wadhwa PD, Culhane JF, Rauh V, Barve SS. Stress and preterm birth: neuroendocrine, immune/inflammatory, and vascular mechanisms. *Matern Child Health J* 2001;5:119-25.
- Miller GE, Cohen S, Herbert TB. Pathways linking major depression and immunity in ambulatory female patients. *Psychosom Med* 1999;61:850-60.
- Miller AH. Neuroendocrine and immune system interactions in stress and depression. *Psychiatr Clin North Am* 1998;21:443-63.
- Thoppil J, Riutcel TL, Nalesnik SW. Early intervention for perinatal depression. *Am J Obstet Gynecol* 2005;192:1446-8.
- Johnson J, Weissman MM, Klerman GL. Service utilization and social morbidity associated with depressive symptoms in the community. *JAMA* 1992;267:1478-83.

