Dads Get Sad Too: Depressive Symptoms and Associated Factors in Expectant First-Time Fathers

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Deborah Da Costa^{1,2}, Phyllis Zelkowitz³, Kaberi Dasgupta^{1,2},
Maida Sewitch^{1,2}, Ilka Lowensteyn², Rani Cruz², Kelly Hennegan²,
and Samir Khalifé³

Abstract

This cross-sectional study aims to determine the prevalence and determinants of depressive symptoms in first-time expectant fathers during their partner's third trimester of pregnancy. As part of a prospective study examining depressive symptoms in men over the first postnatal year, 622 men (mean age = 34.3 years, ± 5.0 years) completed standardized online self-report questionnaires measuring depressed mood, physical activity, sleep quality, social support, marital adjustment, life events, financial stress, and demographics during their partner's third trimester of pregnancy. The Edinburgh Depression Scale was used to assess depressed mood. Partners also completed the Edinburgh Depression Scale in the third trimester. The results revealed that 13.3% of expectant fathers exhibited elevated levels of depressive symptoms during their partner's third trimester of pregnancy. Significant independent factors associated with antenatal depressive symptoms in men were poorer sleep quality, family history of psychological difficulties, lower perceived social support, poorer marital satisfaction, more stressful life events in the preceding 6 months, greater number of financial stressors, and elevated maternal antenatal depressive symptoms. These findings highlight the importance of including fathers in the screening and early prevention efforts targeting depression during the transition to parenthood, which to date have largely focused only on women. Strategies to promote better sleep, manage stress, and mobilize social support may be important areas to address in interventions tailored to new fathers at risk for depression during the transition to parenthood.

Keywords

antenatal paternal depression, determinants, prevalence

Introduction

The mental health of men during the transition to parenthood is a much neglected area of research. While the transition to parenthood is often viewed as a positive and joyful life event, it can be perceived as a stressful experience, negatively affecting psychological and marital resources for each partner in the couple (Kluwer, 2010; Whisman, Davila, & Goodman, 2011). The few studies conducted with fathers have reported that paternal psychological distress is related to destructive health behaviors (i.e., greater use of alcohol and cigarettes) in fathers, maternal postpartum depression, and the quality and level of paternal involvement with the child (Lamb, 2004; Ramchandani et al., 2008; Sethna, Murray, Netsi, Psychogiou, & Ramchandani, 2015). Paternal depression occurring during pregnancy or in the early months of the infant's life may also negatively affect the child's behavioral, emotional, cognitive, and physical development

(Kvalevaag et al., 2014; Ramchandani, Stein, Evans, & O'Connor, 2005).

In the last few decades, maternal adjustment during pregnancy and following childbirth has been extensively studied, with postpartum depression being the most commonly recognized negative outcome occurring in 13% to 19% of women (O'Hara & McCabe, 2013). As many as 18.4% of women are depressed during pregnancy (Gavin et al., 2005). Depression during pregnancy has been identified as a strong predictor of maternal postpartum

¹McGill University, Montreal, Quebec, Canada

²McGill University Health Centre, Montreal, Quebec, Canada

³Jewish General Hospital, Montreal, Quebec, Canada

Corresponding Author:

Deborah Da Costa, Division of Clinical Epidemiology, McGill University Health Centre, 687 Pine Ave, Montreal, Quebec, Canada H3A 1A1.

Email: Deborah.DaCosta@mcgill.ca

depression (O'Hara & McCabe, 2013; Verreault et al., 2014). Some investigators have also examined paternal postpartum depression. A review of 20 studies which assessed the incidence of paternal postpartum depression any time during the 1st year postpartum estimated the incidence to be 1.2% to 25.5% in community-based samples (Goodman, 2004). A more recent meta-analysis estimated the rate of paternal antenatal and postpartum depression to be approximately 10% (Paulson & Bazemore, 2010). The authors note that most of the studies in the meta-analyses were conducted with fathers during the first postpartum year, with fewer studies assessing paternal depression during the partner's pregnancy. More recently four additional studies conducted in various European countries (Portugal, Spain, Germany) have been published reporting rates of antenatal paternal depression between 6.4% and 11.5% (Escribà-Agüir & Artazcoz, 2011; Figueiredo & Conde, 2011; Gawlik et al., 2014; Teixeira, Figueiredo, Conde, Pacheco, & Costa, 2009). While these recent studies all used the Edinburgh Depression Questionnaire (EDS), a widely used validated measure for use in men during the perinatal period (Edmondson, Psychogiou, Vlachos, Netsi, & Ramchandani, 2010), they differed in the cutoff scores used to classify depression and in the timing of the assessment, one in the first trimester (Figueiredo & Conde, 2011) and three in the third trimester (Escribà-Agüir & Artazcoz, 2011; Gawlik et al., 2014; Teixeira et al., 2009). With few exceptions (Boyce, Condon, Barton, & Corkindale, 2007), most of these studies have grouped together men who are for the first-time becoming fathers with those who have one or more children. To our knowledge no Canadian study has reported the prevalence of depression in men whose partner's are expecting their first child.

Paternal depression is multidetermined and a number of factors including higher antenatal paternal depression, anxiety, poorer social support, poorer marital adjustment, previous personal and/or family history of depression, and having a depressed partner either during pregnancy or soon following birth have been associated with postpartum paternal depression (Edward, Castle, Mills, Davis, & Casey, 2015; Paulson & Bazemore, 2010; Ramchandani et al., 2008; Wee, Skouteris, Pier, Richardson, & Milgrom, 2011). Fewer studies have examined factors associated with antenatal depression among expectant first-time fathers. Younger age, being unemployed, low social support, and experience of adverse life events have been associated with antenatal paternal depression (Boyce et al., 2007; Figueiredo & Conde, 2011). While lifestyle factors including physical activity level and sleep problems have been reported to be independently related to maternal antenatal and postpartum depressive symptoms (Dorheim, Bjorvatn, & Eberhard-Gran, 2012; Teychenne & York, 2013), these modifiable factors have received little attention in studies examining determinants of paternal

depression. The present study aims to examine the role of these lifestyle factors which has been largely neglected in previous studies of paternal depression during the perinatal period.

Given recent prospective studies demonstrating that antenatal paternal depression is a strong predictor of postpartum paternal depression (Giallo et al., 2012; Ramchandani et al., 2008), more rigorous and systematic studies are needed to identify risk factors associated with paternal antenatal depression. A better understanding of the factors associated with paternal antenatal depression would inform recommendations for screening and the development of gender-specific, evidence-based preventive approaches to facilitate the transition to parenthood for men at risk.

The present study sought to examine the prevalence of depressive symptoms among first-time expectant fathers in late pregnancy. Second, as a means to further our understanding of the factors associated with antenatal paternal depression, this study comprehensively examined the role of sociodemographics, lifestyle, and psychosocial factors.

Method

Participants and Procedure

A consecutive sample of expectant couples in the second or third trimester of pregnancy were recruited by research staff or through study flyers in the waiting rooms at the offices of obstetricians/gynecologists associated with three McGill University hospitals in the Montreal area, as well as local prenatal classes. All couples were at least 18 years of age, functionally fluent in French or English, either married or cohabiting at the time of study entry and both partners were expecting their first child. In the third trimester of their partner's pregnancy (28-36 weeks) an e-mail prompt to the password secured website was sent separately to the expectant father and his partner who had indicated an interest in participating. The electronic consent form and the questionnaires were accessible online through Fluid Surveys (www.fluidsurveys.com). Participants had 1 week to complete them and reminder phone calls were used to encourage completion and answer any questions. The study was approved by the McGill University Faculty of Medicine Institutional Review Board prior to commencement, as well as by the ethics review boards of the participating hospitals.

Measures

The *Edinburgh Depression Scale* (EDS; Cox, Holden, & Sagovsky, 1987) is a widely used 10-item scale originally developed and validated for new mothers. Items inquire about mood in the past 7 days and are rated on a 4-point scale. The EDS has been validated in fathers (Edmondson

et al., 2010; Matthey, Barnett, Kavanagh, & Howie, 2001). In men, a cutoff score of 10 has been reported to have a sensitivity of 71.4% and a specificity of 93.8% (Matthey et al., 2001) when compared with a diagnosis of minor or major depression using a psychiatric interview.

The *Pittsburgh Sleep Quality Index* (PSQI; Buysse et al., 1989) assesses sleep quality and disturbances in the past month. It includes 19 items, generating 7 component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. A global score conveying the number and severity of sleep problems is obtained by summing the seven component scores. The global score has a possible range of 0 (*no sleep difficulty*) to 21 (*severe sleep difficulties*). The scale has good psychometric properties with a global score >5 yielding a diagnostic sensitivity of 89.6% and specificity of 86.5% in differentiating good and poor sleepers (Buysse et al., 1989).

The *Dyadic Adjustment Scale* (DAS; Spanier, 1976) was used to measure men's levels of adjustment and distress in their couple relationship. This 32-item measure is comprised of four subscales: consensus, affectional expression, satisfaction, and cohesion. It yields a total score (ranging from 0 to 151) as well as four subscale scores, with higher scores indicating a better couple relationship. The DAS has been widely used in studies of marital quality and parental adjustment (Ramchandani et al., 2011; Weinfeld, Ingerski, & Moreau, 2009). The reliability and validity of the DAS has been well-established (Graham, Liu, & Jeziorski, 2006; Weinfeld et al., 2009).

The *MOS Social Support Survey* was used to assess social support (Sherbourne & Stewart, 1991). This 7-item shortened version of the scale assesses perceived support from one's social network related to emotional, tangible, and affectionate domains. Good internal consistency (0.88) has been reported for this measure (Sherbourne & Stewart, 1991).

The modified version of the *Life Stress Event Scale* (LSE-S; Hurst, Jenkins, & Rose, 1978) was used to assess the occurrence of stressful life events in the last 6 months. This questionnaire lists 10 major life events that could have occurred in the past 6 months. The LSE-S exhibits good internal consistency (Cronbach's $\alpha = .87$; Hurst et al., 1978).

Financial stress was measured with four items developed by Kim and Garman (2003) assessing satisfaction with one's present financial situation, income adequacy, debt, and saving and investment. Responses are coded on a 4-point Likert-type scale, from 4 = *agree* to 1 = *disagree*, and summed. A higher total score indicates greater financial stress. An acceptable level of reliability (Cronbach's $\alpha = .79$) has been demonstrated for this measure (Kim & Garman, 2003).

The well-validated *International Physical Activity Questionnaire Short-Form* (IPAQ; Craig et al., 2003) was used to measure physical activity. The questionnaire was scored using established criteria posted on the IPAQ website (www.ipaq.ki.se). These data were summarized to report physical activity into three categories: low, moderate, and high levels of physical activity (Bauman et al., 2009). Time spent on physical activities during the last 7 days and the types of physical activities, including vigorous, moderate, and walking was weighted by the energy expended for these categories of activity, to produce MET-minutes of physical activity in a usual week.

Sociodemographics (i.e., age, marital status, employment status, income, and education), medical history, history of psychological difficulties, and current health status were collected using a self-report questionnaire developed for this study. Smoking, drinking behavior, and substance abuse information was obtained in terms of quantity and frequency estimates for each behavior in the past month. These questions are similar to those used in the National Population Health Survey (NPHS) by Statistics Canada (Statistics Canada, 1998).

Statistical Analysis

Descriptive statistics including means, medians, and standard deviations were calculated for all the variables. A Pearson correlation matrix was computed with all the variables to examine the bivariate correlations between the outcome variable (depressed mood scores) and potential determinants. The pattern of intercorrelations among the predictor variables to be entered in the multiple regression model were examined to determine the extent of multicollinearity among predictors. Hierarchical multiple regression analyses were computed to test the importance of behavioral and psychosocial factors on depressed mood, after controlling for demographic factors (i.e., age, socioeconomic status). Hierarchical multiple regression is the regression strategy of choice when the research goals are to determine the importance of a predictor variable(s) once other predictor variables have already been entered into the equation (Cohen, Cohen, West, & Aiken, 2013). Variable selection was based on theoretical relevance, pattern of correlation with the outcome variable and other potential predictor variables, and the assumptions underlying multiple regression analysis. All statistical analyses for this study were performed using IBM Statistical Package for Social Science (SPSS) version 20.0 (SPSS Inc., Chicago, IL).

Results

Patient Characteristics

Of the 1,176 men who agreed to learn more about this study and provided their e-mail address, 622 (54.7%)

Table 1. Characteristics of Study Participants.

	All participants (N = 622)
Age (years)	34.3 (5.0)
Ethnicity—Caucasian	72.7%
Time with partner (years)	6.3 (3.6)
Education—University degree	69.6%
Household income ^a	5.7 (2.0)
Employment status—Working	91.5%
BMI (≥ 28)	15.9%
Alcohol consumers	80.9%
Smokers	19.8%
Moderate/vigorous LTPA	77.3%
PSQI—global score	4.6 (2.6)
Dyadic Adjustment Scale	123.6 (13.0)
EDS	5.0 (3.9)
Life events	1.2 (1.2)

Note. BMI = body mass index; LTPA = leisure time physical activity; PSQI = Pittsburgh Sleep Quality Index; EDS = Edinburgh Depression Scale.

^aIncome scale 1-8: for example, 5 = \$61,000-\$80,000; 6 = \$81,000-\$100,000.

completed the on-line questionnaires fully. The mean age for men in this study was 34 years ($SD = 5.0$; range = 22-52; Table 1). Nearly 70% had a university degree and 71% had a family income of more than \$60,000. The mean global score for the PSQI was 4.6 ($SD = 2.6$; range = 0-15). Using the criteria for global sleep disturbance (PSQI—global score > 5 ; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989), 24% were classified as “poor sleepers.” The mean DAS score was 123.6 ($SD = 13.0$) and using an established cutoff score indicative of marital distress (DAS score < 101 ; Sher & Baucom, 1993), 4.5% scored below the cutoff. Men reported experiencing at least 1 stressful life event in the prior 6 months (mean = 1.2; $SD = 1.2$; range = 0-6) and 16.1% had a family history of mental health problems.

The mean EDS score was 5.0 ($SD = 3.9$; range = 0-21). Using a cutoff score of ≥ 10 (Edmondson et al., 2010; Matthey et al., 2001), 13.3% ($n = 83$) of men reported elevated depressed mood during their partner's third trimester of pregnancy. Of the 622 men in this study, 517 (83.1%) of their partners (the expectant mother) also completed the EDS during their third trimester. Using the same cutoff score, 21.9% of women were exhibiting elevated levels of depressive symptoms during their third trimester of pregnancy. Among men whose partner's were experiencing elevated depressive symptoms during pregnancy, the prevalence of antenatal paternal depression was 23%.

Bivariate Associations

As reported in Table 2, Pearson coefficients were computed to identify sociodemographic, behavioral, and

Table 2. Correlation Coefficients Between Sociodemographics, Lifestyle Factors, Psychosocial Variables, and Depressed Mood.

	<i>r</i>
Sociodemographics	
Age (years)	.09*
Ethnicity ^a	.09*
Time with partner (years)	-.01
Education—University degree	.01
Household income	-.08*
Employment status ^b	-.12**
BMI	-.06
Lifestyle	
Alcohol use	-.07
Smoking status	-.01
Physical activity level ^c	-.09*
PSQI—Global score	.40***
Psychosocial	
Family history	.15***
Dyadic Adjustment Scale	-.30***
Social support	-.29***
Financial stress	.21***
Stressful life events	.25***
Partner EDS	.19***

Note. BMI = body mass index; PSQI = Pittsburgh Sleep Quality Index; EDS = Edinburgh Depression Scale.

^aEthnicity coded as 1 = Caucasian, 2 = non-Caucasian. ^bEmployment status coded as 0 = unemployed, 1 = employed. ^cPhysical activity level = leisure time physical activity status coded as 1 = inactive, 2 = moderately to vigorously active.

psychosocial correlates of depressed mood among expectant fathers. Among the sociodemographic variables, men who were older, non-Caucasian, had a lower household income and who were unemployed had higher EDS scores. Leisure time physical inactivity was correlated with higher EDS scores. Sleep was the variable most strongly associated with EDS scores, with men reporting poorer sleep quality having higher depressed mood scores. Having a family history of mental health problems, lower satisfaction in the couple relationship, lower perceptions of social support, higher financial stress, and having experienced more stressful life events in the preceding 6 months were all significantly associated with higher depressed mood scores. Finally, a significant correlation was also identified between higher partner depressed mood scores during the third trimester and elevated EDS scores among expectant fathers.

Determinants of Paternal Depressive Symptoms

The results of the hierarchical multiple regression to identify factors associated with elevated EDS scores in men during their partner's third trimester of pregnancy is reported in Table 3. In Step 1 of the model, age

Table 3. Results of Hierarchical Regression Model to Examine Determinants of Depressed Mood in Expectant First-Time Fathers.

Variables	EDS score		
	β , Step 1	β , Step 2	β , Step 3
Sociodemographics			
Age	0.09*	0.06	0.04
Ethnicity	0.08	0.09*	0.06
Income	-0.03	-0.06	0.01
Work status	-.010*	-0.06	-0.07
Health behaviors			
LTPA		-0.07	-0.04
Sleep quality		0.40***	0.32***
Psychosocial variables			
Family history			0.09**
Social support			-0.17***
Marital adjustment			-0.10*
Financial stress			0.09*
Life events			0.13***
R	0.17**	0.44***	0.54***
R ²	0.03	0.20	0.29
Adjusted R ²	0.02	0.19	0.28
R ² change	0.03**	0.17***	0.09***

Note. EDS = Edinburgh Depression Scale; LTPA = leisure time physical activity.

* $p < .05$. ** $p < .01$. *** $p < .001$.

(higher) and work status (unemployed) accounted for a statistically significant amount of variance in depressed mood scores ($R^2 = .03$; $F = 4.45$, $p = .001$). In Step 2, the addition of physical activity level and the PSQI global score resulted in a significant increase in the amount of variance accounted for in depressed mood ($R^2 = .20$; F change = 63.78, $p < .001$), with sleep quality significantly emerging as an independent determinant. In Step 3, the psychosocial variables explained an additional 9% of the variance in depressive symptoms ($R^2 = .29$; F change = 16.03, $p < .001$), with family history of mental health problems, lower social support, poorer marital adjustment, greater financial stress, and experiencing more stressful life events emerging as significant independent determinants of depressive symptoms among first-time expectant fathers. The total model (Steps 1-3) accounted for 29% of the variance in depressive symptoms.

A second hierarchical multiple regression was computed with the addition of third trimester partner depressive symptoms scores in Step 4 of the model for the subgroup of men with available partner data ($n = 517$). Elevated partner depressive symptoms resulted in a small but significant increment of the variance ($\beta = 0.11$, $p = .005$) explained in prenatal paternal depressive symptoms (analysis not presented).

Discussion

The results of this study indicate that 13.3% of men expecting their first child experience elevated depressive symptoms during their partner's third trimester of pregnancy. This is one of the first studies to report the prevalence of antenatal depressive symptoms in a sample of Canadian men. Previous studies on paternal antenatal depression have reported prevalence rates ranging from 6.4% to 11.5% (Escribà-Agüir & Artazcoz, 2011; Escribà-Agüir, Gonzalez-Galarzo, Barona-Vilar, & Artazcoz, 2008; Figueiredo & Conde, 2011; Gawlik et al., 2014; Teixeira et al., 2009). Figueiredo and Conde (2011) using a cutoff score of ≥ 10 on the EDS reported a rate of 11.5% for expectant fathers in early pregnancy which increased in each trimester, particularly for first-time fathers, while Teixeira et al. (2009) reported a rate of 6.4% in the third trimester which declined from 11.3% in the first trimester. Gawlik et al. (2014) assessed 102 expectant fathers in a German community sample and reported that 9.8% scored ≥ 9 on the EDS in mid to late pregnancy. It is difficult to make direct comparisons with prior studies due to differences in assessment measures, cutoff scores, timing of assessment, and study populations. The prevalence of antenatal paternal depressive symptoms in the present study is within the range previously reported, particularly in North American countries (14%; Paulson & Bazemore, 2010). These findings indicate that an important number of expectant first-time fathers experience elevated depressive symptoms. While there is increasing awareness regarding paternal postpartum depression, little has been reported on antenatal paternal depression, which appears to be as or slightly more prevalent than postpartum paternal depression. This is important as antenatal paternal depression has also been identified as a strong predictor of postpartum paternal depression and can negatively impact infant and child development (Kvalevaag et al., 2014; Ramchandani et al., 2008).

Studies on maternal depression during pregnancy have reported an association between poor sleep and higher risk of depressive symptoms (Dorheim et al., 2012; Skouteris, Germano, Wertheim, Paxton, & Milgrom, 2008). These findings extend the literature by revealing that poor sleep quality among expectant first-time fathers was independently associated to elevated antenatal depressive symptoms. While the cross-sectional nature of the present study precludes making causal inferences regarding sleep problems and depressive symptoms, in the general population and in women during pregnancy, sleep disturbances appear to be an antecedent to and a negative prognostic factor for new and recurrent depression (Buysse et al., 2008; Neckelmann, Mykletun, & Dahl, 2007; Okun, Kiewra, Luther, Wisniewski, & Wisner, 2011; Skouteris et al., 2008). These findings

suggest that screening and addressing sleep difficulties in men during the transition to parenthood may help prevent the development of or further increases in current depressive symptoms.

Psychosocial factors including poorer social support, less marital satisfaction, financial stress, and more life events were also associated with elevated paternal depressive symptoms in the present study. Poorer social support has previously been identified as a risk factor for maternal depression during pregnancy and the postpartum (Lancaster et al., 2010; Rich-Edwards et al., 2006). Two previous studies reported associations between poorer social support with increased psychological distress and depressive symptoms among expectant fathers (Boyce et al., 2007; Escribà-Agüir & Artazcoz, 2011). These findings suggest that expectant fathers who felt less satisfied with the level of emotional, tangible, and affectionate support they received by key individuals in their interpersonal environment were more likely to be depressed.

Less satisfaction in the marital/partner relationship was associated with elevated antenatal paternal depressive symptoms. These findings are consistent with those from other studies with expectant fathers and new fathers (Boyce et al., 2007; Demontigny, Girard, Lacharite, Dubeau, & Devault, 2013; Escribà-Agüir & Artazcoz, 2011; Escribà-Agüir et al., 2008; Gawlik et al., 2014; Roubinov, Luecken, Crnic, & Gonzales, 2014; Wee et al., 2011). As indicated by Boyce et al. (2007) it is unclear whether the elevated depressive symptoms is a consequence of a poor intimate relationship that is further strained by the pregnancy or whether the distress of finding out that their partner is pregnant leads to a decline in the satisfaction with the relationship. Given that some studies suggest that at least half of couples report a decline in marital satisfaction following childbirth (Kluwer, 2010), it may be particularly important to include adaptive couple strategies (e.g., division of labor, couple communication, co-parenting, problem solving) as part of prenatal preparation to prevent relationship quality from declining following childbirth.

In the present study, experiencing more life stressors in the preceding 6 months was associated with elevated depressive symptoms for expectant fathers. Exposure to stressful life events has in the general population, particularly among women, been associated with depression onset and reoccurrence (Harkness et al., 2010; Roca et al., 2013). During pregnancy, life event stress has been identified as a risk factor for antenatal maternal depression (Leigh & Milgrom, 2008). These results are consistent with emerging findings suggesting an association between stressful life events and paternal depression (Boyce et al., 2007; Wee et al., 2011; Edward et al., 2015). In the present study, the self-report measure assessed stressful life events experienced in the prior 6 months. Events

occurring earlier in life such as physical, sexual, and emotional abuse and loss experiences were not assessed. Future studies should also examine the potential role of earlier stressful events given studies in other adult populations which have reported long-lasting effects of events occurring in childhood and adolescence on emotional well-being (Kendler, Kuhn, & Prescott, 2004).

Financial strain was associated with elevated antenatal depressive symptoms for men expecting their first child. Economic strain increases the amount of stress placed on an expectant father due to limited financial resources for raising an infant. Similar associations between financial hardship and perinatal depression have been reported in women (Rich-Edwards et al., 2006; Lanes, Kuk, & Tamim, 2011). In a small community sample study, Zerkowicz and Milet (1997) reported a relationship between economic stress and elevated psychological distress in men whose partners were depressed in the postpartum. The results of the present study extend this relationship previously observed in men during the postpartum to the pregnancy period for first-time expectant fathers. Financial hardship likely predates depression and these findings support others who suggest that it should be a factor signaling greater risk for paternal perinatal depression and targeted prevention.

In concordance with other studies (Goodman, 2008; Wee et al., 2011), having a partner with elevated antenatal depressive symptoms was associated with increased depressive symptoms in expectant fathers. The causal relationship between maternal and paternal antenatal depression is unclear, but it has been suggested that each partner's psychosocial state directly influences the other partner's or that men and women who are vulnerable to depression are more likely to develop relationships with each other (Deater-Deckard, Pickering, Dunn, & Golding, 1998). Importantly, antenatal depression in both parents has been associated with a greater risk of emotional difficulties in children compared with when only one parent is depressed, suggesting a cumulative effect (Kvalevaag et al., 2014). These findings underscore the importance of routine screening for paternal antenatal depression, particularly when their partner is experiencing depressive symptoms.

The present study has several limitations. Depressive symptoms were assessed by self-report with the EDS. Diagnostic clinical interviews remain the gold standard for identifying clinical depression. However, the EDS is the most widely used tool to assess depressive symptoms in parents during the perinatal period and has been reported to be a reliable and valid measure for use with expectant and new fathers (Edmondson et al., 2010; Matthey et al., 2001). Depressive symptoms in the present study were assessed at a single time point in the late second or early third trimester. It has been suggested that

paternal depressive symptoms may fluctuate over the course of pregnancy (Figueiredo & Conde, 2011; Gawlik et al., 2014; Teixeira et al., 2009), similar to what has been observed for maternal antenatal depressive symptoms (Matthey & Ross-Hamid, 2012). In the final models 29% to 32% of the variance in antenatal paternal depressive symptoms was explained, suggesting that other variables not assessed in this study (i.e., history of depression, pregnancy and birth related anxiety, prior perinatal loss, trauma history) require further study to determinate their relative contributions. The cross-sectional design of the present study does not allow us to determine the direction of the relationships identified. Future multivariate prospective studies beginning earlier in pregnancy are needed to expand the understanding of factors associated with antenatal paternal depressive symptoms. Finally, the sample in this study was fairly well-educated, consisting predominately of middle-class expectant fathers, limiting generalizability. While in Canada, the average age, income, and education for first-time fathers has increased considerably over the last three decades (Statistics Canada, 2015), studies targeting more socially vulnerable populations are needed. Despite these limitations, this study had a large sample size which allowed us to examine a broad range of risk factors, some which (i.e., sleep, physical activity level) have not been investigated in previous studies on paternal depression. This study remains one of the best efforts to date in assessing paternal antenatal depressive symptoms in a Canadian population.

The factors identified in the present study (i.e., social support, stress, family history) in relation to antenatal paternal depression are consistent with the diathesis-stress model (Hankin & Abramson, 2001; Monroe & Simons, 1991). Future studies may find the application and refinement of the diathesis-stress model useful as a guiding framework for understanding the manifestation of depressive symptoms in men during the transition to parenthood.

These results indicate that a significant number of expectant new fathers experience elevated depressive symptoms during their partner's pregnancy. These findings are important because antenatal depression has been identified as a strong risk factor for postpartum depression and adverse child development outcomes. The findings suggest a vital need for early and accurate screening of expectant fathers as well as mothers for depression during the transition to parenthood. Pregnancy may be a "teachable moment" for educating and preparing men at risk for mental health difficulties. Strategies to promote better sleep, manage stress, and mobilize social support may be important areas to address in innovative (i.e., mobile and web-delivered) interventions tailored to new fathers at risk for depression during the perinatal period.

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