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Original article

Seasonal patterns in self-reported peripartum depressive symptoms

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1. Introduction

Peripartum depression is defined as a major depressive episode with onset of mood symptoms during pregnancy (also called antenatal depression) or within four weeks after delivery (postpartum depression) [1]. However, in both research and clinical practice, the postpartum period is often extended to include the first 12 months after delivery [2]. Risk factors for developing peripartum depression include previous mental illness, lack of social support, low income, unplanned or unwanted pregnancy, adverse life events, and pregnancy complications [2–4].

Peripartum depression does not only have consequences for the woman, but can negatively influence the entire family. Infants of mothers suffering from antenatal depression have been reported to have an increased risk of premature birth [5,6], and low birth weight [6]. Peripartum depression can adversely influence the mother–child attachment, the social behavior of the child [7], and the child's cognitive development [8,9]. With an estimated period prevalence of up to 18% during pregnancy and 19% in the first three months following delivery [10], and with substantial associated costs [11], peripartum depression should be seen as a serious global health problem.

The notion of a seasonal variation in mood symptoms dates back to the Hippocrates era, approximately 400 BC [12]. The syndrome of seasonal affective disorder (SAD) was described by Rosenthal [13] in 1984. The seasonal specifier in mood disorders was introduced in the revised third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) [14]. Individuals with SAD typically experience mood deterioration during the winter or fall, and remission in the summer or spring [15]. It should be noted that while the prevalence of SAD is estimated to approximately 10% [15], the prevalence of DSM-based seasonal patterns in major depression is approximately 1% [16,17]. SAD is reported to be more common among women than men [18,19]. Seasonal patterns have been studied among other mental disorders as well, with seasonal variations reported in the prescription of antidepressants [20], symptoms and admissions in bipolar disorder [21], as well as with suicide [22].

An increased international interest of potential seasonal patterns in peripartum depression has been noted during the past decades. Although a fair number of studies have been conducted, the results are conflicting and most of the focus has been on the postpartum period [23–29]. In addition, the geographical location of the studies varies greatly (Table 1). In the study by Sylvén et al. [28], conducted within our research group but on another study population, an increased risk of depressive symptoms at both 6 weeks and 6 months postpartum was noted in women giving birth in the last quartile of the year.

The aims of this study were to investigate whether seasonal patterns in postpartum depressive symptoms identified in an earlier Swedish study could be replicated in a larger material, as

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Table 1
Summary of studies assessing the association between season and peripartum depressive symptoms.

Study	Country	Time period of study (years)	Time point for season corresponding to	Definition of season	Mood assessment method and time point	Total number of participants	Statistical method	Main findings
Meliska et al., 2013 [38]	USA	20.5	Assessment	Sp/Su: Apr–Sep F/W: Oct–Mar	HRSD ≤ Gestational week 34	31	Pearson correlation	More severe depressive symptoms in depressed patients during seasonally longer nights in comparison with seasonally shorter nights ($P = 0.01$)
Sit et al., 2011 [27]	USA	5	Assessment	Months	EPDS (≥ 10) at 4–6 weeks pp	9339	Fourier Basis	Highest risk of PPD in December and lowest in July ($P = 0.03$)
Sylvén et al., 2011 [28]	Sweden	1	Delivery	Q1: Jan–Mar Q2: Apr–May Q3: Jun–Sep Q4: Oct–Dec	EPDS (≥ 12) at 5 days, 6 weeks, and 6 months pp	2318	Cross-tabulation, logistic regression	Increased risk of self-reported depressive symptoms at 6 weeks (OR = 2.02; 95% CI: 1.32–3.10) and 6 months (OR = 1.82; 95% CI: 1.15–2.88) postpartum when giving birth in the last quartile of the year, compared with April–June
Yang et al., 2011 [29]	Taiwan	4	Delivery	Sp: Mar–May Su: Jun–Aug F: Sep–Nov W: Dec–Feb	Psychiatrists' diagnoses and prescription of antidepressants within 6 months pp	10,535	χ^2, logistic regression	When compared with winter, there was a decreased risk of PPD in summer (OR = 0.61; 95% CI: 0.53–0.70) and fall (OR = 0.65; 95% CI: 0.56–0.74)
Jewell et al., 2010 [25]	USA	2	Delivery	Sp: Apr–Jun Su: July–Sep F: Oct–Dec W: Jan–Mar	Modified PHQ-2 pp (≥ 3 and ≥5), median age of infant was 112.06 days	67,079	Survey logistic regression	There was no association between PPD and either season of delivery or length of daylight at delivery
Panthangi et al., 2009 [26]	USA	2	Delivery	Sp: Mar–May Su: Jun–Aug F: Sep–Nov W: Dec–Feb	EPDS (≥ 13) at 5–8 weeks pp	530	χ^2, unpaired *t*-test, logistic regression	There was no seasonal patterns in PPD
Corral et al., 2007 [23]	Canada	2.5	Assessment	SPAQ scores at assessment point	DSM-IV, SPAQ Cases: 5.56 months pp	112	Logistic regression	SAD was twice as common in the PPD group compared with control group. The PPD group also had higher global seasonality score (GSS). However, higher GSS in women with PPD were not predictive of PPD
Hiltunen et al., 2004 [24]	Finland	1 year 2 months	Assessment	Sp: Mar–May Su: Jun–Jul F: Sep–Oct W: Dec–Feb According to light Dark: Oct–Jan Intermediate: Feb–Sep Light: Apr–Jul	EPDS (≥ 10 and ≥ 13) at 2–7 days pp and 4 months pp	185	χ^2 for multinomials	Immediately after delivery there was an increased prevalence of mild depression in fall (OR = 1.62; 95% CI: 1.05–0.62), less mild depression in the intermediate daylight time (OR = 0.66; 95% CI: 0.39–0.93), and increased depression during the dark time (OR = 1.58; 95% CI: 1.05–2.11). Four months after delivery, in spring, there were less mild depression (OR = 0.56; 95% CI: 0.23–0.89) and depression (OR = 0.27; 95% CI: 0.00–0.62)
Weobong et al., 2015 [39]	Ghana	1.5	Delivery	Rainy: May–Oct Dry: Nov–Apr	PHQ-9 (≥ 10) 4 weeks after detected pregnancy and 4 weeks after reported delivery	13,360	Logistic regression	More women experienced postpartum depression when giving birth in the dry season, when compared with the rainy season (OR = 1.29; 95% CI: 1.08–1.54)

EPDS: Edinburgh Postnatal Depression Scale; DSM-IV: Diagnostic and Statistical Manual, 4th edition; GSS: Global Seasonality Score; HRSD: Hamilton Depression Rating Scale; PHQ-2: Patient Health Questionnaire-2; PHQ-9: Patient Health Questionnaire-9; PPD: Postpartum depression; SAD: Seasonal Affective Disorder; SPA: Seasonal Pattern Assessment Questionnaire; pp: postpartum; Sp: spring; Su: summer; F: Fall; W: winter