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REVIEW ARTICLE

Abuse as a risk factor for prenatal depressive symptoms: a meta-analysis

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Abstract

Depression is the most common mental disorder in pregnancy. An important risk factor in the development of prenatal depression is lifetime history of abuse. The current review quantitatively synthesized research on the association between history of abuse and prenatal depressive symptoms using a meta-analytic technique. A total of 3322 articles were identified through electronic searches of the following databases: PsycINFO, PubMed, CINAHL, and EMBASE Cochrane Collaboration databases between the years of 1980 and 2016. All were independently screened against the following inclusion criteria: articles reporting on original data that included measures of prenatal depression and abuse. Data were extracted by the first and second authors. Descriptive analyses were conducted using Excel version 15.32, and all analyses involving effect sizes were conducted using comprehensive meta-analysis (CMA) version 3.0. Seventy articles met the inclusion criteria and were included in the meta-analyses. Meta-bias detected no publication bias. Abuse had a significant positive relation with prenatal depressive symptoms, with effect sizes in the moderate range for any abuse ($\bar{r}$ = 0.287), physical abuse ($\bar{r}$ = 0.271), sexual abuse ($\bar{r}$ = 0.259), and emotional abuse ($\bar{r}$ = 0.340; Cohen 1969. Statistical power analysis for the behavioral sciences. Academic Press, New York). The meta-analyses found a robust relation between abuse and prenatal depressive symptoms holding across a variety of demographic and study design characteristics. These results reinforce the established association between trauma victimization and subsequent psychopathology, extending current knowledge to specifically address the under-studied area of prenatal depression. These findings highlight the need for women who have survived child or adulthood abuse to receive appropriate referral and psychological treatment to mitigate their risk for prenatal depression.

Keywords Pregnancy · Prenatal · Depression · Depressive symptoms · Abuse · Intimate partner violence

Depression is the most common mental disorder in pregnancy, affecting 10 to 25% of pregnant women, and represents a significant threat to maternal and infant well-being (Anderson et al. 2003, 2004; Ayvaz et al. 2006; De Tychey et al. 2005; Stowe et al. 2005). Depression during pregnancy (i.e., prenatal depression) is associated with an amplification of the physical symptoms of pregnancy, including increased headaches, gastrointestinal distress, fatigue, and nausea (Kelly et al. 2001), and is the strongest predictor of depression continuing into the postpartum period (Hoffman and Hatch 2000; Shidhaye and Giri 2014). Prenatal depression is associated with higher rates of spontaneous abortion (Nakano et al. 2004; Sugiura-Ogasawara et al. 2002), greater chance of preterm birth (Jesse et al. 2003; Moncuso et al. 2004), and low fetal birth weight (Field et al. 2004; Hoffman and Hatch 2000).

Over the past two decades, there has been increasing global recognition of the prevalence and morbidity associated with prenatal depression (World Health Organization 2007, 2017). Substantial evidence from both cross-sectional and prospective studies indicates that one of the strongest environmental predictors of the development of depression in women is a lifetime history of abuse (i.e., childhood and/or adult physical, sexual, or emotional abuse; Infurna et al. 2016; Devries et al. 2014). An abuse history also predicts a more recurrent and persistent course of depression (Nanni et al. 2012). A recent qualitative review examined the relation of a lifetime history of abuse to depressive symptoms during the perinatal period (i.e., pregnancy and up to 12 months postpartum; Alvarez-Segura et al. 2014). The results of this review indicated a strong relation between

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abuse and perinatal depressive symptoms in all 43 studies that were included. Despite a growing body of evidence indicating significant negative consequences of prenatal depression for both mother and offspring (e.g., Gentile 2017), the etiology of prenatal depression remains an understudied area of research. A recent meta-analysis found that on average fewer than 10% of pregnant women are screened for intimate partner abuse in primary care settings and virtually no practitioners query child abuse (Natan et al. 2012; Todahl and Walters 2011). The purpose of this meta-analysis is to provide a statistical summary of the relation between abuse and prenatal depression in order to highlight the negative mental health consequences of abuse that occur during pregnancy and the need for appropriate screening, referral, and treatment of trauma to mitigate these risks.

The vast majority of studies examining the relation between a lifetime history of abuse and prenatal depression have operationalized depression using particular cut-off scores on a symptom severity scale, such as the Edinburgh Postnatal Depression Scale (EPDS; Cox et al. 1987), the Beck Depression Inventory—II (BDI-II; Beck et al. 1996), or the Center for Epidemiological Studies—Depression scale (CES-D; Radloff 1977). These scales have moderate to high sensitivity in detecting clinical depression during pregnancy (ranges from 80 to 87% sensitivity) and specificity in distinguishing prenatal depression from other mental disorders (ranges from 73 to 85% specificity) when certain cut-off scores are used (e Couto et al. 2015). However, different studies use a range of cut-off scores, making it problematic to combine these studies. Further, artificial dichotomization of a naturally continuous variable attenuates correlations with other variables (Hunter and Schmidt 1990). As such, effect sizes based off an artificial dichotomization of a symptom severity measure were corrected using the adjustment procedure suggested by Hunter and Schmidt (1990). Therefore, the current meta-analysis reports on the relation between lifetime history of abuse and prenatal continuous scores on depression symptom measures. Consistent with previous qualitative reviews in perinatal depression (Alvarez-Segura et al. 2014) and depression in the general population (Infurna et al. 2016), we expect to confirm a strong and robust association.

Further, identifying moderators in the relation between abuse and prenatal depression is important in furthering our understanding of prenatal depression and for predicting who is at the greatest risk for developing depression. In the general population, the relation of abuse to depression is moderated by several factors, including abuse type (e.g., emotional vs. physical vs. sexual; Infurna et al. 2016), age of exposure (e.g., childhood/adolescence vs. adulthood; Chen et al. 2010), and type of sample (e.g., community vs. clinical; Infurna et al. 2016). To date, it is unknown whether the relation of abuse to depression in the prenatal period is moderated by these same factors or whether there are additional specific moderators that need to be considered for this unique depression subtype.

As such, the second objective of the current meta-analysis is to examine moderation of the relation between abuse and depression. We conducted separate meta-analyses for any abuse (composite index of abuse that includes any of physical abuse, sexual abuse, emotional abuse, or the combination thereof); physical abuse (any abuse of a physical nature that includes spanking, hitting, kicking, and shoving); sexual abuse (any unwanted sexual act [physical or verbal], age-inappropriate sexual activity, or sexual contact with an authority figure or family member as a child); and emotional abuse (physical or emotional neglect, or antipathy by a parent or partner). The following moderators were considered in each meta-analysis unless specified differently in the results: (1) sample characteristics: age of participants (adolescent, adult), country (developed, developing), proportion of non-White participants, proportion of low-income participants, and proportion of partnered participants; (2) study characteristics: recruitment method (random, convenience) and sample source (clinic, community); and (3) abuse characteristics: quality of abuse measure (validated, invalidated), timing of abuse (childhood, lifetime, adulthood), and perpetrator of abuse (partner, any perpetrator[1]).

Method

All procedures and findings are reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al. 2009). A search was conducted on the PsycINFO, PubMed, CINAHL, and EMBASE Cochrane Collaboration databases using the search terms “antenatal” OR “prenatal” OR “perinatal” OR “prepartum” OR “peripartum” OR “antepartum” OR “pregnancy” AND “depress*” AND “violen*” OR “abus*” OR “trauma” OR “rape” OR “assault” OR “neglect” in titles and abstracts of books, dissertations, and journal articles. Forward and backward searches were conducted using the Web of Science database. A total of 3322 articles were obtained from databases and additional searching (see Fig. 1 for flow diagram). All were independently screened against inclusion criteria by the first and second authors. Exclusion criteria included the following: (1) studies that did not include an assessment of prenatal depression or assessed depression within another construct (e.g., a “psychopathology score” that consisted of depression, anxiety, etc.); (2) studies that did not include an assessment of abuse or assessed abuse within another construct (e.g., the number of recent stressful life events); (3) studies that included less than 20 participants; (4) studies in which the entire sample had a diagnosis of

[1] “Partner” was coded when the author(s) specified that the perpetrator was the partner, such as in intimate partner violence, whereas “anyone” was coded when the authors did not specify that the perpetrator of abuse was the partner.

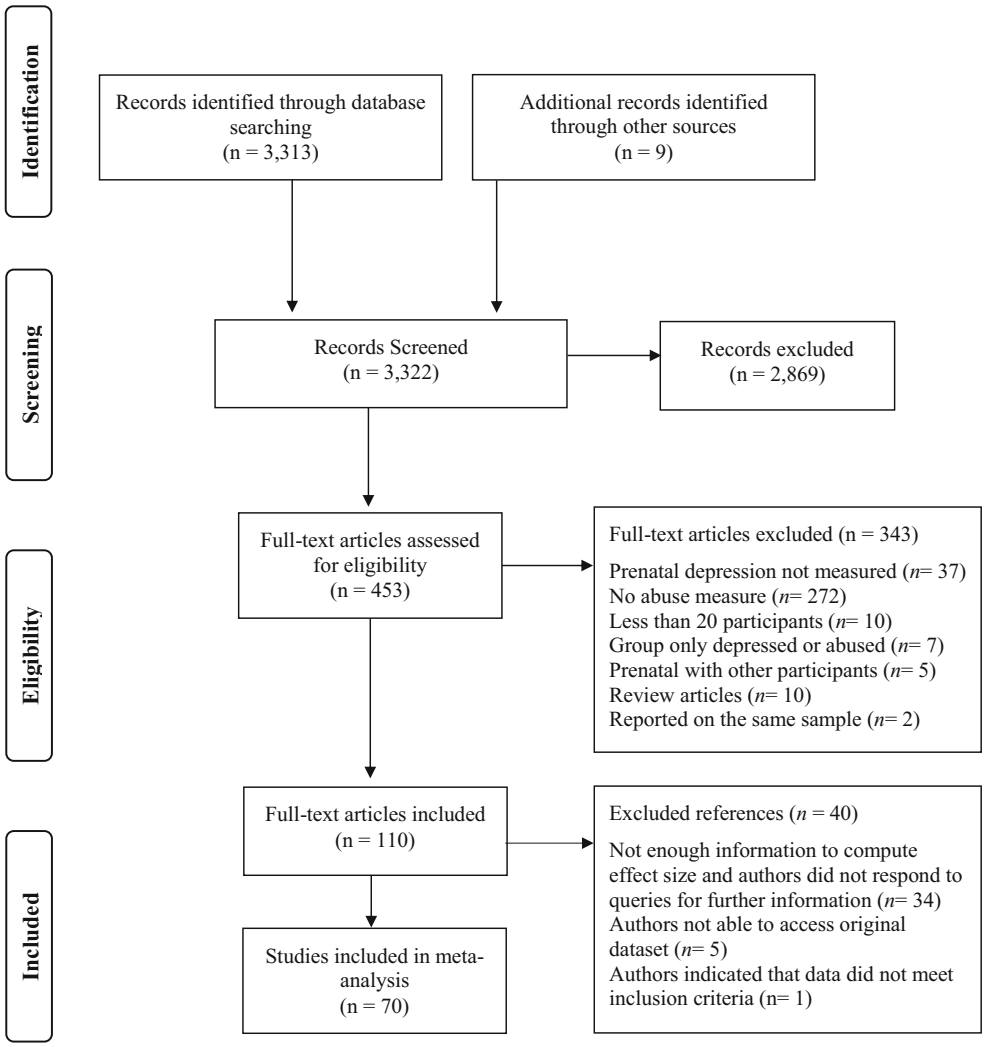

Fig. 1 Flow diagram of study selection

depression or had been identified as being abused; (5) studies in which the sample consisted of both pregnant and non-pregnant women; (6) review articles with no original data; and (7) articles that reported on the same sample.

Several studies reported effect sizes for more than one type of abuse. As such, we conducted separate meta-analyses examining the relation between prenatal depression and (1) any abuse, (2) physical abuse, (3) sexual abuse, and (4) emotional/verbal abuse. We extracted effect sizes (Pearson's correlation coefficients, *r*) from all identified studies. If *r* was not reported, we extracted effect sizes in other statistics (e.g., odds ratio) or data necessary to calculate an effect size. As described previously, effect sizes were corrected for artificial dichotomization of a continuous depression measure ($n = 36$) using the adjustment procedure suggested by Hunter and Schmidt (1990). When there was insufficient information to compute an effect size, we contacted the corresponding authors ($n = 42$); 14 authors responded (33% response rate). Some studies included enough information that would allow for the computation of multiple effect sizes. In these cases, we selected the effect size for lifetime abuse as this categorization captured all women who experienced abuse. If lifetime abuse was not provided, the abuse variable that captured the larger time-frame was selected (e.g., abuse in previous 12 months over abuse during pregnancy alone).

Descriptive analyses were conducted using Excel version 15.32, and all analyses involving effect sizes were conducted using the comprehensive meta-analysis (CMA) version 3.0. When combining effect sizes, correlation coefficients were first transformed into Fisher's *Zr* to provide a normally distributed metric (Rosenthal 1994). Effect sizes were then combined using weighted random-effects analyses. The random effects model was chosen a priori due to the heterogeneity of participant characteristics, assessment measures, and study design. This model is more conservative than the fixed-effects model as it makes fewer assumptions about shared population characteristics and allows for findings to be generalized beyond the studies used in the current meta-analyses (Card 2012). Further, the fixed-effects model was inappropriate given that for all meta-analyses performed, there was significant heterogeneity around the mean (see the "Results"

section). Effect sizes were transformed back into r for interpretation. Correlation coefficients of 0.10 are considered small, 0.30 moderate, and 0.50 large (Cohen 1969).

All studies were coded for the moderators as well as for the following variables: sample size; mean age; year of publication; name of depression measure used; cut-off score for depression measure and number of participants meeting study criteria for depression (note: not applicable in studies reporting depression as a continuous variable); and number of participants meeting study criteria for abuse. All articles were coded independently by the first and second authors. Agreement rate—the proportion of studies that two coders independently assign the same categorical code for a specific variable—was used as an index of reliability (Orwin and Vevea 2009). The agreement rate was 1 for all variables except for the following: (1) sample size (agreement rate = 0.93); (2) proportion of low-income participants (agreement rate = 0.89); and (3) perpetrator of abuse (agreement rate = 0.96). Sample size, depression measure, abuse measure, and timing of abuse for each study are presented in Tables 1, 2, 3, and 4.

Moderator analyses were conducted when overall effect sizes contained significant heterogeneity. All moderator analyses utilized a mixed-effects model in which the effect sizes of studies were permitted to randomly vary whereas moderator variables were considered fixed. These models were estimated using maximum likelihood (Borenstein et al. 2009). Categorical moderators were examined using variance partitioning procedures comparable to analysis of variance. Continuous moderators were tested using a procedure comparable to weighted regression. Significant between-moderator group heterogeneity (Q_b) is indicative of moderation (Lipsey and Wilson 2001). Significance of the $Q_{regression}$ is indicative of significant variance that was unaccounted for by the moderation.

Rosenthal's (1979) fail-safe N was computed as an index of publication bias across meta-analyses. Fail-safe N refers to the number of excluded (unpublished) studies with null results that would be sufficient to reduce the overall effect sizes to a non-significant value (i.e., such that confidence intervals would include zero). Rosenthal (1979) suggests that a sufficiently high fail-safe N is equal to $5k + 10$ (k = number of studies included in the meta-analysis). We compared the recommended fail-safe N to the one generated based on the meta-analysis results to assess the degree of threat to the robustness of the findings.

Results

Seventy studies with a total of 62,438 participants met the inclusion criteria and were included in the current review. File-drawer analyses that yielded values for the *fail-safe N* for all analyses in the current study well exceeded the suggested criteria (range = 432–7606), indicating that a substantial number of unpublished studies with null findings would need to be included in the meta-analysis for the average effect size to drop to $\alpha > 0.05$.

Results of the meta-analyses are presented in Tables 1, 2, 3, and 4. The relation between prenatal depressive symptoms and abuse was significant for any abuse ($k = 30$, $n = 34{,}163$), $\bar{r} = 0.287$ (95% CI = 0.220, 0.351), $p < 0.001$; physical abuse ($k = 35$, $n = 24{,}580$), $\bar{r} = 0.271$ (95% CI = 0.243, 0.299), $p < 0.001$; sexual abuse ($k = 31$, $n = 18{,}624$), $\bar{r} = 0.259$ (95% CI = 0.220, 0.296), $p < 0.001$; and emotional abuse ($k = 8$, $n = 3643$), $\bar{r} = 0.340$ (95% CI = 0.229, 0.442), $p < 0.001$. All effect sizes were within the moderate range (Cohen 1969).

Moderation

Within all four meta-analyses, significant heterogeneity was found across studies (all ps < 0.001), and the proportion of variation of effects attributable to heterogeneity was large (I^2 range 78.471–97.081), permitting an examination of moderation. Table 5 presents the results of the moderation analyses. There were no significant moderators identified for the relations between prenatal depressive symptoms and any abuse, physical abuse, or emotional abuse.

Significant moderation (Q_b) was identified for the relation between several sexual abuse variables and prenatal depressive symptoms. First, timing of abuse emerged as a significant moderator. To understand the moderation, child abuse was entered as the reference variable. The effect size for the relation between sexual abuse experienced in childhood and prenatal depressive symptoms was significantly lower than sexual abuse experienced in adulthood or during the lifetime (Z). Second, perpetrator of abuse emerged as a significant moderator such that a stronger association between sexual abuse and prenatal depression was found when the perpetrator of the sexual abuse was the partner compared to anyone. Third, abuse measure quality emerged as a significant moderator such that studies that used a validated measure of sexual abuse yielded a smaller effect size compared to studies that used a non-validated, study-specific measure. Finally, country of study emerged as a significant moderator such that the effect size for studies conducted in developed countries was significantly larger compared to developing countries. Of importance, although we identified significant moderation, all levels of each moderator were significantly related to prenatal depression (r). Further, significant variance was unaccounted for by each moderation ($Q_{residual}$).

When all significant moderators were entered simultaneously in a regression (all variables categorical and thus entered as dummy-coded variables), the overall model captured significant variance, $Q_{regression(5)} = 27.44$, $p < 0.001$. Quality of the abuse measure emerged as a significant moderator, $Zr(1) = 2.94$, $p = 0.003$. Abuse timing (childhood abuse was

Table 1 Relation between any abuse and prenatal depression

Author	*N*	Depression measure	Abuse measure	Timing	Statistics for each study				
					Correlation	Lower limit	Upper limit	*Z* value	*p* value
Akçalı Aslan et al. (2014)	463	SCID-I	Study Specific	Lifetime	0.136	0.024	0.244	2.373	0.018
Ali et al. (2012)	78	HASD	Study Specific	Lifetime	0.249	0.028	0.447	2.202	0.028
Almeida et al. (2013)	184	IACLIDE	CTS-2	Adult	0.261	0.124	0.388	3.685	0.000
Barrios et al. (2015)	1503	PHQ-9	CPSA	Child	0.315	0.269	0.360	12.629	0.000
Baydoun (2009)	373	CESD	AAS & WEB	Adult	0.238	0.141	0.329	4.744	0.000
Bernstein et al. (2016)	623	EPDS	WHO-VAWQ	Adult	0.379	0.310	0.445	9.944	0.000
Bilszta et al. (2008)	1539	EPDS	Study Specific	Lifetime	0.261	0.214	0.307	10.471	0.000
Bonacquisti et al. (2014)	258	CESD	Study Specific	Lifetime	0.296	0.183	0.400	5.008	0.000
Brittain et al. (2015)	726	BDI-II	CTQ-SF	Child	0.342	0.276	0.405	9.582	0.000
Bublitz and Stroud (2012)	135	IDS	ACES	Child	0.107	− 0.061	0.269	1.252	0.211
Choi et al. (2015)	84	EPDS	CTQ-SF	Child	0.230	0.016	0.424	2.108	0.035
Edwards et al. (2008)	383	EPDS	APQ	Child	0.211	0.113	0.305	4.176	0.000
Flach et al. (2011)	13617	EPDS	Study Specific	Adult	0.424	0.392	0.455	23.030	0.000
Fonseca-Machado et al. (2015)	358	EPDS	WHO-VAWQ	Adult	0.325	0.229	0.415	6.354	0.000
Holden et al. (2012)	602	EPDS	WAST	Adult	0.260	0.184	0.333	6.513	0.000
Imran and Haider (2010)	213	EPDS	Study Specific	Lifetime	0.345	0.221	0.458	5.213	0.000
Lara et al. (2014)	250	CESD	IPV-ES	Adult	0.450	0.133	0.684	2.706	0.007
Lydsottir et al. (2014)	353	EPDS	Study Specific	Lifetime	0.231	0.130	0.327	4.401	0.000
McDonnell and Valentino (2016)	398	BDI-II	FHHQ	Child	0.340	0.250	0.424	7.037	0.000
Melville et al. (2010)	1887	PHQ-SF	AAS	Adult	0.279	0.237	0.320	12.440	0.000
Miszurka et al. (2012)	5162	CESD	AAS	Adult	0.436	0.368	0.500	11.239	0.000
Plant et al. (2013)	125	CIS	Study Specific	Child	0.435	0.265	0.579	4.696	0.000
Rees et al. (2016)	1057	EPDS	WHO-VAWQ	Adult	0.364	0.311	0.415	12.385	0.000
Rodriguez et al. (2008)	210	BDI-FS	AAS	Lifetime	0.388	0.267	0.497	5.891	0.000
Sidebottom et al. (2014)	511	PHQ-9	Study Specific	Adult	0.226	0.142	0.307	5.183	0.000
Thananowan and Heidrich (2008)	475	EPDS	AAS	Lifetime	0.163	0.068	0.254	3.360	0.001
Thompson et al. (2000)	224	CESD	Study Specific	Lifetime	0.348	0.227	0.458	5.399	0.000
Van Heyningen et al. (2016)	376	MINI	CTS-2	Adult	0.192	0.076	0.303	3.224	0.001
Van Parys et al. (2015)	1894	CESD	Study Specific	Adult	0.051	0.041	0.061	10.142	0.000
Walsh et al. (2016)	102	SCL-90	CTQ	Child	0.300	0.112	0.467	3.080	0.002
Overall					0.287	0.220	0.351	8.111	0.000

Effect sizes are Pearson's *r*

Depression measures: SCID, Structured Clinical Interview for the DSM-IV—Turkish version (Çorapçıoğlu et al. 1999); HASD, Hospital Anxiety and Depression Scale (Zigmond and Snaith 1983); IACLIDE, Inventory of the Clinical Evaluation of Depressions (Portuguese version; Vaz Serra 1994); PHQ, Patient Health Questionnaire (9 items, Kroenke et al. 2001; or short form, Spitzer et al. 1999); CESD, Center for Epidemiological Studies Depression Scale (Radloff 1977); EPDS, Edinburg Postnatal Depression Scale (Cox et al. 1987); BDI, Beck Depression Inventory (second edition or fast screen, Beck et al. 1996; 2000); IDS, Inventory for Depression Symptomatology (Rush et al. 1996); CIS, Clinical Interview Schedule (Goldberg et al. 1970); MINI, expanded mini-international neuropsychiatric interview (Sheehan et al. 1998); SCL-90, Symptom Checklist—90 depression subscale (Derogatis 1992)

Abuse measures: Study Specific, a questionnaire or interview designed specifically for the study and not validated; CTS-2, Conflict Tactics Scale Second Edition (Straus and Hamby 1996); CPSA, Childhood Physical and Sexual Abuse Questionnaire (Felitti et al. 1998); AAS, Abuse Assessment Screen (McFarlane et al. 1992); WEB, Women's Experience with Battering scale (Smith et al. 1995); WHO-VAWQ, World Health Organization—Violence Against Women Questionnaire (Schraiber et al. 2010); CTQ, Childhood Trauma Questionnaire (regular and short forms, Bernstein et al. 1997; 2003); ACES, Adverse Childhood Experiences Scale (Dube et al. 2003); APQ, Antenatal Psychosocial Questionnaire (Matthey et al. 2004); WAST, Women Abuse Screening Tool (Brown et al. 2000); IPV-ES, Intimate Partner Violence Evaluation Scale (Rey et al. 2004); FHHQ, Family Health History Questionnaire—female version (Felitti et al. 1998)

entered as the reference group) approached significance, $Q_{b(2)} = 5.20$, $p = 0.07$, with difference between childhood abuse and lifetime abuse significant, $Zr(1) = 1.99$, $p = 0.047$, and childhood abuse and adult abuse at trend level, $Zr(1) =$

Table 2 Relation between physical abuse and prenatal depression

Author	*N*	Depression measure	Abuse measure	Timing	Statistics for each study				
					Correlation	Lower limit	Upper limit	*Z* value	*p* value
Barrios et al. (2015)	1020	PHQ-9	CPSA	Child	0.277	0.219	0.333	9.071	0.000
Buzi et al. (2015)	249	CESD	Study Specific	Child	0.406	0.297	0.505	6.757	0.000
Choi et al. (2015)	84	EPDS	CTQ-SF	Child	0.210	−0.005	0.406	1.919	0.055
Dibaba et al. (2013)	622	EPDS	Study Specific	Adult	0.204	0.127	0.278	5.148	0.000
Dunn and Oths (2004)	420	CESD	AAS	Adult	0.269	0.180	0.354	5.765	0.000
Flynn et al. (2007)	1054	CESD	Study Specific	Adult	0.220	0.162	0.277	7.251	0.000
Gausia et al. (2009)	361	EPDS	Study Specific	Adult	0.277	0.179	0.370	5.382	0.000
Hartley et al. (2011)	1062	EPDS	Interview	Adult	0.182	0.123	0.240	5.989	0.000
Hedin and Janson (1999)	207	TSC-33	SVAWS	Adult	0.391	0.269	0.501	5.904	0.000
Jackson et al. (2012)	101	BDI-II	JHP	Adult	0.210	0.015	0.389	2.110	0.035
Jeong et al. (2013)	1262	EPDS	Study Specific	Child	0.156	0.102	0.209	5.581	0.000
Jundt et al. (2009)	455	HASD	Study Specific	Lifetime	0.239	0.152	0.322	5.271	0.000
Karaçam and Ançel (2009)	1039	BDI-II	Study Specific	Adult	0.133	0.073	0.192	4.301	0.000
Lesser and Koniak-Griffin (2000)	95	CESD	CTS	Child	0.247	0.054	0.422	2.494	0.013
Lewis et al. (2017)	228	CESD	CTS-R	Adult	0.311	0.193	0.421	4.982	0.000
Lovisi et al. (2005)	230	CIDI	Study Specific	Adult	0.337	0.202	0.460	4.698	0.000
Mahenge et al. (2013)	1180	HSCL-25	CTS-2	Adult	0.306	0.253	0.357	10.845	0.000
Martin et al. (2006)	95	CESD	CTS-2	Adult	0.252	0.059	0.426	2.547	0.011
Meltzer-Brody et al. (2013)	187	EPDS	Study Specific	Child	0.200	0.058	0.334	2.750	0.006
Nasreen et al. (2011)	720	EPDS	Study Specific	Lifetime	0.382	0.318	0.443	10.775	0.000
Peltzer et al. (2016)	663	EPDS	CTS	Adult	0.218	0.144	0.289	5.692	0.000
Records and Rice (2007)	136	CESD	Study Specific	Lifetime	0.270	0.108	0.418	3.229	0.001
Rees et al. (2016)	833	EPDS	WHO-VAWQ	Adult	0.264	0.200	0.326	7.790	0.000
Rich-Edwards et al. (2011)	3499	EPDS	PSQ	Lifetime	0.250	0.219	0.281	15.102	0.000
Rotheram-Borus et al. (2015)	904	EPDS	Study Specific	Adult	0.240	0.178	0.301	7.347	0.000
Scheid et al. (2007)	568	CESD	Study Specific	Lifetime	0.324	0.228	0.415	6.306	0.000
Seng et al. (2008)	1259	CIDI	LSC	Lifetime	0.112	0.018	0.204	2.328	0.020
Shah et al. (2011)[a]	123	EPDS	Study Specific	Lifetime	0.033	−0.145	0.209	0.362	0.718
Shneyderman and Kiely (2013)	917	HSCL	CTS-2	Adult	0.300	0.241	0.356	9.589	0.000
Stevens-Simon and McAnarney (1994)	127	CESD	Study Specific	Child	0.229	0.061	0.384	2.663	0.008
Tinglöf et al. (2015)	1514	HASD	Study Specific	Lifetime	0.365	0.316	0.412	13.523	0.000
Trotter et al. (2004)	200	BDI	SVAWS	Adult	0.380	0.255	0.493	5.615	0.000
Varma et al. (2007)	203	BDI	ISA	Adult	0.451	0.341	0.549	7.304	0.000
Wangel et al. (2016)	981	EPDS-5	NorAQ	Lifetime	0.393	0.339	0.445	12.989	0.000
Zhong et al. (2016)	1982	PHQ-9	CPSA	Child	0.319	0.279	0.358	14.704	0.000
Overall					0.271	0.243	0.299	17.938	0.000

[a] Subsample of pregnant women from Northern Pakistan

Effect sizes are Pearson's *r*

Depression measures: PHQ-9, Patient Health Questionnaire—9 items (Kroenke et al. 2001); CESD, Center for Epidemiological Studies Depression Scale (Radloff 1977); EPDS, Edinburg Postnatal Depression Scale (standard and 5-item versions, Cox et al. 1987; Eberhard-Gran et al. 2007); TSC-33, Trauma Symptom Checklist Depression Subscale (Briere and Runtz 1989); BDI, Beck Depression Inventory (first and second editions; Beck et al. 1961; 1996); HASD, Hospital Anxiety and Depression Scale (Zigmond and Snaith 1983); CIDI, Composite International Diagnostic Review (Wittchen et al. 1991); HSCL, Hopkin's Symptoms Checklist Depression Scale (Derogatis et al. 1974)

Abuse measures: CPSA, Childhood Physical and Sexual Abuse Questionnaire (Felitti et al. 1998); Study Specific, a questionnaire or interview designed specifically for the study and not validated; CTQ, Childhood Trauma Questionnaire (standard and short forms, Bernstein et al. 1997; 2003); AAS, Abuse Assessment Screen (McFarlane et al. 1992); SVAWS, Sexual Violence Against Women Scale (Marshall 1992); JHP, Jackson, Hogue, Phillips Contextualized Stress Measure (Jackson et al. 2004); CTS, Conflict Tactics Scale (standard, second, and revised editions, Straus 1990; Straus and Hamby 1996; Straus and Douglas 2004); WHO-VAWQ, World Health Organization—Violence Against Women Questionnaire (Schraiber et al. 2010); PSQ, Personal Safety Questionnaire (Rich-Edwards et al. 2011); LSC, Life Stressor Checklist (Wolfe and Kimerling 1997); ISA, Index of Spouse Abuse (Hudson and McIntosh 1981); NorQA, NorVold Abuse Questionnaire (Swahnberg and Wijma 2003)

Table 3 Relation between sexual abuse and prenatal depression

Author	*N*	Depression measure	Abuse measure	Timing	Statistics for each study				
					Correlation	Lower limit	Upper limit	*Z* value	*p* value
Barrios et al. (2015)	579	PHQ-9	CPSA	Child	0.062	−0.020	0.143	1.490	0.136
Benedict et al. (1999)	357	CESD	Study Specific	Child	0.314	0.217	0.405	6.114	0.000
Bonacquisti et al. (2014)	258	CESD	Study Specific	Child	0.257	0.142	0.365	4.297	0.000
Bublitz and Stroud (2012)	135	IDS	ACES	Child	0.085	−0.104	0.267	0.878	0.380
Buzi et al. (2015)	249	CESD	Study Specific	Child	0.406	0.297	0.505	6.757	0.000
Choi et al. (2015)	84	EPDS	CTQ-SF	Child	0.250	0.038	0.441	2.299	0.022
Hedin and Janson (1999)	207	TSC-33	SVAWS	Adult	0.391	0.269	0.501	5.904	0.000
Jeong et al. (2013)	1262	EPDS	Study Specific	Child	0.139	0.084	0.193	4.964	0.000
Jundt et al. (2009)	455	HASD-G	Study Specific	Lifetime	0.239	0.152	0.322	5.271	0.000
Lesser and Koniak-Griffin (2000)	95	CESD	CTS	Child	0.247	0.054	0.422	2.494	0.013
Lev-Wiesel and Daphna-Tekoah (2010)	407	CESD	CSAS	Child	0.161	0.065	0.253	3.290	0.001
Lewis et al. (2017)	228	CESD	RCTS	Adult	0.311	0.193	0.421	4.982	0.000
Littleton (2015)	407	CESD	SES	Lifetime	0.297	0.206	0.383	6.155	0.000
Lovisi et al. (2005)	230	CIDI	Study Specific	Adult	0.337	0.202	0.460	4.698	0.000
Mahenge et al. (2013)	1180	HSCL-25	CTS-2	Adult	0.306	0.253	0.357	10.845	0.000
Martin et al. (2006)	95	CESD	CTS-2	Adult	0.183	−0.014	0.366	1.818	0.069
Meltzer-Brody et al. (2013)	187	EPDS	Study Specific	Child	0.200	0.058	0.344	2.750	0.006
Nasreen et al. (2011)	720	EPDS	Study Specific	Lifetime	0.299	0.231	0.364	8.259	0.000
Rich-Edwards et al. (2011)	2364	EPDS	PSQ	Lifetime	0.319	0.282	0.355	16.061	0.000
Romano et al. (2006)	252	DIS	CTQ	Child	0.255	0.034	0.452	2.250	0.024
Scheid et al. (2007)	568	CESD	Study Specific	Lifetime	0.324	0.228	0.415	6.306	0.000
Seng et al. (2008)	1259	CIDI	LSC	Lifetime	0.112	0.018	0.204	2.328	0.020
Shah et al. (2011)[a]	123	EPDS	Study Specific	Lifetime	0.371	0.205	0.516	4.214	0.000
Shah et al. (2011)[b]	123	EPDS	Study Specific	Lifetime	0.327	0.157	0.478	3.672	0.000
Shneyderman and Kiely (2013)	917	HSCL	CTS-2	Adult	0.300	0.241	0.356	9.589	0.000
Stevens-Simon and McAnarney (1994)	127	CESD	Study Specific	Child	0.229	0.061	0.384	2.663	0.008
Tinglöf et al. (2015)	1514	HASD	Study Specific	Lifetime	0.413	0.363	0.461	14.604	0.000
Verreault et al. (2014)	364	EPDS	THQ	Lifetime	0.150	0.048	0.249	2.872	0.004
Wangel et al. (2016)	981	EPDS-5	NorAQ	Lifetime	0.368	0.313	0.421	12.075	0.000
Yampolsky et al. (2010)	1830	CESD	CSAS	Child	0.160	0.115	0.205	6.915	0.000
Zhong et al. (2016)	1067	PHQ-9	CPSA	Child	0.136	0.077	0.194	4.464	0.000
Overall					0.259	0.220	0.296	12.645	0.000

[a] Subsample of pregnant women from Northern Pakistan

[b] Subsample of pregnant Aboriginal women from Canada

Effect sizes are Pearson's *r*

Depression measures: PHQ-9, Patient Health Questionnaire—9 items (Kroenke et al. 2001); CESD, Center for Epidemiological Studies Depression Scale (Radloff 1977); IDS, Inventory for Depression Symptomatology (Rush et al. 1996); EPDS, Edinburg Postnatal Depression Scale (standard and 5-item versions, Cox et al. 1987; Eberhard-Gran et al. 2007); TSC-33, Trauma Symptom Checklist Depression Subscale (Briere and Runtz 1989); HASD, Hospital Anxiety and Depression Scale (Standard and German versions, Zigmond and Snaith 1983; Hermann et al. 1995); CIDI, Composite International Diagnostic Review (Wittchen et al. 1991); HSCL, Hopkin's Symptoms Checklist Depression Scale (Derogatis et al. 1974); DIS, Diagnostic Interview Schedule (Helzer and Robins 1988)

Abuse measures: CPSA, Childhood Physical and Sexual Abuse Questionnaire (Felitti et al. 1998); Study Specific, a questionnaire or interview designed specifically for the study and not validated; ACES, Adverse Childhood Experiences Scale (Dube et al. 2003); PSQ, Personal Safety Questionnaire (Rich-Edwards et al. 2011); CTQ, Childhood Trauma Questionnaire (standard and short forms, Bernstein et al. 1997; 2003); SVAWS, Sexual Violence Against Women Scale (Marshall 1992); CTS, Conflict Tactics Scale (standard and second editions, Straus 1990; Straus and Hamby 1996); LSC, Life Stressor Checklist (Wolfe and Kimerling 1997); THQ, Trauma History Questionnaire (Green 1996); NorQA, NorVold Abuse Questionnaire (Swahnberg and Wijma 2003)

Table 4 Relation between emotional abuse and prenatal depression

Author	*N*	Depression measure	Abuse measure	Timing	Statistics for each study				
					Correlation	Lower limit	Upper limit	*Z* value	*p* value
Aktas and Calik (2015)	266	BDI-II	Study Specific	Adult	0.349	0.229	0.459	5.440	0.000
Choi et al. (2015)	84	EPDS	CTQ-SF	Child	0.330	0.124	0.508	3.085	0.002
Dayan et al. (2010)	643	EPDS	Study Specific	Child	0.421	0.298	0.531	6.185	0.000
Hedin and Janson (1999)	207	TSC-33	PMWI	Adult	0.598	0.503	0.679	9.864	0.000
Jackson et al. (2012)	98	BDI-II	JHP	Lifetime	0.320	0.130	0.487	3.232	0.001
Rees et al. (2016)	1241	EPDS	WHO-VAWQ	Adult	0.209	0.155	0.262	7.464	0.000
Shah et al. (2011)[a]	123	EPDS	Study Specific	Lifetime	0.137	−0.041	0.307	1.510	0.131
Wangel et al. (2016)	981	EPDS	NorAQ	Lifetime	0.295	0.187	0.395	5.201	0.000
Overall					0.340	0.229	0.442	5.742	0.000

[a] Subsample of pregnant women from Northern Pakistan

Effect sizes are Pearson's *r*

Depression measures: BDI-II, Beck Depression Inventory Second Edition (Beck et al. 1996); EPDS, Edinburg Postnatal Depression Scale (Cox et al. 1987); TSC-33, Trauma Symptom Checklist Depression Subscale (Briere and Runtz 1989)

Abuse measures: Study Specific, a questionnaire or interview designed specifically for the study and not validated; CTQ-SF, Childhood Trauma Questionnaire—Short Form (Bernstein et al. 2003); PMWI, Psychological Maltreatment of Women Inventory (Tolman 1989); JHP, Jackson, Hogue, Phillips Contextualized Stress Measure (Jackson et al. 2004); WHO-VAWQ, World Health Organization—Violence Against Women Questionnaire (Schraiber et al. 2010); NorQA, NorVold Abuse Questionnaire (Swahnberg and Wijma 2003)

1.87, $p = 0.062$. A goodness-of-fit test indicated that there was significant variance unexplained by the model, $Q_{\text{residual}(25)} = 66.92$, $p < 0.001$.

Discussion

Although a substantial literature base exists documenting the relation between abuse and prenatal depression, this meta-analytic review is the first to quantitatively synthesize the available research. We found that abuse had a significant positive relation with prenatal depression, with effect sizes in the moderate range for any abuse ($\bar{r} = 0.287$), physical abuse ($\bar{r} = 0.271$), sexual abuse ($\bar{r} = 0.259$), and emotional abuse ($\bar{r} = 0.340$; Cohen 1969). In fact, all but two studies (Bublitz and Stroud 2012; Shah et al. 2011) found a significant relation between abuse and depression, confirming the robust nature of this relation in the prenatal period. These results suggest that a lifetime history of abuse is as strong a risk factor for prenatal depression as it is for depression in the general population. This risk factor

Table 5 Results of the moderation analyses for sexual abuse

Variable	*k*	*r*	95% CI	Q_b	*Z*	Q_{residual}
Timing of abuse				15.529***		96.37***
Child	14	0.197***	0.150–0.243		Reference	
Adult	6	0.309***	0.275–0.341		2.71**	
Lifetime	11	0.295***	0.242–0.346		2.92**	
Perpetrator				4.230*		177.48***
Partner	6	0.305***	0.274–0.335			
Anyone	25	0.247***	0.200–0.293			
Measure quality				7.202**		154.74***
Validated	19	0.225***	0.176–0.273			
Non-validated	12	0.315***	0.270–0.359			
Country				4.942*		123.89***
Developed	21	0.286***	0.247–0.325			
Developing	10	0.208***	0.149–0.265			

*$p < 0.05$

**$p < 0.01$

***$p < 0.001$

has important prognostic implications. Meta-analytic results have shown that, in the general population, those with a history of abuse are significantly less likely to respond to depression treatments than those without (Nanni et al. 2012). Therefore, an assessment of abuse in women with prenatal depression is necessary for them to receive evidenced-based care. We recommend that in regions where women have access to treatment and supports, routine prenatal care should include an assessment of lifetime abuse history and that policy governing the activities of practitioners who provide care to pregnant women reflects this recommendation.

Despite significant heterogeneity among studies, none of the moderators examined in the current meta-analysis were significant for the relation of prenatal depression to any abuse (composite score of abuse), physical abuse, or emotional abuse. On the one hand, these results suggest that abuse in general, and in particular physical and emotional abuses, are robust predictors of prenatal depression regardless of demographic characteristics, including age of participants, country of residence, partner status, ethnicity, and income level. On the other hand, these types of abuse may be moderated by variables not examined in the current study, such as severity and chronicity of abuse, and level of current social support, as these variables were not consistently reported across studies. These models retained a significant amount of residual variance across studies signifying a need for future research to examine additional moderators.

Several variables significantly moderated the relation of sexual abuse to prenatal depression, and two emerged as independently predictive in the multivariate model: quality of the abuse measure and abuse timing. First, while the relation between sexual abuse and prenatal depression was significant both when abuse was measured using standardized instruments and using non-validated, study-specific measures, the relation was significantly stronger when the assessment was a non-validated measure. The contents of these non-validated, study-specific measures was not always provided, but they typically consisted of very general questions (e.g., "Being the victim of physical and sexual violence;" Lovisi et al. 2005, pg. 1487). There is a great deal of evidence to suggest that responses garnered with this method are subject to idiosyncratic interpretation and recall bias and, thus, may more accurately reflect subjective perceptions of abuse rather than actual exposure to abuse (Bifulco et al. 1994; Brewin et al. 1993; Cohen et al. 1988; Harkness and Monroe 2016). This issue is particularly germane in the present context given that depression is associated with negative biases in autobiographical recall (Moore and Fresco 2012). As a result, the association between depression and abuse assessed with non-contextually anchored instruments may be artificially inflated (see also Brown et al. 2007; Harkness and Monroe 2016). We encourage researchers to use validated measures of abuse so as to ensure ecological validity and generalizability of research findings.

Second, the relation between sexual abuse and prenatal depression was significantly stronger when the abuse was perpetrated in adulthood, or operationalized as a lifetime history, than when the abuse was perpetrated only in childhood. Most of the studies that measured adult abuse focused on abuse solely in the year prior to the depression assessment with the woman's partner, and father of the baby, as the perpetrator. Systematic reviews on the relation between abuse and postpartum depression have found similar results with abuse during pregnancy or the year before pregnancy as a stronger predictor of depression than abuse at an earlier time (e.g., Ross and Dennis 2009). There are several possible explanations for these results. First, one of the strongest and most consistent risk factors for adult intimate partner sexual violence is a history of childhood sexual abuse (meta-analytic effect size of 0.59; Roodman and Clum 2001). As such, it is possible that the stronger association between adult/lifetime sexual abuse compared to childhood abuse and prenatal depression is due to cumulative abuse exposure in women experiencing adult sexual abuse. Despite well-established evidence for revictimization, particularly for physical and sexual abuses (Ports et al. 2016), trauma is often treated as an isolated event in research. Consistent with this, only two of the 70 studies in the current meta-analysis assessed the relation between cumulative abuse exposure to prenatal depression.

Second, lifetime abuse captures women with any history of abuse, including adult and childhood abuses. Littleton (2015) assessed both child and adult sexual abuses and found that 9.1% of their sample reported a history of child abuse only, 9.3% reported adult abuse only, and 9.3% reported experiencing both child and adult abuses. Further, the relation between prenatal depression and lifetime sexual abuse was stronger than the relation between prenatal depression and any of the three specific categories of abuse (i.e., child abuse only, adult abuse only, both child and adult abuses). For studies that assess sexual abuse during a specific period (e.g., childhood only), it is likely that women with abuse at another time point are included in the no abuse group potentially confounding the relation between abuse and prenatal depression.

Finally, the importance of sexual abuse during or just before pregnancy for depression may reflect an exacerbation of the helplessness and powerlessness women experience in violent relationships due to concern for the offspring's safety, a lack of social support from the partner and potential limiting of other social supports, restriction of access to healthcare, and possible unwanted pregnancy as a result of the sexual violence (Abajobir et al. 2016; Valentine et al. 2011). Similarly, women experiencing abuse during pregnancy have had less of a chance to receive treatment for the abuse and subsequent mental health concerns due to proximity of the abuse to the assessment. Of importance, the relation between childhood sexual abuse and prenatal depression was still significant, just smaller in magnitude, compared to adult sexual abuse. This result underscores

the importance of including an assessment of sexual abuse across the lifespan as a routine part of prenatal care.

Strengths and Limitations

This quantitative review had several strengths. First, we included all papers that met a priori criteria from both developed and developing countries. Therefore, the current review included representative estimates of social and economic characteristics, thereby allowing the current results to generalize to a large population. Second, we included studies that measured abuse experienced in both childhood and adulthood, in both adolescent and adult samples. This again permitted the examination of these variables as moderators as well as increased the generalizability of the findings. Third, we conducted meta-analyses and subgroup analyses for each type of abuse, allowing us to identify differences in moderation across abuse types, as well as to include the most data possible from available studies. Finally, we used robust techniques to estimate effect sizes and conduct subgroup analyses, including correcting for artificial dichotomization, weighting effect size estimates, and examining publication bias.

Nevertheless, the review was limited in several important ways due to the data available for review. First, studies used a variety of measures, both to assess for depression and to assess for abuse, as well as different classification rules for defining when abuse had occurred and what constituted "depression." As such, pooled estimates reflect the relation between two composite scores that encompass a variety of definitions of depression and abuse. This is of particular importance when considering cross-cultural differences in definitions of abuse. For example, in several non-westernized countries, there is an understanding that a wife is the possession of her husband. Her duty is to engage in sexual relations with her husband and as a result, sexual assault by the husband is considered appropriate within the context of a marriage (Bennice and Resick 2003; Kwiatkowski 2016; Menjívar 2016). As such, the association between abuse and depression may be attenuated in non-Western cultures due to a lack of consistent reporting of the abuse variable. This limitation may be overcome with the use of an interview that uses investigator-based determination of the presence and severity of abuse.

Further, most studies assessed abuse as occurring during one-time point only (e.g., childhood abuse, intimate partner violence during pregnancy) and often grouped participants as "abuse present" or "abuse absent" based on a single or series of "yes/no" question(s) (e.g., "In the past year, have you been the victim of physical or sexual violence?"). However, a single abusive experience is often the exception and not the rule for women (Kira et al. 2008). Despite a wealth of research indicating that health consequences are worse for women who experience repeat abuse or victimization in the general population (see Scott-Storey 2011 for a review), research on cumulative abuse exposure and prenatal depression is noticeably limited.

Moreover, all studies were cross-sectional and may be limited by recall bias, particularly for studies that focused on abuse in childhood and that used unstandardized, non-validated instruments to assess abuse. Finally, most studies included in the review did not assess whether the depressive episode began within the prenatal period or was present prior to the pregnancy and continued into the prenatal period. It is possible that abuse may differentially relate to the onset of depression in the prenatal period, perhaps through an interaction with pregnancy hormones. Therefore, in future research, it would be important to examine abuse as a risk factor in the context of hormonal factors that may play a role in the onset of depression in pregnancy (Ross et al. 2004).

Implications

The current meta-analysis found a robust relation between abuse and prenatal depression, with this relation holding across a variety of demographic and study design characteristics, and for sexual abuse in particular, across all levels of the moderators. Trauma over the lifespan confers substantial risk to depression during pregnancy, which not only impacts the mother's well-being but can also lead to several negative effects for the fetus (e.g., irregular heartbeat [Allister et al. 2001], increased placental expression of stress hormones [Sandman et al. 2006], and increased amygdala volume [Buss et al. 2012]), infant (e.g., altered EEG activity [Diego et al. 2004] and increased cortisol and norepinephrine levels, and decreased dopamine levels [Field et al. 2004]), and child (e.g., increased salivary cortisol [Ashman et al. 2002] and internalizing and externalizing symptoms [El Marroun et al. 2014; Pawlby et al. 2009]). These results emphasize the need for women who have experienced abuse to receive appropriate screening, referral, and intervention, such as psychotherapy, prior to becoming pregnant. Further, it is important that as a society we increase our efforts aimed at preventing women and girls from suffering abuse and violence given that this abuse has consequences that extend to the next generation by compromising the well-being of women during their pregnancy and, in turn, their offspring.

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Compliance with ethical standards

Conflict of interest Amanda L. Shamblaw declares that she has no conflict of interest. Robyn E. Cardy declares that she has no conflict of interest. Eric Prost declares that he has no conflict of interest. Kate L. Harkness declares that she has no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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