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Review
Prevalence and course of anxiety disorders (and symptom levels) in men during the perinatal period: A systematic review

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A R T I C L E  I N F O

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Course

A B S T R A C T

Background: Little has been done to synthesise the literature detailing the prevalence and course of heightened anxiety in men across the perinatal period. The current review is the first to systematically review the published literature.

Methods: Five databases (PubMed, PsycINFO, Cochrane, SCOPUS, and Web of Science) were searched to identify relevant papers published between January 2000 and April 2015. The literature search identified articles with data for expectant fathers (antenatal period) and/or fathers of an infant aged between 0 and 1 (postnatal period). The following data were extracted: (a) anxiety disorder prevalence (diagnostic clinical interviews), (b) heightened anxiety symptom prevalence (thresholds/cut-points on anxiety screening tools), and (c) mean anxiety levels (psychometric scales). Initially, 390 unique papers were identified. Subsequently, 34 papers met criteria for inclusion in the review.

Results: Prevalence rates for ‘any’ or a ‘likely’ anxiety disorder (as defined by either diagnostic clinical interviews or cut-points on screening tools) ranged between 4.1–16.0% during the antenatal period, and 2.4–18.0% during the postnatal period. The data reviewed suggest the course of anxiety across the perinatal period is fairly stable, with some evidence that anxiety levels are highest during the antenatal period and lowest postpartum.

Limitations: Wide variation in study methodology and methodology makes synthesis of individual findings difficult. The prevalence and course of anxiety disorders is examined in isolation from depression.

Conclusions: Anxiety disorders are common for men during the perinatal period, and potentially peak during their partner’s pregnancy. Prevention and treatment services tailored specifically for men are needed.

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1. Introduction

Perinatal anxiety refers to both antenatal anxiety (ANA), which occurs during pregnancy, and postnatal anxiety (PNA), which is experienced during the first 12 months following childbirth. The prevalence of heightened anxiety and the course (timing of onset, persistence) across the perinatal period is not well understood for men. To date, much of the literature investigating men's mental health during the perinatal period has focused on depression. For example, a meta-analysis by Paulson and Bazemore (2010) reported pooled prevalence rates of postpartum depression in men overall from 0% to 7%, with the largest effect in men who had depression during the first 6 months postpartum. However, there has been no such similar meta-analysis or systematic review summarising the available research findings with regards to perinatal anxiety in men.

Despite a lack of synthesised information, there are strong indications that anxiety is common for men during the perinatal period, warranting further research and clinical attention. A recent Australian study by Wynter et al. (2013) showed that anxiety was more common than depression for men during the first 6 months postpartum (n=172). Wynter reported that 4.1% of men experienced a diagnosable anxiety disorder (using criteria from the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV)) during the first 6 months postpartum, and a further 12.2% met the criteria for an 'Adjustment Disorder with Anxiety'.

Keeton et al. (2008) also identified a large number of 'expecting fathers' with high anxiety prior to childbirth. This study found 16.6% of men with partners in the third trimester of pregnancy scored higher than 0 on the Spilberger State-Trait Anxiety Inventory (STAI-State), indicating a likely anxiety disorder (n=153). The importance of quantifying men's anxiety levels during the perinatal period is underscored by findings that fathers' anxiety impacts on childhood development in the early years, increasing the risks of insecure attachment (Creasey and Jarvis, 1994), infant passivity (Parfitt et al., 2013), and child internalising problems (Pihlakoski et al., 2013). Furthermore, identification and treatment efforts targeting depression may not be effective in the management of paternal anxiety, suggesting additional specific information about anxiety is required.

Several studies have tracked men's anxiety levels across the perinatal period to observe the course (or pattern) of anxiety and determine critical 'peaks' in symptomology. Research by Figueiredo and Conde (2011a) found that the prevalence of 'disordered' anxiety decreased across the antenatal period (1st trimester = 10.1%, 2nd trimester = 8.0%, 3rd trimester = 7.8%), and was lowest at 3 months postpartum (4.4%). In the postnatal period, Condon et al. (2004) found a high level of stability, in levels of anxiety reported at three, six and 12 months. Linking these and other, disparate pieces of research together is necessary to better clarify common trajectories of anxiety symptoms and disorders for men across the perinatal period. In turn, this knowledge about the course of men's anxiety is needed to identify the optimal stages when prevention, intervention and service provision should be targeted.

While there has been substantial growth in the number of studies reporting single-time-point data and repeated-measures (course) data for men's anxiety across the postnatal period, there has been little attempt to synthesise these findings. A systematic review of this literature is both timely and warranted. The aim of the current systematic review is to summarise the published literature estimating the prevalence and course of paternal anxiety disorders (and symptomatology) within the antenatal period and the first postpartum year. The review aims to: (a) provide an overall picture of how common perinatal anxiety is in men (prevalence); (b) describe how anxiety develops, persists or relieves across the postpartum period (course); (c) identify gaps in the extant evidence to best guide future research; and (d) inform prevention, service planning and intervention. The reporting of this systematic review follows the protocols outlined in the PRISMA guidelines (http://www.prisma-statement.org/statement.htm (Moher et al., 2009)).

2. Methods

2.1. Search strategy

Five databases (PubMed, PsycINFO, Cochrane, SCOPUS, and Web of Science (Social Science Index)) were searched for relevant scientific articles published between the year 2000 and April 2015. Search terms included terms referring to fathers, the perinatal period and anxiety. Specific search terms were: 'fathers' OR 'paternal OR dad') AND (pregnancy OR childbirth OR postpartum OR postnatal OR perinatal OR antenatal OR prenatal) AND (anxiety OR panic OR phobia OR obsessive-compulsive OR post-traumatic stress OR generalised anxiety). The terms were searched within the title or abstracts of published articles. The search was limited to peer-reviewed articles published in English language, and to those reporting on human research. The initial search returned 671 articles. The database of articles was searched for duplicates, and 281 duplicate articles were excluded. Thus, 390 unique articles were identified.

2.2. Study selection

The study selection process is described in Fig. 1. Two rounds of study selection were undertaken. First, two researchers (LL and CP) independently screened the titles and abstracts for eligibility. Articles were excluded if they were clearly unrelated - not human research, or not related to men/fathers, the perinatal period or anxiety. At this stage, 306 articles were excluded, leaving 84 articles. In the second stage, the full-texts of the remaining 84 articles were obtained and rated independently by two researchers (LL and CP). Papers were included if they met the following inclusion...
criteria: (1) contained a sample of expecting fathers or fathers in the first 12 months postpartum, (2) contained an assessment of anxiety either by diagnosis (e.g., clinical interview) or screening for the presence of anxiety symptoms (e.g., self-report psychometric tool), (3) were a general sample of fathers (i.e., not father groups constrained to particular samples, e.g., teenage fathers, IVF fathers), (4) had a sample size greater than 30. A further 50 articles were excluded based on these criteria (see Fig. 1). The remaining 34 articles were identified as meeting the requirements to be included in the review. Hand-searching of the reference lists of these 34 articles was undertaken and one potential new paper was identified but did not meet inclusion criteria.

3. Results

3.1. Study characteristics

Tables 1–3, present information about the individual study characteristics in addition to the reported prevalence rates for anxiety disorders and mean scores for anxiety symptom scales.

3.2. Sample size and recruitment

The tables show sample sizes ranging from 37 to 739. Out of the 34 studies included, there were six large studies with samples of over 300 men (Coelho et al. 2014; Condon et al. 2004; Ekein et al. 2009; Quevedo et al. 2011; Tohotoa et al. 2012; Vliska et al. 2009). The recruitment information indicates that the vast majority of studies (n=31; 91.2%) recruited men at hospitals or antenatal medical clinics where pregnant women and their partners attend. In most cases, recruitment was conducted via convenience sampling, usually at a single site. Only one study recruited directly from the community, outside a hospital, clinic or health-care setting. Wynter et al. (2013) recruited from five regional areas within Victoria, Australia via maternal home visits (almost universal postbirth) to achieve a population-based community sample. In addition, a population-based study by Massoudi et al. (2013) recruited participants from all 27 infant health centres in Sweden, however the final prevalence estimates reported were from a sub-sample of non-representative participants. Fisher et al. (2012) recruited men via a random sample of health centres in Northern Vietnam to increase the representativeness of the sample.

3.3. Anxiety assessment

The majority of studies used a self-report anxiety scale to assess mean levels of anxiety symptoms (n=22; 64.7%), often to track changes in anxiety levels across the perinatal period. The most

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Table 1

<table>
<thead>
<tr>
<th>Author, year, country</th>
<th>Sample size, and recruitment method (no. sites)</th>
<th>Age range (mean SD)</th>
<th>Measurement</th>
<th>Time of assessment</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'High' symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figueiredo and Cardile (2011), Portugal</td>
<td>260, Antenatal clinic public hospital (1)</td>
<td>nr</td>
<td>STAI-State (≥ 45)</td>
<td>1st trimester</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2nd trimester</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3rd trimester</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Birth control (1–3 days)</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 months PP</td>
<td>4.4</td>
</tr>
<tr>
<td>Keeten et al. (2008), USA</td>
<td>153, Antenatal classes (nr. regional), first child only</td>
<td>nr (29.1 (1))</td>
<td>STAI-State (≥ 40)</td>
<td>3rd trimester</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 month PP</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 months PP</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 months PP</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12 months PP</td>
<td>14.0</td>
</tr>
<tr>
<td>Skari et al. (2002), Norway</td>
<td>122, Hospital</td>
<td>17-49 (31.2 (1))</td>
<td>STAI-State (≥ 40)</td>
<td>Childbirth (0–4 days)</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 weeks PP</td>
<td>12.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 months PP</td>
<td>11.8</td>
</tr>
<tr>
<td>Bradley et al. (2008), UK</td>
<td>199, Hospital (nr)</td>
<td>18-40 (5)</td>
<td>STAI-State (≥ 50)</td>
<td>6 weeks PP</td>
<td>6.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HADS-A (≥ 11)</td>
<td>6.6</td>
</tr>
<tr>
<td>Tedeschi et al. (2012), Australia</td>
<td>315, Antenatal classes, Hospitals (8)*</td>
<td>17-54 (29.4 (1))</td>
<td>STAI-State (≥ 40)</td>
<td>Pregnancy</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HADS-A (≥ 7)</td>
<td>2.4</td>
</tr>
<tr>
<td>Quintin and Condon (2005), Australia</td>
<td>50, partner's first child, Hospital (1 metro)*</td>
<td>(29.6 (nr))</td>
<td>HADS-A (≥ 7)</td>
<td>Pregnancy (M=22 weeks, SD=3.5)</td>
<td>12.0</td>
</tr>
</tbody>
</table>

Any anxiety disorder

Wuyts et al. (2011), Brazil  | 172, partner's first child, nurse home visits (5 regions) | nr (32.8 (5.6)) | CIDI          | Birth-6 months PP | 16.3 |

Quevedo et al. (2001), Brazil  | 650, Hospitals (nr, city area), exclusions: previous suicide risk or other mood disorders | nr | MINI          | 1-2 months PP | 8.0 |

Massoudi et al. (2012), Sweden  | 262, child health centres (27), High scorers on EPDS or HAD-A and a random sample of low scorers | 20-51 (33 (nr)) | Prime-MD       | 3 months PP | 11.1 |

Parfitt and Ayres (2012), UK  | 40, first-time fathers, antenatal clinics/classes (nr), JTP study | 26-44 (35.6) | BMMH          | 4-8 months PP (M=5.41, SD=10.8) | 7.5 |

Matticey et al. (2001), Australia  | 196, first-time fathers, antenatal classes, Hospital (1) | 20-44 (29.1) | DIS           | Birth-6 weeks PP | 10.7 |

Australia  | 160, first-time fathers, antenatal classes, Hospital (1) | 20-47 (4.7) | DIS           | Birth-6 weeks PP | 5.0 |


*Population based samples. Sample is mixed primigravidae and multigravidae unless otherwise noted.

No mental health exclusion criteria reported for sample.

Period prevalence from birth to 6 months postpartum.

Period prevalence from birth to 6 weeks postpartum.

common measure adopted was the State version of the Spielberger State-Trait Anxiety Inventory (STAI-S) (Spielberger, 2010; Spielberger and Gorsuch, 1983). This is a widely used self-report measure of anxiety and measures 'state anxiety' that is how the participant is feeling 'right now'. State-anxiety is defined as a transitory emotional state, rather than a permanent/personality related trait. The anxiety subscale of the Hospital Anxiety and Depression Scale (HADS-Anxiety) was also commonly adopted (Zigmond and Snaith, 1983). A number of different interviewers or clinician diagnostic interviews, such as the Diagnostic Interview Schedule (DIS), Composite International Diagnostic Interview (CIDI), Mini International Neuropsychiatric Interview (MINI), and Structured Clinical Interview for the DSM-IV (SCID), were also used to ascertain prevalence estimates of specific anxiety disorders such as Generalised Anxiety Disorder (GAD), Acute Adjustment Disorder with Anxiety (AAD), Panic Disorder (PD), Obsessive Compulsive Disorder (OCD) and Post-Traumatic Stress Disorder (PTSD).

3.4. Assessment timing and duration

The studies vary considerably in terms of when and how frequently data were collected, and at what stage prevalence was assessed. Antenatal anxiety was assessed (at least once) in 22 studies. Of the studies assessing postnatal anxiety at one or more intervals (n= 27), six-eight weeks postpartum was the most frequent specific time-points assessed (11 studies).

3.5. 'High anxiety' and 'any anxiety disorder' prevalence

The papers reviewed reported prevalence estimates for men's general anxiety in two ways: (1) as 'high anxiety' (or 'probable anxiety disorder') defined using threshold or cut-points on continuous scales measuring anxiety symptoms, or (2) as 'any diagnosable anxiety disorder' ascertained by psychiatric clinical interviews. Table 1 shows six studies reporting prevalence estimates for men's 'high anxiety'. In the antenatal period, between 4.1% and 16.0% of men reported 'high anxiety' (four studies), as did between 2.4% and 18.0% of men during the postnatal period (five studies). This variation in reported prevalence estimates can in part be explained differences in the study methodologies, particularly the use of varying cut-points for anxiety measures. Five studies reported prevalence estimates of 'any diagnosable anxiety disorder' ranging between 5.0% and 16.3%. All five of these studies recorded data during the postnatal period, with no diagnostic findings available for the antenatal period. While the prevalence estimates for this second group of studies utilising diagnostic interviews might be considered more comparable than those with varying threshold cut-points, there are still methodological differences which lead to heterogeneity in estimates. This includes variation in which diagnostic categories are assessed, in the time-period over which diagnoses are made, and in the characteristics of target population.
Table 2

<table>
<thead>
<tr>
<th>Author, year, country</th>
<th>Sample size, and recruitment method (no. sizes)</th>
<th>Age range Mean (SD)</th>
<th>Measurement</th>
<th>Time of assessment</th>
<th>Prevalence %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generalised anxiety disorder (GAD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisher et al. (2012), Vietnam</td>
<td>231, Community health centres (10) #</td>
<td>20–49 (31) (63)</td>
<td>SCID</td>
<td>3rd trimester or 6 weeks postpartum</td>
<td>4.3</td>
</tr>
<tr>
<td>Matthey et al. (2003)*, Australia</td>
<td>196, first-time fathers, antenatal classes, Hospital (1)†</td>
<td>20–44 (29.1) (46.1)</td>
<td>DIS (no depression)</td>
<td>Birth-6 weeks postpartum</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>160, first-time fathers, antenatal classes, Hospital (1)†</td>
<td>20–47 (26.4) (47.1)</td>
<td>DIS (no depression)</td>
<td>Birth-6 weeks postpartum</td>
<td>0.0</td>
</tr>
<tr>
<td>Wynnert et al. (2013)*, Australia</td>
<td>172, partner’s first child, nurse home visits (5 regions), Community-based #</td>
<td>32.8 (5.6)</td>
<td>CIDI</td>
<td>Birth – 6 months PP</td>
<td>12.2</td>
</tr>
<tr>
<td>Panic disorder (PD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisher et al. (2012), Vietnam</td>
<td>231, Community health centres (10) #</td>
<td>20–49 (31) (63)</td>
<td>SCID</td>
<td>3rd trimester</td>
<td>0.0</td>
</tr>
<tr>
<td>Matthey et al. (2003), Australia</td>
<td>196, first-time fathers, antenatal classes, Hospital (1)†</td>
<td>20–44 (29.1) (46.1)</td>
<td>DIS (no depression)</td>
<td>Birth-6 weeks postpartum</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>160, first-time fathers, antenatal classes, Hospital (1)†</td>
<td>20–47 (26.4) (47.1)</td>
<td>DIS (no depression)</td>
<td>Birth-6 weeks postpartum</td>
<td>0.0</td>
</tr>
<tr>
<td>Obsessive compulsive disorder (OCD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coelho et al. (2014), Brazil</td>
<td>739, Hospitals (nr. city area)</td>
<td>29.5 (8.1)</td>
<td>MINI</td>
<td>3rd trimester</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>1–2 months PP</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-traumatic stress disorder (PTSD) (diagnosed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parfit and Ayers (2012), UK</td>
<td>40, first-time fathers, antenatal classes/clinics (nr. JTP study)</td>
<td>26–44 (33.6) (73.1)</td>
<td>BIMMH</td>
<td>4–8 months PP</td>
<td>5.0</td>
</tr>
<tr>
<td>Post-traumatic stress disorder (PTSD) (threshold)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turtur et al. (2006)*, UK</td>
<td>37, Hospitals (3)</td>
<td>35.6 (4.9)</td>
<td>PTSD-I</td>
<td>3rd trimester</td>
<td>2.7</td>
</tr>
<tr>
<td>Bradley et al. (2008), UK</td>
<td>199, Hospital (nr)</td>
<td>18+</td>
<td>PTSD IES (≥ 19)</td>
<td>12 months PP</td>
<td>0.0</td>
</tr>
<tr>
<td>Ayers et al. (2007), UK</td>
<td>64, Hospital (1)</td>
<td>18+</td>
<td>PTSD IES (≥ 20)</td>
<td>6 weeks PP</td>
<td>0.0</td>
</tr>
<tr>
<td>Skar et al. (2002), Norway</td>
<td>12, Hospital (1)</td>
<td>17–49 (31.2) (nr)</td>
<td>PTSD IES (≥ 20)</td>
<td>Childbirth (0–4 days)</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 weeks PP</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 months PP</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


* GAD with criteria for Acute Adjustment Disorder with Anxiety (AADA) (all the criteria for GAD except 6 month duration).

† Population-based samples. Sample is mixed primigravidae and multigravidae unless otherwise noted.

# No mental health exclusion criteria reported for sample.

© Used of intrusion ≥ 20 and avoidance ≥ 20 and hyper-arousal required.

## Intrusion ≥ 20 and avoidance ≥ 20 required.

92. Five studies investigated PTSD in men during the perinatal period: one of which utilised a diagnostic clinical interview, while the remaining four adopted continuous measures of PTSD and applied threshold cut-points to indicate likely diagnosis. Parfit and Ayers (2012) assessed PTSD diagnosis at 4–8 months postpartum and reported a finding of 5.0%. A single study examined PTSD during partner’s pregnancy using the PTSD-Interview (Watson et al., 1991) and provided an estimate of 2.7% in the third trimester (Turtur et al., 2006). PTSD in men 0–4 days after childbirth was reported in Skar et al. (2002), with a reported prevalence of 0.0% using the PTSD Impact of Event Scale (IES). Two further studies reported estimates of likely PTSD of 0.0% and 5.0% at 6 and 9 weeks postpartum, as measured by a cut point on the...
Table 3
Studies reporting mean levels of anxiety symptoms in men across the perinatal period.

<table>
<thead>
<tr>
<th>Author, year, country</th>
<th>Sample size, and recruitment method (no. sites)</th>
<th>Mean range (SD)</th>
<th>Measurement</th>
<th>Time of assessment</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vreeswijk et al. (2014), Netherlands</td>
<td>281, midwifery practices (4)*</td>
<td>27.3–49.6 (34.0–46.8)</td>
<td>STAI-State</td>
<td>26 weeks pregnant</td>
<td>31.4 (7.7)</td>
</tr>
<tr>
<td>Eeflin et al. (2009), Sweden</td>
<td>652, routine ultrasound, Hospital (1)*</td>
<td>17–56 (17)</td>
<td>STAI-State</td>
<td>2nd trimester</td>
<td>28.8 (8.7)</td>
</tr>
<tr>
<td>Figueiredo and Coelho (2011b), Portugal</td>
<td>260, Antenatal clinic public hospital (1)*</td>
<td>rr</td>
<td>STAI-State</td>
<td>1st trimester</td>
<td>28.8 (7.6)</td>
</tr>
<tr>
<td>Hjelmstedt and Collins (2008) and Hjelmstedt et al. (2007), Sweden</td>
<td>37, antenatal clinics (4), control group*</td>
<td>33 (2.7)</td>
<td>STAI-State</td>
<td>24–36 weeks pregnant</td>
<td>35.2 (4.6)</td>
</tr>
<tr>
<td>Johnson and Baker (2004), UK</td>
<td>216, GPs with antenatal care clinics (nr)*</td>
<td>rr</td>
<td>STAI-State</td>
<td>12 months PP</td>
<td>34.6 (9.5)</td>
</tr>
<tr>
<td>Latif et al. (2004), USA</td>
<td>175, Larne or classes (nr), exclusions: anxiety or depressive disorders or taking medication for psychological problems</td>
<td>18+</td>
<td>STAI-State</td>
<td>29–37 weeks (5 weeks post baseline)</td>
<td>50.2 (6.1)</td>
</tr>
<tr>
<td>Skari et al. (2002)</td>
<td>122, Hospital (1)*</td>
<td>17–49 (31.2)</td>
<td>STAI-State</td>
<td>Childbirth (0–4 days)</td>
<td>29.5 (nr)</td>
</tr>
<tr>
<td>Tolvanen et al. (2011), Finland</td>
<td>51, maternity clinics (nr) pilot birth cohort study</td>
<td>30.6 (5.1)</td>
<td>STAI-State</td>
<td>6 weeks PP</td>
<td>32.0 (nr)</td>
</tr>
<tr>
<td>Turton et al. (2006), UK</td>
<td>37 antenatal clinics, Hospitals (3), matched control group*</td>
<td>35.5 (8.7)</td>
<td>STAI-State</td>
<td>18–32 weeks pregnant</td>
<td>30.6 (9.8)</td>
</tr>
<tr>
<td>Field et al. (2006), USA</td>
<td>156, prenatal ultrasound clinic (1)*</td>
<td>33.3 (nr)</td>
<td>STAI-State</td>
<td>12 months PP</td>
<td>29.1 (8.7)</td>
</tr>
<tr>
<td>Gowik et al. (2014), Germany</td>
<td>102, prenatal care centre (1)*</td>
<td>23–55 (35.8)</td>
<td>STAI-State</td>
<td>6–4 weeks PP</td>
<td>49.6 (9.1)</td>
</tr>
<tr>
<td>Li et al. (2009), Taiwan</td>
<td>42, birth education classes, Hospital (1) (control group)*</td>
<td>20–308 (4.4)</td>
<td>STAI-State</td>
<td>Birth</td>
<td>48.12 (7.38)</td>
</tr>
<tr>
<td>Tohotoa et al. (2012), Australia</td>
<td>244, antenatal classes, Hospitals (8) (control group)*</td>
<td>17–54 (29.4)</td>
<td>HADS-Angst</td>
<td>Pregnancy 6 weeks PP</td>
<td>4.2 (nr)</td>
</tr>
<tr>
<td>Castle et al. (2008), UK</td>
<td>66, first-time fathers antenatal classes, Hospitals (2)*</td>
<td>18–32.9 (5.1)</td>
<td>HADS-Angst</td>
<td>Third trimester (M:33 weeks)</td>
<td>6.35 (3.04)</td>
</tr>
<tr>
<td>Glazebrook et al. (2009), UK</td>
<td>134, antenatal clinics, Hospital (1) (matched control group)*</td>
<td>31.3 (45)</td>
<td>HADS-Angst</td>
<td>18 weeks pregnant</td>
<td>5.44 (2.82)</td>
</tr>
<tr>
<td>Carter et al. (2007), NZ</td>
<td>89, Hospital (1) (control group)*</td>
<td>33.3 (6.0)</td>
<td>HADS-Angst</td>
<td>28 weeks pregnant</td>
<td>5.47 (3.04)</td>
</tr>
<tr>
<td>Parfit et al. (2011), UK</td>
<td>40, first-time fathers from antenatal clinics, Hospitals (nr)*</td>
<td>26–64 (33.5)</td>
<td>HADS-Angst</td>
<td>6 weeks PP</td>
<td>5.28 (3.24)</td>
</tr>
<tr>
<td>Feinberg and Kan (2008), USA</td>
<td>40, first-time fathers, antenatal classes, Hospitals (2), health centres</td>
<td>29.27 (5.81)</td>
<td>Taylor Manifest Anxiety Scale</td>
<td>Pregnancy (M:22 weeks, SD:3.3)</td>
<td>6.05 (3.70)</td>
</tr>
<tr>
<td>Viska et al. (2009), Finland</td>
<td>370 hospital ultrasound records Hospital (1)*</td>
<td>25–34.2 (5.4)</td>
<td>GHQ-30 Anxiety</td>
<td>6 months PP</td>
<td>5.22 (4.60)</td>
</tr>
<tr>
<td>Biehle and Mickelson (2011), USA</td>
<td>104, first-time fathers, birth classes, online message boards</td>
<td>18–52 (47.7)</td>
<td>SCT-90</td>
<td>18–20 weeks pregnant</td>
<td>1.44 (0.16)</td>
</tr>
<tr>
<td>Gordon et al. (2004), Australia</td>
<td>312, first-time fathers, antenatal clinics, Hospitals (2)*</td>
<td>29 (5.2)</td>
<td>STAI-5</td>
<td>2 months PP</td>
<td>1.39 (0.25)</td>
</tr>
</tbody>
</table>


* Scored in opposite direction.

† No mental health exclusion criteria reported for sample.

PTSD IES (Ayers et al., 2007; Bradley et al., 2008).

3.7. The course of anxiety across the perinatal period

A large number of the studies included in the current review (18/34, 55.9%) did not report any prevalence data. Instead these studies contributed means and standard deviations for anxiety symptom scales at individual or multiple time-points, largely to track change (and stability) in men’s anxiety across the perinatal period (see Table 3). Four studies reported both prevalence and means data. Thirteen studies reported means data derived using the STAI-State and a further five studies reported means data derived using the HADS-Angst. A further four studies adopted less common measures of general anxiety (see Table 3). Eight studies assessed men’s anxiety levels at least three times across the perinatal period, five using the STAI-S, and the three others...
adopted the HADS-A, GHQ-28 and the HSCI-90. Four out of the eight studies reported that anxiety levels were marginally higher during the antenatal period and then declined postpartum (Condon et al., 2004; Figueiredo and Conde, 2011b; Helmstedt and Collins, 2008; Johnson and Baker, 2004). However, the four other studies reported little change in anxiety levels across the antenatal period through to postpartum (Glazebrook et al., 2000; Skari et al., 2002; Tovsvåg et al., 2013; Vilska et al., 2009).

4. Discussion

The current systematic review identified 34 studies that reported data for men on the prevalence of anxiety disorders and/or average anxiety levels during the ante- and/or postnatal period. The review found 15 articles that reported prevalence estimates (of either a ‘probable’ or diagnosed anxiety disorder) and 22 articles that reported summary means data (using anxiety assessment scales). Overall, the data suggest heightened anxiety is common for men during both the ante- and postnatal period. Within the antenatal period, the prevalence of a ‘probable anxiety disorder’ was shown to be as high as 16.0% (Keeton et al., 2008). Similarly, within the first 6 months postpartum, prevalence of a clinical diagnosis of ‘any anxiety disorder’ was shown to be as high as 16.3% (including diagnoses of Acute Adjustment Disorder with Anxiety) (Wynter et al., 2013). However, other studies reported substantially lower rates, such as Tohtoaa et al. (2012) who reported 4.1% during the antenatal period and 2.4% at 6 weeks postpartum. The data reviewed also suggest the course of anxiety across the perinatal period is fairly stable for men, with some evidence that anxiety levels are highest early during the antenatal period and then decrease postpartum.

While the prevalence rates reported for men in the current review are lower than those reported previously for women, the disparity is smaller than one might expect. Wynter et al. (2012) reported lower rates for adjustment disorder with anxiety as 12.2% for men and 18.6% for women, and a recent review of anxiety prevalence in perinatal women reported a wide range of 2.6–39.0% for a ‘probable’ anxiety disorder (Leach et al., 2015b). Taken together, the evidence suggests anxiety during both the ante- and postnatal period is not a problem isolated to women, and that formal supports need to be available to men as well as women. This finding echoes other recent research advocating that both partners should be included in discussions and interventions focused on mental health during the perinatal period (Pilkington et al., 2015; Rowe et al., 2014). More needs to be done to include men, who often feel excluded and irrelevant in ante- and postnatal health care (Rowe et al., 2013).

The review identifies a number of methodological weaknesses in the literature available, providing important directions for future research. The review found that sample sizes tended to be small, with no studies over 800 participants and only six studies with over 300 participants. In addition, the vast majority of studies recruited convenience samples from single hospital or clinic sites. It is not possible to draw reliable conclusions about the epidemiology of men’s perinatal anxiety at the population level with small sample sizes recruited using convenience samples. Larger sample sizes are also needed to more accurately detect change in symptom levels, or the course of anxiety, across the perinatal period (Kast and Hofer, 2014). In addition, the review identified no studies with appropriate control groups of non-perinatal men to provide appropriate comparison. This is, in part, because many studies focused on assessing perinatal men (only) repeatedly across the perinatal period to detect change in symptom levels. However, even in these studies, a control group of ‘non-perinatal’ men would bolster the assumption that any changes in anxiety were due to change in perinatal stage, rather than representing normal variation, other event related change or simply test–retest effects (Christensen et al., 2010). The review found no studies which included estimates of anxiety disorders/levels in men pre-pregnancy. Such data would plausibly strengthen the evidence that changes in anxiety symptoms are readily attributable to the ante- or postnatal period (and specific stressors most salient at this time) (Leach et al., 2014, 2015a).

4.1. Limitations

The current review is limited in a number of ways that should be recognised. The first concerns heterogeneity in both study sample and anxiety assessments. The wide variation in sample characteristics and the variety of study measures adopted make it difficult to synthesise the findings succinctly in a meaningful way. For example, variation in the reported prevalence estimates can in part be explained by varying cut-points on anxiety symptom scales used to screen for ‘probable’ disorders. Similarly, the assessments used to estimate ‘period prevalence rates’ vary greatly between studies. For example, the HADS-A assesses anxiety symptoms over the past week, several of the diagnostic interviews assessed postpartum anxiety during the first 6 weeks since birth (e.g. Fisher et al. (2012), Matthey et al. (2003)), while another assessed disorder prevalence from birth to 6 months postpartum (Wynter et al., 2013). In addition, men’s past psychiatric history (including anxiety) was rarely reported (see Tables 1–3), making it difficult to conclude how accurately prevalence represented de novo “onset” or “incidence” of anxiety disorder during the perinatal period. Given the high variability in the estimates obtained and heterogeneity in study methodology, we cannot reliably conclude whether rates of anxiety are any greater for expecting and new fathers than men in the general population. A national survey found that during 2011, in Australia the 12 month prevalence estimates for ‘any anxiety disorder’ for men aged between 25 and 34 was 9.5% and for men aged between 35 and 44 it was 11.9% (McEvoy et al., 2011). While it appears that prevalence figures from the general population are sensibly within the range of prevalence rates reported for perinatal men in the current review (4.1–16.0% during the antenatal period, and 2.4–18.0% during the postnatal period), indicating rates of anxiety may not be higher during the perinatal period, firm conclusions cannot be drawn. A further limitation is the distinction made between anxiety and depressive disorders during the perinatal period. While the current review examined perinatal anxiety in isolation from perinatal depression, research indicates comorbid anxiety and depression are common during the perinatal period (e.g. Fisher et al. (2012)) and estimates which incorporate mixed anxiety-depressive psychiatry might better represent the overall burden of mental illness for men at this time.

4.2. Conclusion

This systematic review is the first to provide a summary of the reported prevalence estimates for anxiety disorders and mean levels of anxiety symptoms for men across the perinatal period. The evidence available indicates that anxiety is common for men during both the ante- and postnatal period. The data suggest the course of anxiety is fairly stable across the perinatal period, although there is some evidence that anxiety may be highest early during pregnancy and diminish after birth. The current review also highlights the challenges in comparing studies with broad differences in study methodology. Further population-based research, including control groups of non-perinatal men and assessments prior to the antenatal period, would assist greatly in understanding how anxiety is impacted uniquely during the perinatal period.

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period. Nonetheless, the greater understanding of men's perinatal anxiety provided by this systematic review is timely. While depression and distress in fathers has received some research attention, anxiety has been less widely investigated. This review underscores the importance of tailoring identification, prevention and treatment towards fathers experiencing anxiety, whose needs are likely to be met by current services targeted towards women. Further, identifying time periods where fathers are potentially in high need (e.g. the antenatal period) provides valuable insight into when identification and support for fathers might be introduced most effectively.

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Conflicts of interest

None.

Author contributions

LL developed the design of the literature review. LL, CP, AC, RG all contributed to the design of the research questions. LL and CP conducted the systematic literature review (CP conducted the database searches, LL and CP conducted the data screening and extraction). LL, AC and RG drafted the manuscript for the review. All authors have contributed to the final draft of the manuscript, and have approved the final article for submission.

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