Review Article

Functional neurological disorder in pregnancy, labour and the postpartum period: systematic review

Verónica Cabreira,[1] Caoimhe McLoughlin,[1] Natasha Shivji,[2] Alexandra Lodge,[3] Sanne Van Rhijn,[4,5] Roxanne C. Keynejad,[6] Jan Coebergh,[3] Alan Carson,[1] Jon Stone,[1] Alex Lehn,[7] Ingrid Hoeritzauer[1]

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[1]Centre for Clinical Brain Sciences, University of Edinburgh, Edinburgh, UK; [2]Central and North West London NHS Foundation Trust, London, UK; [3]St George's Hospitals and University, London, UK; [4]Perinatal Mental Health Service, West London NHS Trust, London, UK; [5]Department of Brain Sciences, Imperial College, London, UK; [6]Department of Health Service and Population Research, King's College London, London, UK; [7]Princess Alexandra Hospital, Brisbane, Queensland, Australia

Correspondence to Verónica Cabreira (veronica.cabreira@ed.ac.uk)

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Aims and method Functional neurological disorder (FND) most often presents in women of childbearing age, but little is known about its course and outcomes during pregnancy, labour and postpartum (the perinatal period). We searched MEDLINE, PsycInfo and Embase combining search terms for FND and the perinatal period. We extracted data on patient demographics, subtype of FND, timing of symptom onset, comorbidities, medications, type of delivery, investigations, treatment, pregnancy outcomes and FND symptoms at follow-up.

Results We included 36 studies (34 case reports and 2 case series) describing 43 patients. Six subtypes of FND were identified: functional (dissociative) seizures, motor weakness, movement disorder, dissociative amnesia, speech disorders and visual symptoms. New onset of perinatal FND was more common in the third trimester and onwards. Some women with functional seizures were exposed to unnecessary anti-seizure prescriptions and intensive care admissions.

Clinical implications Prospective studies are urgently needed to explore how FND interacts with women's health in the perinatal period.

Keywords Pregnancy; functional neurological disorder; conversion disorder; postpartum; perinatal.

Functional neurological disorder (FND) is a common condition at the interface of neurology and psychiatry. Symptoms of FND are diverse and include functional (dissociative) seizures, weakness, sensory changes, movement disorders and speech disturbance.[1,2] FND is well-recognised and potentially treatable when diagnosed in a timely manner.[2]

FND affects women disproportionately, with around 70% of study cohorts consisting of females.[3] It most often presents in women of childbearing age, who represent a substantial proportion of women seen in FND clinics.[3] Hence, pregnancy is a common theme when caring for patients with FND.

Emotional neglect and other adverse life events, including physical and sexual abuse, which disproportionately affect women, have consistently been identified as risk factors for developing FND.[4–6] Additionally, migraine, pain, fatigue, anxiety and mood disorders, dissociative disorders and post-traumatic stress disorder (PTSD) are common comorbidities of FND,[7–9] and can be both predisposing

and precipitating factors. Limb injury, surgical procedures and other painful experiences have also been shown to acutely precipitate FND.[10,11]

Pregnancy introduces a cascade of physiological changes in a woman's body, affecting neurobiology and hormonal balance and triggering physical strain. The transition to parenthood also involves important psychological changes, including opportunities to reflect on one's own childhood and experiences of being parented. The perinatal period can be a particularly vulnerable time owing to specific psychosocial stressors of this period, both for first-time parents and for those who already have children. Risks to the mother (and child) such as domestic violence increase during this period, and women with pre-existing neuropsychiatric problems are particularly vulnerable to poorer pregnancy outcomes.[12] Although evidence on this topic is limited, it has been shown that women who have been exposed to prior trauma and maltreatment are more likely to dissociate during labour, which may have implications for the onset of FND in the perinatal period.[13]

Despite an existing evidence base on pregnancy-induced changes in other neurological conditions, such as migraine, epilepsy and multiple sclerosis,[14] little is known about perinatal FND, limiting the amount of information that can be provided to patients. Moreover, there is a lack of clear professional guidance in obstetric, neurological and mental health services on how to best provide care for people who develop perinatal FND.

In this systematic review, we aimed to describe the published literature on perinatal FND, including known clinical presentations and symptom trajectory. Additionally, we aimed to explore any evidence for proposed mechanisms, recommended investigations and therapeutic approaches.

Method

We report the study according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[15] and registered this review on the International Prospective Register of Systematic Reviews (PROSPERO; ID number: 504757).

Search strategy

We searched MEDLINE, PsycInfo and Embase databases from inception to July 2022 using subject headings and free-text terms combining FND and the perinatal period using Boolean operators (Box 1). We applied no language or date restrictions. Given the limited literature, conference abstracts indexed in these databases were also included. Authors of included abstracts were contacted whenever possible to obtain additional data. We electronically excluded duplicate results using Covidence (www.covidence.org). Reference lists of relevant papers were manually screened for additional studies.

Eligibility criteria

Inclusion criteria comprised studies of any design reporting any cases meeting established diagnostic criteria of FND occurring during the perinatal period (between conception and 12 months postpartum).[16,17] Cases of dissociative disorder without a neurological symptom as a main presentation were excluded to maintain the focus of this review on perinatal FND and ensure relevance to the audience.

Three independent researchers (V.C., N.S. and C.M.) screened the titles and abstracts of all unduplicated results for potential eligibility, before assessing full texts for eligibility. Any disagreements were resolved through discussion with a fourth author (I.H. or S.V.R.). We extracted data on patient demographics, subtype of FND, timing of symptom onset, comorbidities (obstetric, psychiatric, other functional disorders and other physical health conditions), medications, type of delivery, investigations, treatment, and symptom trajectory and outcomes, when available.

Quality appraisal

A systematic analysis of the quality of the included studies was not performed as only case reports and two case series (one of them a conference abstract) were identified, providing the lowest level of evidence.

Results

Figure 1 displays the process of study selection. Out of 526 search results, we assessed 52 full texts for eligibility. In total, 36 publications describing 43 patients (34 case reports and 2 case series[18,19]) were included in our review. No studies included a control group. Publication dates ranged from 1950 to 2022. The median age of reported patients was 29 years. Characteristics of individual studies are described in Supplementary Table 1, available at https://doi.org/10.1192/bjb.2024.70.

Perinatal functional neurological symptoms

Included cases comprised six FND subtypes: functional seizures ($n = 23$),[18–35] motor weakness ($n = 11$),[19,27,36–44] movement disorders ($n = 4$),[19,45,46] speech disorders ($n = 3$),[44,47,48] dissociative amnesia ($n = 3$)[49–51] and visual symptoms ($n = 2$)[52,53] (Table 1 and Fig. 2); two patients had mixed

Box 1. Search terms

'conversion disorder' OR 'functional neurological disorder' OR hysteria OR dissociative or psychogenic OR hysteric* OR 'medically unexplained' OR somatic OR somatoform OR 'functional movement' OR 'functional motor' OR 'Psychogenic Nonepileptic Seizures' OR non*epileptic OR pseudoseizure OR dissociative seizure' OR 'dissociative motor' OR 'somatoform disorders'	AND	pregnancy OR pregnant OR gravid* OR puerper* OR labour OR labor OR epidural OR cesarean OR caesarean OR perinatal OR postnatal OR 'post-natal' OR 'C-section' OR 'cesarean section' OR peripartum OR postpartum OR childbirth OR obstetric/ OR parturition/ OR 'perinatal care' OR 'postnatal care' OR 'prenatal care' OR antenatal

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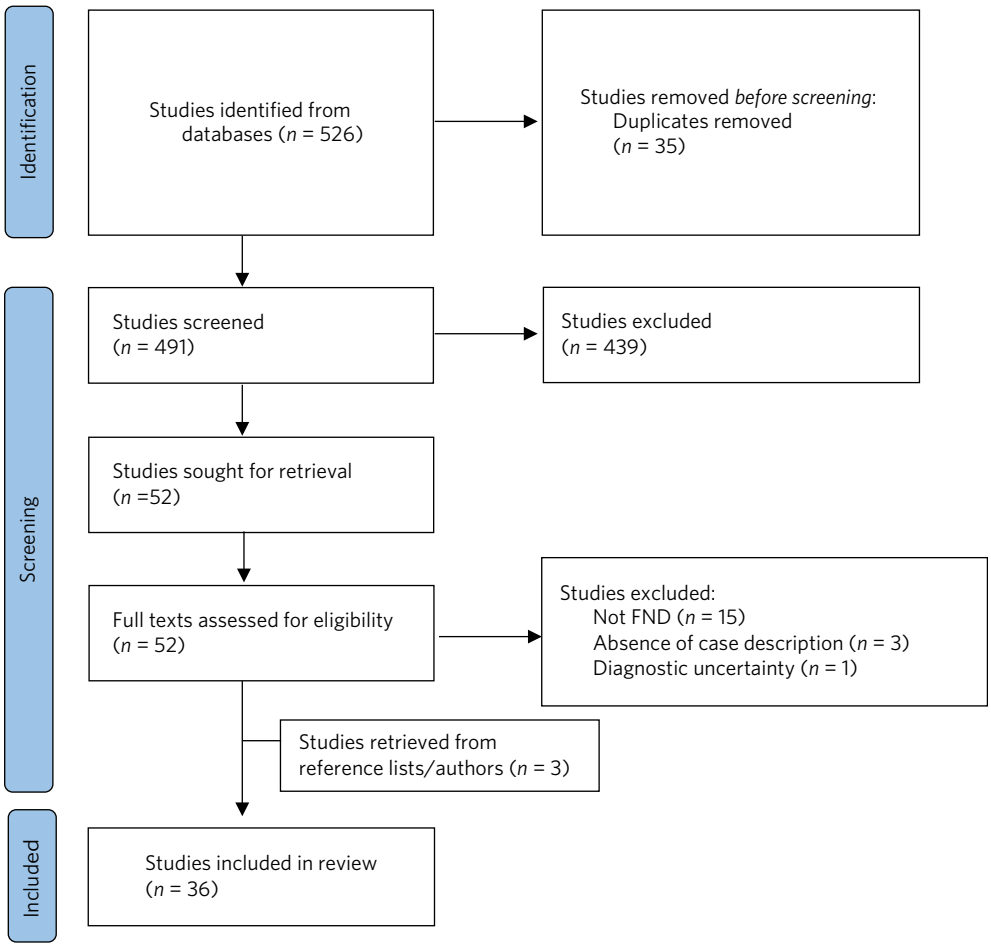

Fig. 1 PRISMA flowchart: identification of studies via the MEDLINE, Embase and PsycINFO databases. FND, functional neurological disorder.

phenotypes: seizures and motor FND ($n = 2$) and motor FND with aphonia ($n = 1$). Twenty-three (64%) studies[19,21–29,31,33,34,36–38,41,42,44–47,52] reported positive diagnostic features characteristic of FND, including improvement with distraction, long seizure episodes, variability of symptoms and signs, and suggestibility. Thirteen (36%) studies relied on the exclusion of secondary causes to diagnose FND. Four studies noted 'la belle indifference' (diminished concern about symptoms).[27,29,40,48]

Onset of FND symptoms

Thirteen (30%) patients had FND prior to conception.[18–21,25,35,36,53] In 14 (33%) reported cases, FND symptoms commenced during pregnancy (3 in the first trimester,[18,32,33] 4 in the second trimester[18,23,37,45] and 7 in the third trimester[22,24,27,28,30,31,38]). Symptoms commenced during labour in 6 (14%) cases[26,29,40–42,48] and postpartum in 10 (23%) cases (onset between 2 h and 4 months postpartum).[34,39,43,44,46,47,49–52]

Comorbidities

In total, 33 studies provided information on premorbid comorbidities, of which 31 described specific conditions. In these, three (7%) patients had physical health problems during the current pregnancy: gestational diabetes ($n = 2$),[34,39] hypertension ($n = 1$)[39] and urinary tract infection with prolonged hospital admission ($n = 1$).[27] Prior obstetric/gynaecological history included miscarriage ($n = 4$),[19,30,39,51] stillbirth ($n = 1$),[21] neonatal loss after premature birth ($n = 1$), infertility ($n = 1$)[51] and dyspareunia due to endometriosis ($n = 1$).[38]

Twenty-one (49%) patients had a neuropsychiatric or neurological history, including a history of depression, anxiety disorder, postpartum depression ($n = 3$),[31,41,46] migraine ($n = 5$),[23,30,35,38,42] and traumatic brain injury ($n = 3$).[22,28,51] Nine patients had a history of physical health conditions (Supplementary Tables 1 and 2).[19,25–27,31,35,36,42,43,52] Six patients (14%) had no known prior comorbidities.[24,33,40,44,48,50] Sixteen (37%) had a history of adverse life events, including abuse ($n = 16$).[23,25,26,28,30–32,34–39,45,47,49]

Birth outcomes

Data on birth outcomes were available for 21 (51%) babies.[20,22,24,25,29,35,37–39,41–44,48–51] Two required special care because of prematurity; and one case of cleft palate was reported.[43,51]

Type of delivery

Data regarding type of delivery were available for 19 (44%) women.

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Table 1 Functional neurological disorder (FND) presentations during the perinatal period

Subtype	Mean age, years	Comorbidities	Symptom onset	Type of delivery	Treatments	Pregnancy outcomes	Follow-up
Functional (dissociative) seizures ($n = 23$)	28	Possible epilepsy ($n = 3$), depressive disorders/anxiety ($n = 6$), TBI ($n = 2$), sexual abuse/trauma ($n = 2$), bipolar affective disorder $n = 1$), pain ($n = 1$), migraine ($n = 3$), personality disorder ($n = 2$), panic attacks ($n = 1$), prolonged hospital admission ($n = 1$), miscarriage ($n = 3$), stillbirth ($n = 1$), premature loss ($n = 1$), anaphylactic reaction ($n = 1$), asthma ($n = 1$), PTSD ($n = 1$), PCOS ($n = 1$), gestational hypertension and diabetes ($n = 1$), no comorbidities ($n = 3$)	Pre-pregnancy ($n = 9$) First trimester ($n = 3$) Second trimester ($n = 2$) Third trimester ($n = 6$) Labour ($n = 2$) Postpartum ($n = 1$)	Caesarean ($n = 3$) Vaginal ($n = 4$) Unknown ($n = 16$)	Anti-seizure drugs ($n = 9$) Intravenous medication ($n = 11$, 3 onset pre-pregnancy, 8 onset during pregnancy) Intensive care ($n = 2$) rTMS ($n = 1$) Psychotherapy (stress management strategies, relaxation techniques, multidisciplinary treatment) ($n = 4$) Sertraline, citalopram, bupropion ($n = 1$)	Healthy term babies ($n = 8$) Unknown ($n = 15$)	*Pre-pregnancy seizures*: stable ($n = 1$); seizures in future pregnancies ($n = 1$); worsening during pregnancy ($n = 7$): 3 improved with cessation of epilepsy drugs and neuropsychiatry follow-up, and 4 continued to experience seizures *New onset seizures*: complete recovery ($n = 5$); continued to experience seizures ($n = 1$); unknown ($n = 8$)
Functional limb weakness ($n = 11$) (1 accompanied by aphonia and 2 by functional seizures)	28	Anxiety/depressive disorder ($n = 6$), chronic pain ($n = 1$), migraine ($n = 2$), life stressors ($n = 2$), miscarriage ($n = 2$); gestational diabetes/ hypertension during pregnancy ($n = 1$), stroke ($n = 1$), Arnold–Chiari type 1 malformation ($n = 1$)); neurogenic bladder ($n = 1$), asthma ($n = 2$) No comorbidities ($n = 2$)	Pre-pregnancy ($n = 2$) Second trimester after epidural anaesthesia for McDonald cerclage ($n = 1$) Third trimester ($n = 2$) Labour ($n = 3$) Postpartum ($n = 3$)	Vaginal delivery ($n = 4$: 1 with suction cup, 1 with forceps; 3 with epidural) Caesarean ($n = 4$: 2 epidural, 2 spinal anaesthesia; 1 complicated by subdural block, 2 required repeated anaesthetic procedures)	Psychoeducation, CBT-like therapy (desensitisation therapy), physiotherapy ($n = 1$) Olanzapine ($n = 1$) Spontaneous recovery ($n = 5$)	Healthy term babies ($n = 8$) Baby delivered at 30 weeks ($n = 1$) Unknown ($n = 2$)	*Pre-pregnancy FND*: symptoms stable for at least 8 years ($n = 1$); Symptoms in 2 pregnancies, mild improvement after multidisciplinary intervention ($n = 1$) *New-onset FND*: Full recovery over 2 h to 6 weeks ($n = 7$); partially improved at 14 days ($n = 1$); unknown ($n = 1$)
Functional movement disorders: tremor ($n = 1$), limb dystonia ($n = 1$), jaw dystonia ($n = 1$), abdominal myoclonus ($n = 1$)	31	Eating disorder ($n = 1$), anxiety ($n = 1$), bipolar disorder ($n = 1$), subarachnoid haemorrhage ($n = 1$), Ehlers–Danlos syndrome ($n = 1$), postural tachycardia syndrome ($n = 1$), postpartum depression ($n = 1$), intrafamily violence ($n = 1$)	Pre-pregnancy ($n = 2$) Second trimester ($n = 1$, myoclonus) Postpartum ($n = 1$, dystonia)	Vaginal delivery ($n = 1$) Unknown ($n = 3$)	Behavioural psychotherapy (myoclonus) Psychotherapy (tremor)	Healthy term babies ($n = 2$) Unknown ($n = 2$)	*Pre-pregnancy FND*: stable (tremor); remission during pregnancy and relapse thereafter (limb dystonia) *New-onset FND*: remission (myoclonus); unknown (jaw dystonia)
Functional speech disorders ($n = 3$) (aphonia ($n = 2$) and foreign accent syndrome ($n = 1$))	34	Significant life stressors ($n = 2$) No comorbidities ($n = 1$)	Labour ($n = 1$) Postpartum ($n = 2$)	Caesarean ($n = 1$, with epidural) Vaginal ($n = 1$, with epidural) Unknown ($n = 1$)	IV diazepam and intensive care ($n = 1$) Psychoeducation ($n = 3$) Speech and language therapy ($n = 1$)	Healthy term babies ($n = 3$)	Spontaneous symptom resolution in 2–36 h ($n = 2$); in the foreign accent syndrome case symptoms were present at 6 months postpartum

Continued

Table 1 Continued

Subtype	Mean age, years	Comorbidities	Symptom onset	Type of delivery	Treatments	Pregnancy outcomes	Follow-up
Dissociative amnesia (n = 3)	28	Head injury (n = 1), miscarriage (n = 1), infertility (n = 1), anxiety (n = 1), concern over baby's health (n = 1) No comorbidities (n = 1)	Postpartum (1 h to 4 days and up to four months after) (n = 3)	Vaginal (n = 2) Caesarean (n = 1)	Thiopentone interview and hypnosis (6–8 sessions) (n = 1) Psychotherapy (n = 3)	Healthy term babies (n = 2) Preterm infant was born with cleft palate (n = 1)	Spontaneous recovery (n = 2); partial improvement in autobiographical memory at 12 weeks follow-up (n = 1)
Functional visual symptoms (n = 2)	25	FND (n = 1) Condylar infection (n = 1)	Third trimester (n = 1) Postpartum (n = 1)	Caesarean section (n = 1) Unknown (n = 1)	Demonstration of variability as a treatment (n = 1)	–	*Pre-pregnancy FND*: full recovery but symptoms returned in a subsequent pregnancy (n = 1) *New-onset FND*: symptoms present 2 months after onset (n = 1)

CBT, cognitive-behavioural therapy; IV, intravenous; PCOS, polycystic ovary syndrome; PTSD, post-traumatic stress disorder; rTMS, repetitive transcranial magnetic stimulation; TBI, traumatic brain injury.

For those who underwent Caesarean section (n = 10), FND symptoms presented as follows: antenatally (n = 1), during labour (n = 6) and postpartum (n = 3).[26,29,34,40–43,48,51,53] Regarding vaginal births (n = 9), FND presented as follows: onset pre-pregnancy (n = 3,), onset during the first trimester (n = 1), second trimester (n = 1), third trimester (n = 1) and postpartum (n = 3) (two of the postpartum cases had involved instrumental delivery with forceps and suction cup).[19,22,25,33,37,44,50]

Course of FND symptomatology

Data regarding the course of FND symptomatology were available for 38 (88%) women.

In the 13 women whose symptoms commenced pre-pregnancy, symptom trajectory was variable. For ten of these women, symptoms worsened during pregnancy, and six experienced partial improvement postpartum.[18,20,25,35] For two women, symptoms had started in previous pregnancies, never fully resolved and worsened in the context of the current pregnancy.[21,36] Two women experienced symptoms during pregnancy but symptoms abated between pregnancies.[19,53] In two cases, symptoms continued unchanged throughout pregnancy,[19] and finally in one case symptoms improved during pregnancy, with a relapse thereafter.[19]

Of the 30 women with new-onset perinatal FND, follow-up data on symptoms were available for 23. Five of these had persistent symptoms at last known follow-up (seizures, foreign accent syndrome, dissociative amnesia, visual and motor symptoms), ranging from 14 days to 32 weeks of follow-up.[34,39,47,49,52] Table 1 presents data grouped into the six FND subtypes.

Data for individual subtypes

Functional seizures

Eighteen studies reported perinatal functional seizures (n = 23, 53%). Semiology suggesting functional seizures (Box 2) was described in 13 cases.

Nine women had pre-existing functional seizures (ranging from 18 months to 7 years pre-pregnancy).[18–21,25,35]

Box 2. Semiology of functional seizures in our review

- Eyes closed or rolled back and/or fluttering of the eyelids and/or resistance to eye opening (n = 3)
- Arching of the back (n = 1)
- Pelvic thrusting (n = 1)
- Side-to-side head movements (n = 2)
- Asynchronous limb movements (n = 3)
- Intermittent nature (wax and waning) (n = 3)
- Unresponsiveness to commands or painful stimuli (n = 2)
- Absence of post-ictal confusion (n = 5)
- Panic attack (shortness of breath and chest pain) preceding the seizure onset
- Recovery in 5 min and dissociation after the episode (n = 1)
- Duration ranging between 2 min to several hours (n = 10)
- Responsiveness, such as attempt to close eyes for pupil examination or blinking (n = 2)
- Memory of the episode (n = 3)
- Crying during the seizure (n = 1)

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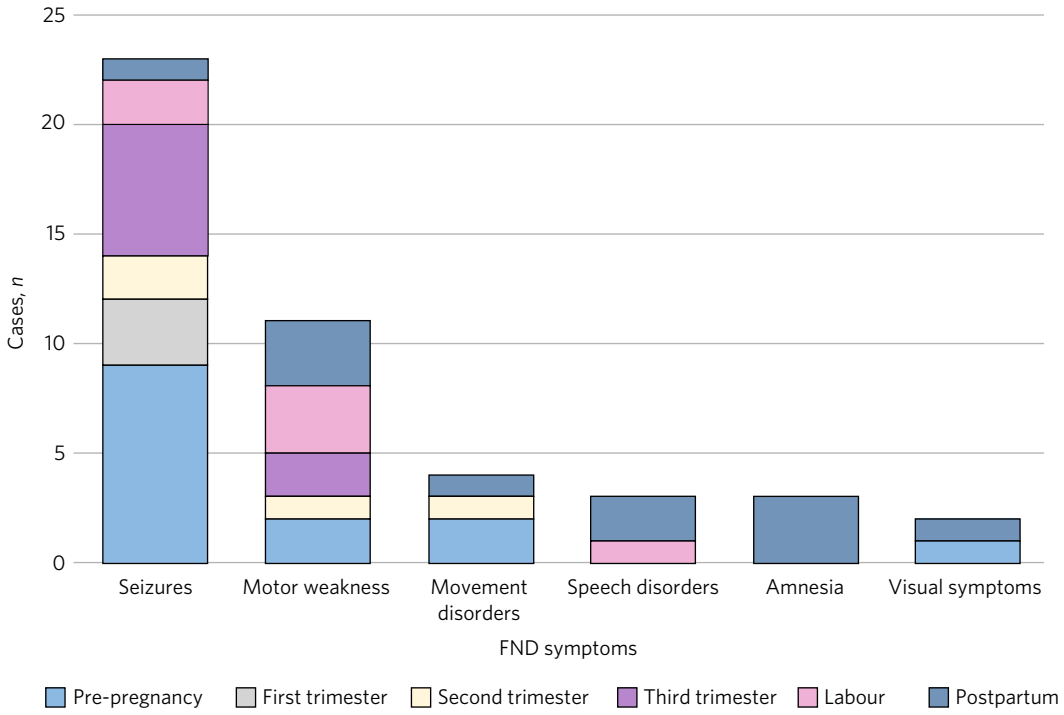

Fig. 2 Stacked bar graph showing the six functional neurological disorder (FND) subtypes reported during pregnancy, and respective timing of symptom onset ($n = 46$ cases, as three patients with motor symptoms had concomitant functional speech disorder and seizures).

Seven of these women experienced seizure worsening throughout pregnancy,[18,20,21,25,35] at a frequency of approximately one per week. All but two women visited an emergency department because of seizures at least once during pregnancy. Six women were prescribed anti-seizure medication (one to two drugs) before pregnancy (in one of whom it was commenced as a mood stabiliser for bipolar disorder).[18,20,25,35] In two of these cases the medication was stopped after FND was diagnosed.[20,25] Three of the five women who were prescribed anti-seizure medication for seizure episodes declined to stop the medication because they feared worsening of symptoms and disagreed with the FND diagnosis, despite counselling and neurologist advice.[18] Attempts to discontinue medications were associated with increased functional seizures and emergency department attendances in two women, with subsequent reinstatement by the primary care physician rather than a neurologist. Three women received intravenous medication during hospital admission (magnesium, phenytoin, diazepam and thiopental), including one woman who was intubated and admitted to intensive care.[21,25]

In the newly diagnosed patients, 14 women had perinatal onset of functional seizures: first trimester ($n = 3$),[18,32,33] second trimester ($n = 2$),[18,23] third trimester ($n = 6$),[22,24,27,28,30,31] immediately after labour ($n = 2$)[26,29] and postpartum period ($n = 1$).[34] Four of these women were also commenced on anti-seizure medications (two on polytherapy because of high seizure frequency during pregnancy – up to 40 episodes per day and five emergency department visits).[18,24,27,30] Eight women with FND commencing in pregnancy received intravenous medication in hospital[18,22–24,26,30] and two (14%) were admitted to intensive care.[24,30]

Overall, regarding diagnosis, 18 of the 23 women with perinatal functional seizures were diagnosed using electroencephalography (EEG) and/or video telemetry during a seizure event. All the women for whom data were available ($n = 8$) delivered healthy babies at term (vaginal: $n = 4$; forceps: $n = 1$; Caesarean section: $n = 3$; unknown: $n = 1$).[19,20,22,24,25,29,35] Regarding treatment, one case report described successful use of repetitive transcranial magnetic stimulation (rTMS) in the first trimester.[32] Other attempted treatment strategies included medication and non-pharmacological strategies such as relaxation techniques and family therapy. Psychodynamic group therapy was described in four case reports,[27,31,33,35] of which one reported reduced seizure frequency.[35]

Follow-up outcome data were available for 14 women, ranging from 2 days to 8 years. Of the nine women with pre-pregnancy functional seizures, three experienced fewer seizures with regular neuropsychiatric follow-up, two of whom were able to cease anti-seizure medication,[20,25,35] and four continued to experience frequent seizures at last known follow-up.[18,21] In those women with perinatal-onset functional seizures ($n = 14$), five recovered completely.[22–24,29,32]

Functional motor (limb) weakness

Eleven case reports (26%) described women with functional motor symptoms, either paraparesis ($n = 5$), quadriparesis ($n = 4$) or lateralised limb weakness ($n = 2$).[19,27,36–44] In three cases, functional motor symptoms were accompanied by speech disorder (aphonia) or functional seizures;[19,27,44] these three are also discussed under those subtypes. In two women, symptoms commenced pre-pregnancy: one had a 7-year history of FND and somatic symptoms[19] and

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the other had previous perinatal FND on a background of a previous stroke.[36] Perinatal-onset functional weakness was mainly reported during labour ($n = 3$) and postpartum ($n = 3$). Two cases occurred during the third trimester and one in the second trimester.

Of the 11 women with functional motor weakness, 7 (64%) developed symptoms following epidural ($n = 5$) or spinal ($n = 2$) anaesthesia (one complicated by subdural block) and 2 had experienced inadequate pain control.[37,39–44] In six of these seven women, functional weakness occurred in the first 12 h post-anaesthesia ($n = 6$) and in the seventh it arose 7 days after three unsuccessful epidural procedures during labour.[43]

Positive diagnostic signs included Hoover's and thigh abductor signs ($n = 1$)[19] and variability ($n = 2$).[41,42] Other accompanying signs were concurrent patchy sensory loss ($n = 1$)[48] and fixed dystonia, pain and memory complaints ($n = 1$).[36] Nine of the eleven patients had unremarkable investigations including: spinal magnetic resonance imaging (MRI) ($n = 7$), brain MRI ($n = 1$), computed tomography (CT) head scan ($n = 1$), as well as electromyography ($n = 1$), evoked potentials ($n = 1$) and lumbar puncture ($n = 1$). Two women were diagnosed based on neurological examination alone, which was deemed incongruent with the clinical presentation.[37,44]

Of the nine women for whom data on delivery were available, eight delivered their babies at term (Caesarean: $n = 4$; vaginal delivery: $n = 4$, one with forceps and one with suction cup; unknown: $n = 1$); one baby was delivered preterm via Caesarean section at 30 weeks' gestation.[43] Of the two women with pre-pregnancy onset of functional weakness, symptoms remained stable[19] or improved after physiotherapy and cognitive–behavioural therapy – part of which involved the therapeutic technique of showing the woman photographs of her limbs relaxed under general anaesthesia.[36] All other cases of functional weakness showed at least some recovery. Seven women recovered fully between 2 h and 6 weeks post-symptom onset, five without requiring physiotherapy or other specialised therapies.[37,38,41,42,44] One report described incomplete recovery at 14 days postpartum.[39]

Functional movement disorders

Three conference abstracts described functional movement disorders during pregnancy ($n = 4$). Two women had symptom onset pre-pregnancy, one of left-sided distractible tremor following a subarachnoid haemorrhage and the other of severe left-arm dystonia.[19] Fatigue, pain, Ehlers–Danlos syndrome and postural tachycardia syndrome were comorbidities in these two cases.[19] The woman with tremor remained stable during pregnancy, whereas the one with dystonia markedly improved during pregnancy but evolved to a fixed clenched-fist posture after a subsequent pregnancy.

Regarding the perinatal onset of functional movement disorders, one case described abdominal myoclonus, which occurred during the second trimester,[33] and one case described jaw-opening dystonia and an irregular limb tremor, which occurred postpartum.[42] Both women presented with acute-onset symptoms that changed on distraction and attention, and both had a history of depressive disorder. The case of myoclonus was investigated with blood tests, somatosensory potentials, brain and cervical spinal MRI, electromyography of phrenic nerves and abdominal wall musculature; symptoms resolved after 'behavioural psychotherapy'. No follow-up data were reported for the woman with jaw dystonia.

Data on delivery or birth outcomes were available only for the two women with symptom onset pre-pregnancy; both delivered healthy babies at term.

Functional speech disorders

Functional speech disorders were reported in three cases, one during labour[48] and two postpartum.[44,47] Two women had received epidural anaesthesia (one during a vaginal delivery and one during Caesarean section); delivery was not described for the third woman. Presentations included aphonia ($n = 2$)[44,48] and foreign accent syndrome ($n = 1$).[47] Concerns about the baby's health immediately post-delivery[48] and adverse life events, such as social isolation and domestic violence,[47] were identified as precipitating stressors in two cases. One woman with aphonia, without known comorbidities, received intravenous diazepam (indication unclear) and was transferred to intensive care.[48] All women with functional speech disorders delivered healthy babies, had unremarkable neurological examinations (outside abnormal speech), brain MRI ($n = 2$), cardiovascular investigations ($n = 1$) and EEG ($n = 1$). The two cases of aphonia resolved within 36 h post-symptom onset, but the case of foreign accent syndrome persisted at 6-month follow-up, with intermittent visual and hearing impairment.[47]

Dissociative amnesia

Dissociative amnesia was described in three women, all during the postpartum period, with onset ranging from 1 h to 4 days postpartum.[49–51] Adverse life events were reported in two cases (marital conflict and concerns over child's health, and previous miscarriage and infertility).[49,51] The second woman had delivered a premature baby with cleft palate.[51] Two women recovered spontaneously pre-discharge.[50,51] The third showed only partial improvement in memory following a therapeutic interview with thiopentone and hypnosis.[49]

Functional visual symptoms

Functional visual symptoms were reported for two women, one of whom with onset pre-pregnancy[53] and a second postpartum.[52] The first woman, who developed sudden blindness during the third trimester that persisted for several days following Caesarean section, had a history of functional weakness and speech and swallowing difficulties. Symptoms recurred in a subsequent pregnancy.[53] The second woman presented with gradual visual loss leading to variable blindness during treatment for a mandibular bone infection.[52] No ophthalmological, CT head scan ($n = 1$) and MRI ($n = 1$), blood ($n = 1$) and cerebrospinal fluid (CSF) ($n = 2$) abnormalities were reported in either woman. In the second case, P100 waves (showing integrity of visual pathways) were absent in both eyes on evoked potentials but reverted to normal with patient positioning and positive reinforcement, demonstrating distractibility.[52] Both women had uncomplicated deliveries but incomplete recoveries.

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Discussion

This review summarises the current literature on characteristics and course of perinatal FND. Although FND is a common neurological disorder in women of childbearing age, we found only 43 descriptions of perinatal FND, all of which were case reports and case series. Despite the limited literature, some potentially noteworthy observations emerge.

Presentation: onset and premorbid conditions

Reported presentations of perinatal FND varied widely, with functional seizures the most frequently reported FND subtype.

Around one-third of reported cases were of FND with onset preceding pregnancy. In this group, a subset of women experienced transient worsening of functional symptoms, often with resolution postpartum, and some women experienced FND (motor, visual and seizures) almost exclusively during pregnancy.[19,36,53]

The second group, the largest represented in this review, comprised women with perinatal-onset FND. Notably, the third trimester, labour and postpartum were the most common periods for symptom onset in this group. Although this review does not shed light on why this is case, precipitating factors for FND identified in the literature, including pain, are likely relevant.[10,11] Moreover, despite evidence not being available for FND populations, studies have linked perceived lack of autonomy or dissatisfaction with care during labour, sleep deprivation, fatigue, hormonal and weight changes, and adjustment to new parenthood in the postpartum period, with peri-labour dissociative experiences (including altered time perceptions and derealisation).[13,54,55] These acute stress disorders and dissociative symptoms are more frequent in the cases of premature birth, prolonged, painful or complicated delivery, following emergency Caesarean section, where there is illness in the mother or the child, and with high levels of negative emotions during the pregnancy, including following perinatal loss.[56–58]

Premorbid psychiatric and neurological conditions, and a history of adverse events, were present in nearly half of the cases of perinatal FND reported in this review. This is consistent with literature supporting adverse events as a risk factor for FND,[4–6] and an association between FND and mental health comorbidities.[9] Of note, late pregnancy and the early postnatal period are also recognisable periods of recurrence of pre-existing psychiatric disorders, such as anxiety, psychosis and mood disorders,[12,59] as well as an increased risk of disorders in individuals who hitherto have not suffered from mental illness, potentially representing a higher risk period for FND. Whether other modifiable factors, such as anticipatory fear about the delivery, also play a role in perinatal FND remains unclear.

Misdiagnosis and anti-seizure medication

Misdiagnosis of perinatal FND during pregnancy can be dangerous. Anti-seizure medications in women with functional seizures diagnosed incorrectly as epileptic seizures are potentially teratogenic,[60] and women can be needlessly exposed to other risks, such as intravenous medications and admissions to intensive care units.[61] More than half of the reported cases of perinatal functional seizures received intravenous medication. The frequently acute and dramatic clinical presentations of pseudostatus epilepticus often pose diagnostic difficulties and likely account for these results. Stopping anti-seizure medications after initiation proved challenging in some,[62] and women expressed the wish to terminate the pregnancy due to anxiety about teratogenicity.[63] It is important to proactively review anti-seizure medication prescribed to women without epilepsy or bipolar affective disorder, especially where teratogenic risks are known. Moreover, continuing anti-seizure medication at the expense of other treatments deprives women of potentially helpful treatments targeting functional seizures. Notably, cases where improvement was observed included those who had regular neuropsychiatric follow-up, psychotherapy and/or cessation of anti-seizure medication after diagnostic revision. The optimal management of pseudostatus epilepticus during the perinatal period requires close collaboration between the patient and family, perinatal teams, emergency care clinicians, neurologists and psychiatrists, and efforts to increase diagnostic awareness of FND. This also potentially reduces chances of prematurity from needlessly early delivery. Only 2 out of 21 cases reporting birth outcomes mentioned complications.[43,51] This is consistent with data from an abstract that did not find differences in prenatal, labour or neonatal outcomes, namely increase in neonatal deaths or congenital malformations, between 10 women with epilepsy, 9 with functional seizures and 25 healthy controls (no individual data regarding these women were provided).[64]

Physical precipitants of functional motor symptoms

Functional motor symptoms almost exclusively occurred during the third trimester, labour and postpartum period, and often followed spinal and epidural anaesthesia. We hypothesise that physical precipitants of functional motor symptoms, such as altered sensory feedback from anaesthesia, could have produced a mismatch between expectations and sensory input.[65] This would be consistent with evidence that medical and surgical interventions are risk factors for functional movement disorders,[8,10,11] which may be in keeping with a slightly higher rate of Caesarean compared with vaginal deliveries in these FND cases. In addition, we can hypothesise that clinicians may have been more likely to recommend elective Caesarean for women experiencing FND symptoms such as severe bilateral leg weakness, or this may have been urgently recommended because of ongoing symptoms such as dissociative events, fatigue or new-onset weakness. We found fewer case reports of functional motor symptoms than functional seizures, even though in practice the frequency appears to be similar. This may just reflect the epidemiology of these subtypes, with functional seizures having a peak onset in the late teens/early 20s, whereas functional motor symptoms have a peak onset in the late 30s.[3]

Non-pharmacological interventions

Psychological and physiotherapy interventions, a mainstay of FND treatment, were used in six reported cases, with

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improved outcomes in four.[31,34–36,45,50] They remain largely unexplored in this group despite evidence for FND in general.[66,67]

Limitations

Our findings have significant limitations. The existing literature is partially populated by conference abstracts, and data were mostly drawn from case reports where reporting and selection bias are likely to be high. It is likely, for example, that authors would be drawn to report new cases of FND during pregnancy, whereas cases of women with prenatal FND whose symptoms had improved or stayed stable are likely to be underrepresented. Variable follow-up data and lack of information on symptom trajectory across the case reports means that long-term outcomes are difficult to determine. Misdiagnosis is a possibility since 20 of the 36 studies were published before 2013, when the new DSM-5 classification of FND defying the traditional mind–body dualistic way of thinking and approach was published. So, some of the diagnostic methods in these studies do not align with current standards for both diagnosis and treatment and current Bayesian understanding of brain–body networks.[68] Equally, four cases described signs such as 'la belle indifference', which have already proved not to be discriminative.[69] The presence of a normal EEG during episodes of functional seizures counterbalances this concern for at least some reports.

Clinical and research implications

These cases demonstrate the strikingly limited literature on perinatal FND, which does not allow us to answer many of the important questions regarding FND and the perinatal period.

However, this review provides a tentative starting point for well-designed cohort studies. Until then, the management of perinatal FND should follow the standard of care of other FNDs, with the necessary adaptions for the patients' state. Early diagnosis, communication and multidisciplinary treatment of FND are vital.[2] Involvement of families and destigmatisation about the condition are key to progress in this area. Choices of delivery and anaesthetic methods are to be taken by obstetric teams together with the patient, on an individual basis, but currently there are no known contraindications for vaginal or Caesarean delivery.

Future studies should explore the role of perceptions of pregnancy and motherhood in relation to FND symptom onset and trajectory. A greater understanding of the relationship between common psychiatric comorbidities during the postnatal period, including dissociation, postpartum depression, PTSD[59] and FND, would benefit the development of joint care pathways and preventive strategies. For women with previous miscarriage or stillbirth, support after perinatal loss may help reduce vulnerability.[70] In women with pre-existing FND, more research into the course of symptoms throughout the perinatal period is needed. Particularly, it remains unknown which women are at higher risk of complications of their FND or immediate relapse postpartum, as well as those at risk of new onset of perinatal FND. Our personal experience is that many women with pre-existing FND find that their neurological symptoms improve during pregnancy, especially during the second trimester. The role of fatigue in labour protraction or arrest in patients with FND also remains to be explored, as well as considerations of previous obstetric adversities (including infertility and assistive reproductive technology) as potential risk factors for perinatal-onset FND.

Lastly, in women with FND the desire to raise their own family is often undermined by concerns about physical and emotional repercussions for the mother and the hypothetical interference of FND symptoms in the ability to take care of the newborn. Women also express other worries, such as fear of passing on FND to future generations and concerns over iatrogenic risks of certain pharmacological therapies and the need to interrupt certain treatments. It is likely that FND itself might affect sexual function and libido for some women, which can affect conception. These concerns warrant investigation in forthcoming prospective studies. Collaborative efforts among neurological, psychiatric and perinatal care teams will be key to produce guidance that supports women with FND in their pregnancy and delivery planning.

About the authors

Verónica Cabreira is a clinical research fellow and neurology senior SpR in the Centre for Clinical Brain Sciences, University of Edinburgh, Edinburgh, UK. **Caoimhe McLoughlin** is a clinical research fellow and consultant liaison psychiatrist in the Centre for Clinical Brain Sciences, University of Edinburgh, Edinburgh, UK. **Natasha Shivji** is a consultant perinatal psychiatrist at Central and North West London NHS Foundation Trust, London, UK. **Alexandra Lodge** is a medical student at St George's Hospitals and University, London, UK. **Sanne Van Rhijn** is a consultant perinatal psychiatrist and neuropsychiatrist with the Perinatal Mental Health Service, West London NHS Trust, London, UK and the Department of Brain Sciences, Imperial College, London, UK. **Roxanne C. Keynejad** is NIHR clinical lecturer and ST6 trainee in general adult psychiatry in the Department of Health Service and Population Research, King's College London, London, UK. **Jan Coebergh** is a consultant neurologist at St George's Hospitals and University, London, UK. **Alan Carson** is a consultant neuropsychiatrist in the Centre for Clinical Brain Sciences, University of Edinburgh, Edinburgh, UK. **Jon Stone** is a consultant neurologist in the Centre for Clinical Brain Sciences, University of Edinburgh, Edinburgh, UK. **Alex Lehn** is a consultant neurologist at Princess Alexandra Hospital, Brisbane, Queensland, Australia. **Ingrid Hoeritzauer** is a consultant neurologist in the Centre for Clinical Brain Sciences, University of Edinburgh, Edinburgh, UK.

Supplementary material

Supplementary material is available online at https://doi.org/10.1192/bjb.2024.70.

Data availability

The data that support the findings of this study are available on request from the corresponding author.

Author contributions

V.C.: conceptualisation, methodology, main analysis, data curation, initial manuscript draft; C.M.: conceptualisation, methodology, manuscript draft edit and review; N.S.: data curation, manuscript draft edit and review; A. Lodge: data curation; S.V.R.: conceptualisation, manuscript draft edit and review; R.C.K.: manuscript draft edit and review; J.C.: manuscript draft edit and review, methodology; A.C.: manuscript draft edit and review;

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J.S.: conceptualisation, manuscript draft edit and review; A. Lehn: manuscript draft edit and review; I.H.: conceptualisation, supervision, manuscript draft edit and review.

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Declaration of interest

J.S. reports personal fees from UptoDate, outside the submitted work, runs a self-help website for patients with functional neurological symptoms (www.neurosymptoms.org), which is free and has no advertising, provides independent medical testimony in personal injury and negligence cases regarding patients with functional disorders and is secretary of the International Functional Neurological Disorder Society. He is a Chief Scientist Office NHS Research Scotland Career Researcher. A.C. is a director of a limited personal services company that provides independent medical testimony in court cases on a range of neuropsychiatric topics on a 50 per cent pursuer–50 per cent defender basis, a paid associate editor of the *Journal of Neurology, Neurosurgery and Psychiatry* and unpaid president elect of the International Functional Neurological Disorder Society. I.H. reports fees from expert witness work.

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