Title: A Clinical Update on Hypermobile Ehlers-Danlos Syndrome during pregnancy, birth and beyond

Author Details

1. Dr Sally Pezaro, School of Nursing, Midwifery and Health and The Centre for Arts, Memory and Community (CAMC)
2. Dr Gemma Pearce, C Psychol. Lecturer. School of Psychological, Social and Behavioural Sciences, Coventry university.
3. Dr Emma Reinhold, Portfolio GP; Clinical Champion for the Ehlers Danlos Syndromes, Royal College of GPs; Primary Care Advisor, EDS UK
   *Corresponding author: Dr Gemma Pearce. Gemma.pearce@coventry.ac.uk

Abstract

New estimates suggest that cases of hypermobile Ehlers Danlos Syndrome (hEDS) along with the related Hypermobility Spectrum Disorders (HSD) affect approximately 1 in 20 pregnancies, globally, per year. As such, cases in maternity services should no longer be considered rare, only rarely diagnosed. These conditions can impact upon childbearing in different ways, yet healthcare professionals are often perceived to be lacking in awareness. This article updates and builds upon a previous international review of maternity care considerations for those childbearing with hEDS/HSD. Findings point to a need for individualised care planning in partnership with parents as part of a multidisciplinary approach. As our knowledge of these conditions has developed significantly in recent years, new research insights could usefully be embedded in staff and student education. As a first step, www.hEDSTogether.com has been launched hosting a freely downloadable EDS Maternity tool for use in practice, along with an i-learn module hosted by the Royal College of Midwives.

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Keywords
Midwifery; Pregnancy; Hypermobility; Ehlers-Danlos Syndrome; Birth; Joint instability; Obstetric; Parturition

Key points
- The management of hEDS/HSD in childbearing remains complex throughout pregnancy, birth and beyond.
- Cases of hEDS/HSD should no longer be considered rare in maternity services, only rarely diagnosed.
- Labours and births for those with hEDS/HSD can be precipitate, which healthcare staff may experience as an unexpected shock.
- The use of the EDS Maternity tool may support both parents and maternity staff in evidence-based decision making and care planning as part of a multidisciplinary approach.

Reflective questions
- How many pregnancies are affected globally by hEDS/HSD per year and how might midwives prepare for this newly highlighted reality.
- In what ways are connective tissues affected for those with hEDS/HSD in childbearing, and what may be done to reduce the risk of any complications?
- What chance does a baby born to a parent with hEDS/HSD have of inheriting the condition themselves, and how might such newborns be assessed at birth?
- How might parents affected by hEDS/HSD be supported to engage in evidence-based decision making about their maternity care?
- How might trauma for those affected by hEDS/HSD in childbearing be reduced?
Introduction
Connective tissue is present throughout the body and acts as a fabric like support structure holding every joint, muscle, and organ in place (Cohen and Hull 2020). It also forms the extracellular matrix providing structural support to cells. As such, conditions which impact upon the functionality of connective tissue may have significant consequences in childbearing, where the human body and its tissues must adapt significantly to grow and birth a baby. The Ehlers Danlos syndromes (EDS) are a group of heritable, multisystemic conditions which affect connective tissues throughout the body (Malfait et al. 2017). Most subtypes of EDS are rare, but hypermobile EDS (hEDS) alongside the related Hypermobility Spectrum Disorders (HSD) are no longer considered rare, as recent work has shown a diagnosed prevalence rate of 1 in 500 (Demmler et al. 2019). On the contrary, hEDS/HSD appears to be only rarely diagnosed, as only 5% of cases are successfully identified (Grahame 2008), and it can take an average (mean) of 16 years for women to be diagnosed with EDS from the time of development of significant symptoms (EURORDIS and Faurisson 2009). Other heritable connective tissue disorders that impact upon pregnancy can now be detected using next-generation DNA sequencing (VanderJagt and Butler 2019). Joint hypermobility is one manifestation of hEDS/HSD, often given prominence over other key features. The 9-point Beighton score of joint motion (Beighton, Solomon, Soskolne 1973), the more recent Lower Limb Assessment Score (Ferrari et al. 2005), or the self-reported five-part questionnaire, 5PQ may be used to assess hypermobility (Schlager et al. 2020). Yet whilst the Beighton score can be used as a guide for the identification of Generalised Joint Hypermobility (GJH), it should not be used to exclude people from a diagnosis of hEDS/HSD or a referral for diagnosis or treatment (Malek, Reinhold, Pearce 2021). As no single gene (or
other reliable testing modality) has yet been identified for hEDS/HSD, diagnosis remains reliant upon clinical observations and family histories (where available).

The various subtypes of EDS may share symptoms such as joint hypermobility and hyperextensible and/or fragile skin (Bloom et al. 2017). For hEDS/HSD, symptoms more commonly relate to joint, skin and proprioception, such as frequent injuries, sprains, dislocations/subluxations (Ericson Jr and Wolman 2017), oromandibular manifestations (Mitakides and Tinkle 2017), easy bruising (Kohn and Chang 2019), and problems relating to balance or proprioceptive precision (Clayton, Jones, Henriques 2015; Russek and Errico 2016). Importantly, a better understanding is now developing on the connective tissues across multiple body systems for people with hEDS/HSD. This includes cardiovascular autonomic dysfunction (Hakim, Alan, O'Callaghan et al. 2017), including orthostatic intolerance, gastrointestinal symptoms such as reflux and bowel dysmotility (Fikree et al. 2017), neurological manifestations including migraine (Henderson Sr et al. 2017), urogynaecological symptoms (Kohn and Chang 2019), and related mast cell dysregulation (Seneviratne, Maitland, Afrin 2017). Additionally, those with hEDS/HSD report increased rates of pain (Chopra et al. 2017), anxiety and depression (Bulbena et al. 2017), fatigue (Hakim, Alan et al. 2017), sleep disturbance and a general reduction in health (Albayrak et al. 2015). People with hEDS/HSD are also more likely to be diagnosed with psychiatric disorders, including Autistic Spectrum Disorder, and attempt suicide (Cederlöf et al. 2016). More broadly, those with hEDS/HSD can experience a repeated lack of understanding by health professionals, restricted life, social stigma, and a fear of the unknown (Bennett et al. 2019). These concerns can be exacerbated over the lifespan, where pregnancy can act as a potential catalyst for change (Tinkle, et al. 2017; Pezaro, Pearce, Reinhold 2018).
New estimates suggest that hEDS/HSD affect approximately 1 in 20 pregnancies globally (Pezaro, Pearce, Reinhold 2020). Despite this, some diagnosed before pregnancy have perceived a lack of preparedness, clinical knowledge, and awareness among healthcare professionals (Terry et al. 2015; Bennett et al. 2019; Pezaro, Pearce, Reinhold 2020).

Nevertheless, whilst much of the literature is focussed upon ‘risk’ it is important to remember that many childbearing with hEDS/HSD will experience an entirely low risk pregnancy and birth, whilst others may experience significant issues or anything in between.

Whilst a recent review has focussed on a variety of EDS subtypes and pregnancy (Kang et al. 2020), this article updates and builds specifically upon practical maternity care considerations and recommendations for those childbearing with hEDS/HSD (Pezaro, Pearce, Reinhold 2018). Since this previous review was published, a 14th subtype of EDS has been discovered (Blackburn et al. 2018). Nevertheless, the present article will remain focussed upon the more prevalent hEDS/HSD. This review will also include the following pre-2017 classifications of the conditions as many people will still have these historic diagnoses recorded: Ehlers–Danlos syndrome type III, Ehlers–Danlos syndrome - Hypermobility Type and Joint Hypermobility syndrome (see Demmler et al (2019) for a further explanation of previous nomenclature). Here, care considerations for both hEDS and HSD are considered together, as in practice their management is the same, and symptom severity does not correlate with the diagnoses. Throughout, we are mindful of the fact that the diagnostic criteria for hEDS/HSD remain under review by the International Consortium (The Ehlers-Danlos Society 2021), and that whilst the words ‘women’ and 'maternity' feature within this article, there are other birthing people who identify with different genders or no gender at all (Pezaro 2019).
Antenatal Care Considerations

For those with hEDS/HSD, pregnancy is generally well tolerated (Volkov et al. 2018; Karthikeyan and Venkat-Raman 2018). Yet in terms of getting pregnant, lower rates of fertility have been reported (Hurst et al. 2014). However, in a recent international qualitative study, conception was not reported as being problematic (Pezaro, Pearce, Reinhold 2020). Inferences cannot be drawn across the whole population from this qualitative study of childbearing women, but these findings open a line of enquiry in need of further investigation, such as whether fertility differs within subgroups of people with hEDS/HSD. Regardless, findings suggest that multidisciplinary care planning in partnership with parents may be useful pre-conceptually (Pezaro, Pearce, Reinhold 2020).

The symptoms of pregnancy can be exacerbated by hEDS/HSD and vice versa (Pezaro, Pearce, Reinhold 2020). Those pregnant with hEDS/HSD can experience disabling increases in joint laxity along with a variety of urogynaecological complications (Gilliam, Hoffman, Yeh 2020). Pelvic pain and joint instability are common (Volkov et al. 2018; Lind and Wallenburg 2002; Ali et al. 2020) and pelvic girdle pain can be especially notable in the first trimester of pregnancy (Ahlqvist et al. 2020). In our previous review, we promoted the need for early referrals to physiotherapy services and general practitioners in such cases (Pezaro, Pearce, Reinhold 2018). Due to increased elasticity in the soft tissues of those with hEDS/HSD combined with increased levels of relaxin during pregnancy, our previous review also highlighted that the occurrence and severity of varicose veins and/or gastrointestinal reflux may be increased (Pezaro, Pearce, Reinhold 2018). Such cases of problematic varicose veins may be managed with the use of compression hosiery and/or a referral to a vascular service (Marsden et al. 2013). Increased gastroesophageal reflux may be managed via standard treatments. For those with hEDS/HSD, joint hypermobility and instability are generally best
managed conservatively with the use of physical therapies, orthotics, and avoidance (Tinkle 2021).

Additionally, hyperemesis gravidarum, carpal tunnel syndrome and fatigue can be particularly challenging for those pregnant with hEDS/HSD (Pezaro, Pearce, Reinhold 2020). In one case study, bladder diverticulum (BD) has reportedly developed without any obstruction of the urinary bladder during pregnancy (Pradhan et al. 2020). This may be because of the growing fetus pressing over the bladder where connective tissues may be compromised. Consequently, in such instances, herniation and diverticulum can formulate and increase as the pregnancy progresses. Such cases may be managed conservatively unless chronic symptoms and complications arise in which case surgery may be required (Pradhan et al. 2020).

In terms of complications for those pregnant with hEDS/HSD, some can experience both high and low risk episodes (Pezaro, Pearce, Reinhold 2018; Pezaro, Pearce, Reinhold 2020). In one study observing 13,881,592 births, pregnancies in those with EDS were found to be more likely to be associated with antepartum haemorrhage (OR 1.79 (95% CI 1.20-2.66)) and placenta previa (OR 2.23 (95% CI 1.29-3.86)) (Nicholls-Dempsey et al. 2019). Although caution must be taken in interpreting these results, as the types of EDS included were not stated and findings are specific to the United States of America (USA), where the data was collected between 1999 and 2013.

Those with connective tissue disorders are also at an increased risk of other adverse pregnancy outcomes including preterm-premature rupture of membranes (PPROM), preterm birth, intra-uterine fetal growth restriction and cervical compromise (Anum et al. 2009; Kim et al. 2007; Nicholls-Dempsey et al. 2019; Karthikeyan & Venkat-Raman, 2018;
Spiegel et al. 2020). In such cases of cervical compromise, cervical surveillance may be considered (Nicholls-Dempsey et al. 2019). However, serial cervical length screening has not been shown to decrease the incidence of preterm birth, and the placement of a cervical cerclage may carry an increased risk of tearing in those with connective tissue disorders (Mardy, Chetty, Norton 2020). Therefore, in antenatal care planning, evidenced based decision making in partnership with those pregnant with hEDS/HSD is essential. Such risks may be usefully communicated and considered with the use of the EDS maternity tool hosted via www.hEDStogether.com.

**Postural Orthostatic Tachycardia Syndrome (POTS)**

The functional state of the autonomic nervous system plays an important role throughout pregnancy, childbirth and in the newborn condition (Dmitrieva et al. 2011; Atallah et al. 1999; Egliston, McMahon, Austin 2007). Postural Orthostatic Tachycardia syndrome (POTS) is a form of autonomic dysfunction that can cause orthostatic intolerance, with up to 78% of women with hEDS/HSD potentially affected (Gazit et al. 2003). Significantly, in one study of pregnant women diagnosed with autonomic dysfunction, where autonomic dysfunction was present in 55% before pregnancy, this figure rose to 100% during pregnancy (Taitubayeva et al. 2020). Those with POTS may also experience symptoms such as trouble concentrating, light-headedness, palpitations, fatigue, exercise intolerance, and in severe cases, syncope (fainting) (Fedorowski, Hamrefors, Ricci 2021). The authors of a recent review of the literature have determined that there is inadequate published evidence to confirm any relationship between hEDS, POTS, and Mast Cell Activation Syndrome (MCAS) (Kohn and Chang 2019). However, others have argued that the overlapping symptoms of these conditions and their under-diagnosis means that the potential link should not be ignored, as
clinical experts find these three conditions together commonly in practice (Afrin et al. 2020; Roma et al. 2018). Such academic debates highlight the need for further inquiry.

Throughout pregnancy, birth and beyond, the symptoms of POTS can be variable (Morgan et al. 2018). The majority (up to 60%) of people with POTS report symptomatic improvement during pregnancy (Bhatia, Kavi, Nelson-Piercy 2018). However, those that experience severe POTS prior to pregnancy are more likely to decompensate throughout the course of pregnancy with worsening orthostatic intolerance, and as a result can become quite immobile in the third trimester of pregnancy, occasionally necessitating hospital admission (Bhatia, Kavi, Nelson-Piercy 2018). Management of POTS during pregnancy can include tailored exercise aimed at improving the ability to remain upright, along with the use of compression hosiery (Ruzieh and Grubb 2018). As a first line therapy, oral hydration (2 l a day) and salt intake (3–5 g of salts per day) may be considered (Grubb 2008). Yet such treatment should be used with caution, taking into consideration the risk of exacerbating the hypertensive disorders of pregnancy.

In the medical management of POTS during pregnancy, α1-receptor agonist (midodrine) or beta blockers can be useful (Ruzieh and Grubb 2018). Continuing any medication prescribed pre-conceptually may also reduce symptoms, and no significant risks have been reported in such cases (Morgan et al. 2018). Medications during pregnancy should always be managed in partnership with a medical professional (Pezaro et al., 2018). Though there is no uniform guidance in caring for those childbearing with POTS, it may be prudent for those with hEDS/HSD and autonomic dysfunction such as POTS to seek early review with an obstetrician and an anaesthetist to engage in timely and evidence-based discussions (Pezaro, Pearce, Reinhold 2018; Morgan et al. 2018; Sheldon et al. 2015).
Intrapartum Care Considerations

The build up to active labour may be slow for those childbearing with hEDS/HSD, whereas active labours and births can progress very quickly (Pezaro, Pearce, Reinhold 2020) (Karthikeyan and Venkat-Raman 2018). It has been suggested that such precipitate births may be somewhat attributed to increased joint laxity, allowing the fetal head an easier passage through the pelvis, thus also less frequently requiring the use of instruments to aid in the birth (Knoepp et al. 2013). In any case, it will be important to recognize the challenges faced in experiencing this phenomenon and listen to those who indicate that their labour may be progressing faster than anticipated. For maternity staff, such precipitate labours and births can seemingly be an unexpected “shock” for which they may be underprepared (Pezaro, Pearce, Reinhold 2020). In order to avoid such births occurring prior to reaching one’s intended place of birth, it may be prudent to plan for a homebirth, either as a contingency or where appropriate.

Those childbearing with hEDS/HSD may experience the premature birth of their babies (Hurst et al. 2014; Turan et al. 2020; Nicholls-Dempsey et al., 2019; Volkov et al. 2018). Additionally, other authors have reported how births may be affected by abnormal fetal presentation (Lind and Wallenburg 2002; Karthikeyan and Venkat-Raman 2018). This may not be surprising when we consider that tissues which typically support babies to remain in an optimal position in preparation for birth may be looser in those with hEDS/HSD.

Furthermore, as those childbearing with hEDS/HSD report episodes of both physical and psychological birth trauma (Pezaro, Pearce, Reinhold 2020), it will be important to prevent, prepare for and anticipate such episodes as well as provide appropriate and effective parental support.
As with previous care considerations (Pezaro, Pearce, Reinhold 2018), it is recommended that those childbearing with hEDS/HSD should not be discouraged from birthing their babies vaginally. Yet in one American cohort of 13,881,592, births to women with a variety of EDS subtypes, 910 were found more likely to be via caesarean section (OR 1.61 (95% CI 1.41-1.85)) compared to those without EDS (Nicholls-Dempsey et al. 2019). Conversely, other evidence suggests that those with joint hypermobility, defined by a Beighton score ≥4 are less likely to birth via caesarean section or vaginally with the aid of instruments after complete cervical dilation [odds ratio (OR)=0.51; 95 % confidence interval (CI):0.27–0.95] compared to those without (Knoepp, McDermott, Muñoz, Blomquist, & Handa, 2013). In any case, gentle handling of tissues and meticulous attention to haemostasis will be important in any surgical interventions. Optimal maternal positioning and joint support is also encouraged throughout labour and birth to avoid unnecessary trauma to joints and ligaments (Pezaro, Pearce, Reinhold 2018). In cases where episiotomy would otherwise be clinically indicated, birth via caesarean section may be preferred to avoid an increased risk of pelvic organ prolapse (Wiesmann et al. 2014).

For those birthing with hEDS/HSD, local anaesthetic can be ineffective (Pezaro, Pearce, Reinhold 2020; Pezaro, Pearce, Reinhold 2018). EDS has also been associated with cerebrospinal fluid (CSF) leak (Schievink, Gordon, Tourje 2004), which can in turn exacerbate the symptoms of hEDS/HSD. This can occur spontaneously but should also be suspected in those with hEDS/HSD who experience ongoing orthostatic symptoms following a procedure like an epidural (Schoenfeld et al. 2017). Other anaesthetic issues associated with hEDS/HSD include increased rates of cervical spine instability and local anaesthetic resistance (Cesare et al. 2019), along with hypotension after anaesthesia (Karthikeyan & Venkat-Raman, 2018). For those with POTS, epidural (bolus and/or infusion) with phenylephrine during childbirth
may be useful in preventing reactive tachycardia in the presence of hypotension-causing peripheral vasodilation (Morgan et al. 2018). Anaesthetic care planning in partnership with parents and a multidisciplinary team is therefore an important aspect to consider during pregnancy for people with hEDS/HSD.

Strategies that promote spontaneous pushing in favour of directed pushing for those with POTS are recommended (Pezaro, Pearce, Reinhold 2018). Though for this group, decision making in relation to labour and mode of birth should be based on obstetrical considerations, rather than simply a diagnosis of POTS (Ruzieh and Grubb 2018; Morgan et al. 2018). Nevertheless, frequent monitoring of hemodynamic parameters may be advisable during the second stage of labour, as pushing, pain and fluid loss may result in a worsening of symptoms (Ruzieh and Grubb 2018). It may also be useful to consider the administration of early analgesia for those with POTS to reduce tachycardia and associated complications (Morgan et al. 2018). To this effect, birthing environments that promote calm and relaxation will also be highly valuable.

**Postnatal Care Considerations**

Postnatally, some with hEDS/HSD can struggle to recover from birth, both physically and psychologically (Pezaro, Pearce, Reinhold 2020). For example, tissues compromised by hEDS/HSD can be problematic to heal (Hakim and Grahame 2003; Hakim and Sahota, 2006; Castori, 2012). Our previous review also highlighted specific complications in relation to abnormal scar formation, haemorrhage, pelvic prolapses which may be associated with episiotomy, deep venous thrombosis, complicated perineal wounds, and coccyx dislocation (Pezaro, Pearce, Reinhold 2018). Complicated lacerations and increased episodes of post-partum haemorrhage have also been reported elsewhere (Volkov et al. 2018), along with
further episodes of coccyx dislocation and separation of the pubic symphysis (Gilliam, Hoffman, Yeh 2020). Health care practitioners should be aware of the risk of these potential complications, along with the potential for increased risk of urogenital and pelvic complications such as recurrent Urinary Tract Infections (UTIs) or incontinence, and gynaecological symptoms such as pain or prolapse (Gilliam, Hoffman, Yeh 2020). As in the antenatal period, early physiotherapy-based interventions along with early input from the multidisciplinary team may be useful in the management of such complications.

Those left with chronic pelvic girdle pain (PGP) are at a significantly increased risk of suffering from anxiety and depression (Siqueira-Campos et al. 2019). The management of this can be further complicated by emotional and behavioural responses to PGP (Alappattu and Bishop 2011), and fear avoidance beliefs, which may lead to worsening levels of pain tolerance (Quartana, Campbell, Edwards 2009; Chang et al. 2007; Rashidi Fakari, Simbar, Saei Ghare Naz 2018; Alappattu and Bishop 2011). Accordingly, multidisciplinary working with clinical psychology, psychiatry, pain management, physiotherapy, and rheumatology teams in line with summarised recommendations may be useful in the management of PGP (Ali et al. 2020; Vleeming et al. 2008). Where PGP persists, last line treatments may include intra-pelvic corticosteroid injection treatments (Lindgren 2020), and joint fusion (Vleeming et al. 2008).

In relation to the management of poor wound healing and anaesthetic coverage along with the additional risk of wound dehiscence in the postnatal period, our previous care considerations advocated the use of non-tension, non-dissolvable, deep double sutures, left in for at least 14 days in line with Chetty and Norton (2017), and individualized assessments of pain (Pezaro, Pearce, Reinhold 2018). Frequent joint dislocations, along with difficulties in
holding, caring for, bonding with, and breastfeeding can also further complicate parenthood for those with hEDS/HSD (Pezaro, Pearce, Reinhold 2020). People with hEDS/HSD are at a greater risk of experiencing shoulder symptoms, which early findings indicate may be improved with strengthening exercises (Liaghat et al. 2020). As such, there may be a heightened need to provide more bespoke, and practical postnatal care for those recovering from birth and engaged in early parenting with hEDS/HSD.

For those with POTS, it may be useful to further encourage breastfeeding where appropriate in order to stimulate the secretion of oxytocin and in turn, its potentially therapeutic antidiuretic effects (Bernal, Mahía, Puerto 2016). In such cases, breastfeeding may be useful in counteracting any excessive diuresis following childbirth (Ruzieh and Grubb 2018). Similarly, for those who experience migraine, pregnancy and lactation can have protective effects (Burch 2020). These unique considerations may be particularly relevant to healthcare professionals who specialise in infant feeding.

In one study of 13,881,592 births occurring in the USA, women with EDS were found to stay longer than 7 days in the hospital setting following the birth of their babies (OR 3.10 (95% CI 2.34-4.09)) (Nicholls-Dempsey et al. 2019). Similar data has also associated EDS with increased maternal mortality in the USA (OR 9.04 (95% CI 1.27-64.27)) (Spiegel et al. 2020). The authors of these works suggest that such findings certify EDS in pregnancy as a high-risk condition. However, because the findings did not distinguish which of the 14 subtypes of EDS this included, caution should be taken. This is because people with vascular EDS would endure a high-risk pregnancy as opposed to the risks associated with pregnancy and hEDS/HSD, which should be determined in relation to individual symptoms. Findings in relation to other geographical areas outside of the USA remain absent, and one must
consider the fact that despite spending more on childbirth than any other country in the world, the USA already has worse outcomes in maternity services than any other high-resource countries (National Academies of Sciences, Engineering et al. 2020). Accordingly, further evidence in relation to outcomes, best practice in postnatal care and length of hospital stay for those with hEDS/HSD is required, especially as some with hEDS/HSD can experience an uncomplicated postnatal recovery (Pezaro, Pearce, Reinhold 2020).

**Neonatal Care Considerations**

As a baby born to a parent with hEDS/HSD has a 50% chance of inheriting it themselves (autosomal dominant pattern of inheritance), it has been suggested that these newborns be thoroughly examined for symptoms of these conditions at birth (Pradhan et al. 2020). As with adults, supplementary joint support may also be required for babies affected during such examinations to avoid unnecessary trauma. The particulars in relation to supporting and examining such newborns’ hips which may be ‘clicky’, have joint hyperlaxity and dislocatability and skin that may feel ‘doughy’ and split and/or bruise easily have been detailed elsewhere (Pezaro, Pearce, Reinhold 2018). Additionally, the incidence of floppy infant syndrome may be higher for babies with hEDS/HSD (Lind and Wallenburg 2002), and due to the risk of premature birth, preparations may be required to receive and support the pre-term infant’s transition into the world. The importance of clinical documentation also remains paramount, especially where new research has identified a case where the bruising found on one baby led to one parent with hEDS/HSD being suspected of dishonesty (Pezaro, Pearce, Reinhold 2020).
**Discussion**

The management of hEDS/HSD in childbearing remains complex. Yet considering the new approximate figure of 1 in 20 put forward for the proportion of pregnancies affected by hEDS/HSD, cases in maternity services should no longer be considered rare, only rarely diagnosed (Pezaro, Pearce, Reinhold 2020). It is considered that the recognition of hEDS/HSD is now critical (Tinkle 2021). Though as outlined in our previous review, the role of the midwife in this context is not necessarily to diagnose cases of hEDS/HSD, but to work in partnership with those affected as part of a multidisciplinary team in making evidenced-based care plans along with early and appropriate referrals (Pezaro, Pearce, Reinhold 2018). Nevertheless, it may be useful for midwives to remain informed and alert to the possibility of many pregnancies occurring in people affected by hEDS/HSD who are as yet undiagnosed. Indeed, some midwives may now reflect that they may have already cared for a number of those birthing with hEDS/HSD previously. Additionally, whilst we have described a number of challenges associated with childbearing and hEDS/HSD here, it is also important for midwives to consider that those childbearing with hEDS/HSD may also feel well during pregnancy (Pezaro, Pearce, Reinhold 2020), and enjoy favourable outcomes (Sundelin et al. 2017). Equally, it is important to remember that there is no hierarchy as to whether cases of HSD are more severe than cases of hEDS and vice versa, and that symptomatic hypermobility may also be relevant in other conditions (Eccles et al. 2020). Therefore, tailored support to the individual is vital in all cases, particularly as many symptoms are invisible. The higher prevalence of pregnancies affected by hEDS/HSD recently presented may also call into question whether some symptoms more typically thought of as being related to pregnancy may instead relate to cases of hEDS/HSD. Yet further research in these areas is required to better understand them in the context of childbearing.
Women childbearing in the USA with a diagnosis of EDS have been found to be more likely to be Caucasian, earn a higher income, and smoke (Spiegel et al. 2020). Still, further quantitative data is required to further understand the outcomes associated with childbearing for those with hEDS/HSD in alternative demographic populations and geographical locations and thus also the educational needs of staff in this regard. Furthermore, as maternity staff can be perceived by those with hEDS/HSD to be panicked and lacking in knowledge and awareness (Pezaro, Pearce, Reinhold 2020), we would recommend additional research-inspired teaching, training, guidance, and education on this topic. As a first step, we have co-created an i-learn module hosted by the Royal College of Midwives and a freely downloadable EDS Maternity Tool to support shared decision making. This tool can also be hosted in maternity records. Furthermore, we have provided educational talks on this topic. Such outputs, further detailed on www.hEDSTogether.com may be useful in facilitating evidence-based care planning for those childbearing with hEDS/HSD during pregnancy, birth and beyond. Going forward, this website resource will also serve as a repository of future evidence and resources in relation to this topic.

In conclusion, this article has presented a clinical update on caring for those childbearing with hEDS/HSD throughout the perinatal period, where management remains complex. Yet cases should no longer be considered rare, only rarely diagnosed. The latest insights presented here may crucially explain the origins of some precipitate labours and births seen in practice along with other outcomes. They may also be used to galvanise change in perinatal services, whereby educational resources, policies, practices, and guidelines are updated to reflect a new reality in which the needs of those childbearing with hEDS/HSD (approximately 1 in 20) are effectively accommodated. Such updates may also ensure that
staff are better prepared to deliver the high-quality and safe care they aspire to, thus also further contributing to professional wellbeing overall.

References


Blackburn PR, Xu Z, Tumelty KE, Zhao RW, Monis WJ, Harris KG, Gass JM, Cousin MA, Boczek NJ, Mitkov MV. 2018. Bi-allelic alterations in AEBP1 lead to defective collagen assembly and


EURORDIS AK, Faurisson F. 2009. The voice of 12,000 patients. experiences and expectations of rare disease patients on diagnosis and care in Europe. EURORDIS-Rare Diseases Eu.


