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Maternal disability and risk for pregnancy, delivery, and postpartum complications: A systematic review and meta-analysis

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Abstract

Background: Women with disabilities are increasingly becoming pregnant, and growing evidence suggests maternal disability may be associated with increased risk for perinatal complications.

Objective: A systematic review and meta-analysis was undertaken to examine the association between maternal disabilities and risk for perinatal complications.

Study Design: Medline, CINAHL, EMBASE, and PsycINFO were searched from inception to July 2018 for full-text publications in English on pregnancy, delivery, and postpartum complications in women with any disability and those with physical, sensory, and intellectual and developmental disabilities specifically. Searches were limited to quantitative studies with a comparison group of women without disabilities. Reviewers used standardized instruments to extract data from and assess the quality of included studies. Pooled odds ratios and 95% confidence intervals (CI) were generated using DerSimonian and Laird random effects models for outcomes with data available from ≥ 3 studies.

Results: The review included 23 studies, representing 8,514,356 women in 19 cohorts. Women with sensory (pooled unadjusted odds ratio [uOR] 2.85, 95% CI: 0.79–10.31) and intellectual and developmental disabilities (pooled uOR 1.10, 95% CI: 0.76–1.58) had elevated but not statistically

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significant risk for gestational diabetes. Women with any disability (pooled uOR 1.45, 95% CI: 1.16–1.82) and intellectual and developmental disabilities (pooled uOR 1.77, 95% CI 1.21–2.60) had increased risk for hypertensive disorders of pregnancy; risk was elevated but not statistically significant for women with sensory disabilities (pooled uOR 2.84, 95% CI: 0.85–9.43). Women with any (pooled uOR 1.31, 95% CI: 1.02–1.68), physical (pooled uOR 1.60, 95% CI: 1.21–2.13), and intellectual and developmental disabilities (pooled uOR 1.29, 95% CI: 1.02–1.63) had increased risk for cesarean section; risk among women with sensory disabilities was elevated but not statistically significant (pooled uOR 1.28, 95% CI: 0.84–1.93). There was heterogeneity in all analyses, and 13 studies had weak quality ratings, with lack of control for confounding being the most common limitation.

Conclusions: Evidence that maternal disability is associated with increased risk for perinatal complications demonstrates that more high-quality research is needed to examine the reasons for this risk and to determine what interventions could be implemented to support women with disabilities during the perinatal period.

Keywords

cesarean section; developmental disabilities; disabled persons; gestational diabetes; meta-analysis; pregnancy; pregnancy complications; pregnancy-induced hypertension; postpartum period; systematic review

Introduction

One in 10 women of reproductive age has a disability.[1] While disabilities vary in their etiology and impact, they can be classified broadly based on common activity limitations.[2,3] Physical disabilities, such as cerebral palsy and spinal cord injuries, are those associated with limits to mobility, flexibility, and dexterity; sensory disabilities include vision and hearing impairments; and intellectual and developmental disabilities, such as Down syndrome, autism spectrum disorder, and fetal alcohol spectrum disorder, are associated with limitations in cognitive and adaptive functioning. In the past, stigma associated with disability and sexuality and medical factors, including risks of medication use in pregnancy, limited childbearing in women with disabilities.[4,5] However, with greater recognition of the reproductive rights of persons with disabilities[6] and medical advances, more women with disabilities now experience pregnancy. In fact, the 2008–2012 U.S. Medical Expenditure Panel Survey showed that similar proportions of women with (10.8%) and without disabilities (12.3%) had a pregnancy in the previous year.[7]

Several health and social inequities impact women with disabilities, including barriers to education and employment and high rates of poverty, abuse, chronic disease, and mental illness,[8–12] all of which are risk factors for adverse perinatal outcomes.[13–16] Yet, women with disabilities continue to experience barriers to obstetric care, including care environments that are physically inaccessible and care approaches that do not consider their unique needs.[17–20] In recognition of these issues, in 2011, the Eunice Kennedy Shriver National Institute of Child Health and Human Development of the National Institutes of Health placed a call for research on the perinatal health of women with physical, sensory, and intellectual and developmental disabilities.[21] As research in this area grows, there is a

need for the development of obstetric care guidelines that are tailored for women with disabilities. With few exceptions (e.g., American College of Obstetricians and Gynecologists guidelines for the obstetric care of women with spinal cord injuries[22]), such guidelines do not currently exist. A barrier to progress in this area is the lack of a systematic summary and assessment of the literature on the perinatal health outcomes of women with disabilities.

Objectives

The objective of this systematic review and meta-analysis was to examine the risks for pregnancy, delivery, and postpartum complications among women with physical, sensory, and intellectual and developmental disabilities.

Methods

Search Strategy and Information Sources

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.[23] We used an adapted version of a validated disability search strategy[24] which includes search terms for disability generally (e.g., functional limitation) and physical, sensory, and intellectual and developmental disabilities. We added search terms for pregnancy (e.g., gestational diabetes), delivery (e.g., cesarean section), and postpartum complications (e.g., postpartum hemorrhage) (Table S1). We searched CINAHL, EMBASE, Medline, and PsycINFO from inception to July 3, 2018 and hand-searched reference lists of original articles chosen for full-text review and reviews to find studies missed in database searches.

Eligibility Criteria

Titles and abstracts were reviewed by two authors. To be included, studies had to report original data on the association between maternal physical, sensory, or intellectual and developmental disabilities and pregnancy, delivery, or postpartum complications; include a referent group of women with no disabilities; be published in a peer-reviewed journal; and be written in English. Studies were excluded if they examined conditions that were not clearly disabilities (e.g., diabetes without evidence of functional limitations) or only examined birth outcomes (e.g., preterm birth). We also excluded studies that reported on the perinatal health of women with psychiatric disabilities or mental health disorders only, as there is already a broad range of literature on this topic.[25–29] Our focus on physical, sensory, and intellectual and developmental disabilities is also aligned with the National Institutes of Health's call for research in this area.[21] A preliminary examination of studies potentially meeting our inclusion criteria revealed that several studies included women with psychiatric disabilities within their "any disability" group, along with women with physical, sensory, and intellectual and developmental disabilities. Due to the limited number of studies that met our overall eligibility criteria, we decided to retain these studies in our review (though we note this as a limitation) and conducted sensitivity analyses to test the impact of this decision on our results. We included all eligible studies in the qualitative synthesis. When there were multiple articles published using the same data sources with overlapping study periods and samples, we included in the quantitative synthesis the study with the highest quality rating or (if these were equal) the largest cohort.

Data Extraction

Two authors independently extracted data using a standardized form, created *a priori* based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[30] Data items included location and study period, study design and data source, sample size, exclusion criteria, disability definition and measurement, outcome definition(s) and measurement, and confounders. For studies that were in press at the time of data extraction or where data were unclear or not fully reported (e.g., descriptively in the text of a manuscript but not numerically in a table), we contacted study authors. Discrepancies in data extraction were resolved through discussion.

Assessment of Risk of Bias

Two authors independently assessed study quality using an adapted version of the Effective Public Health Practice Project Quality Assessment tool, a validated[31,32] and widely used tool in public health and epidemiologic research[33–35]). We rated studies as strong, moderate, or weak based on study design, selection bias (response rate, representativeness), confounding (percentage of confounders controlled for), detection bias (outcome measure validity), and attrition bias (loss to follow-up, missing data). Confounders were identified *a priori* that, based on the literature, are associated with maternal disability and perinatal complications:[8–12,36–38] demographics (e.g., age), socioeconomic status (e.g., income), comorbidities (e.g., chronic disease), lifestyle behaviors (e.g., smoking), and social support (e.g., marital status) (Table S2). Discrepancies in ratings were resolved through discussion.

Data Synthesis

We used DerSimonian and Laird random effects models[39] to calculate pooled odds ratios (OR) and their 95% confidence intervals (CI) for outcomes that were examined by three or more unique studies. We determined the source of variance across studies using Q and I^2 statistics.[40] A non-significant Q statistic and small I^2 value (<25%) indicate variability due to random variation rather than real heterogeneity. We also calculated 95% prediction intervals to demonstrate the range of true effects in similar studies; this was done only for analyses with 5 or more studies, as recommended by Partlett and Riley.[41,42] In sensitivity analyses, we planned to use fixed effects models to re-estimate pooled ORs for studies with a non-significant Q statistic and small I^2 value.[40] We tested the influence of individual studies by removing them one-by-one and re-estimating the pooled ORs. We also tested the impact of removing studies that included psychiatric disabilities in their definition of “any” disability. Finally, for analyses that could have included multiple studies from the same data source and for which we included only the highest quality (or largest) study, we tested the impact of substituting other studies into the analysis. We had an insufficient number of studies in any given analysis to generate a funnel plot to test for publication bias.[43] Analyses R v. 3.4.2 software.

Results

Study Selection

Figure 1 depicts the study selection process. Database searches returned 6,082 articles after duplicate removal. Following title and abstract review, 5,908 articles were excluded, and 174 full-text articles were reviewed. Hand-searches of the bibliographies of these articles yielded another seven articles. Following full-text review, we removed studies that examined birth outcomes only (e.g., preterm birth) (n=21), examined the impact of pregnancy on disability progression (n=31), examined disabilities with onset in pregnancy (n=3), were case series (n=59) or qualitative studies (n=6) with no comparison group, had only an abstract available (n=2), and were reviews or commentaries (n=29). Twenty-three studies,[44–66] representing 8,514,356 women in 19 distinct cohorts (including one U.S. study that examined 4 states separately),[50] met our inclusion criteria and were included in the qualitative synthesis. Three articles from Canada[44–46] and nine from the U.S. representing three different investigations (two using California administrative data,[49,53] five using the Pregnancy to Early Life Longitudinal Data System,[47,48,56,58,59] and two using the Pregnancy Risk Assessment Monitoring System for Rhode Island[57,61]) used the same data sources and had fully or partially overlapping samples and study periods.

Study Characteristics

Table S3 describes the studies' characteristics. Studies were conducted in Australia (n=1),[55] Canada (n=3),[44–46] Israel (n=1),[62] Sweden (n=1),[52] the United Kingdom (n=4),[51,54,64,66] and the United States (n=13).[47–50,53,56–61,63,65] Sixteen studies were retrospective cohort studies,[44–53,56,58–60,62,65] while two were prospective cohort studies[55,66] and five were cross-sectional studies.[54,57,61,63,64] Studies had similar exclusion criteria, which mainly related to the exclusion of multiple gestations, stillbirths, and extremes of maternal age and gestational age. Studies had as few as 68 participants[60] and as many as 4,610,955 participants,[49] with all but two studies[55,60] having a sample of more than 2,000 women. Studies examined the impact of maternal disability overall (n=10)[47–50,53,54,57,61,64,66] or physical (n=1),[60] sensory (n=2),[62,65] or intellectual and developmental disabilities separately (n=10).[44–46,51,52,55,56,58,59,63] Of the studies that examined the impact of maternal disability overall, four compared an "any disability" group to a "no disability" referent group,[50,57,61,66] and six also reported findings broken down by disability type.[47–49,53,54,64] Six studies included women with mental health disorders within their "any disability" group.[47,48,57,61,64,66] Disability was defined using diagnoses only (n=15)[44–49,51–53,56,58,59,62,63,65] or questions related to functional limitations (e.g., "are you limited in any way in any activities because of physical, mental, or emotional problems?", n=8)[50,54,55,57,60,61,64,66] and was measured at or after the time of delivery (n=17)[47–51,53–59,61,63–66] or using past records (n=6).[44–46,52,60,62] Studies examined, as their primary outcomes, pregnancy complications (e.g., gestational diabetes, n=11),[45,48,50,51,55,57,59,60,62,63,65] delivery complications (e.g., cesarean section, n=17),[44,47,49–54,56,57,60–66] and postpartum complications (e.g., hospital readmission, n=8).[46,47,50,52,54,5864,65] Studies varied with respect to their control for confounding variables; six studies did not control for confounders at all.[51,55–57,61,66]

Risk of Bias of Included Studies

Table 1 describes the quality of included studies. Studies were rated overall as having strong (n=4),[45,49,52,53] moderate (n=6),[46–48,58,59,65] or weak quality (n=13).[44,50,51,54–57,60–64,66] Five studies were cross-sectional[54,57,61,63,64] and had high risk of bias due to their design. With regard to selection bias, most studies were population-based and had good generalizability (n=15).[44–49,51–53,56,58,59,62,63,65] However, two retrospective cohort studies relied on low-income Medicaid[50] or tertiary care center samples.[60] Of the two prospective cohort and five cross-sectional studies, two had a response rates <80%[54,57] and four did not report response rates.[61,63,64,66] In terms of confounders, several studies did not control for confounders at all.[51,55–57,61,66] The majority (n=17) controlled for demographics such as age, ethnicity, and parity.[44–50,52–54,58–60,62–65] Nearly half (n=11) controlled for socioeconomic status (e.g., income, education, employment),[44–50,53,58,59] and chronic disease (e.g., obesity, diabetes) and/or mental illness (n=11).[45–50,52,53,58,59,62] Few studies (n=6) controlled for lifestyle behaviors such as smoking,[47,48,50,52,58,59] and even fewer (n=5) controlled for measures of social support such as marital status.[50,52,58,59,64] With respect to detection bias, only two studies used confirmed clinical diagnoses for their outcomes;[55,60] several relied on administrative data but reported limited information on the validity of their algorithms.[51,42,56,58,59,62,65] Finally, with respect to attrition bias and missing data, one of the prospective cohort studies had a follow-up rate of <80%[55] and the other did not report follow-up rates.[66] Most studies did not provide information on missing data.[44,46–48,50,51,54–64]

Synthesis of Results

The pooled analyses examined the association between maternal disability and gestational diabetes, hypertensive disorders of pregnancy, and cesarean section. None of the other outcomes had a sufficient number of studies with similar outcomes for each disability type to be pooled. For analyses that could include multiple studies using the same data source and overlapping study periods, we retained the highest quality study, or, if these were equal, the largest study.

Pregnancy complications—Figure 2 shows the results for gestational diabetes. Sufficient data were provided for sensory disabilities (Panel A) and intellectual and developmental disabilities (Panel B) to calculate pooled unadjusted ORs; these were 2.85 for sensory disabilities (95% CI 0.82–9.92; 3 studies, n=4,863,957) and 1.10 for intellectual and developmental disabilities (95% CI 0.76–1.58; 5 studies, n=5,767,059), but both were not statistically significant. There was significant heterogeneity in both analyses, with the 95% prediction interval for the intellectual and developmental disabilities analysis crossing the null value. The results for sensory disabilities became statistically significant after the removal of some studies (Table S4). An insufficient number of studies provided estimates to calculate pooled adjusted ORs; individual studies suggested increased risk among women with sensory disabilities but not those with intellectual and developmental disabilities after covariate adjustment.

Figure 3 shows the results for hypertensive disorders of pregnancy (i.e., gestational hypertension, eclampsia, and/or preeclampsia). Sufficient data were provided for any (Panel

A), sensory (Panel B), and intellectual and developmental disabilities (Panel C) to calculate pooled unadjusted ORs; these were 1.45 for any disability (95% CI 1.16–1.82; 3 studies with 6 cohorts, n=5,660,846), 2.84 for sensory disabilities (95% CI 0.85–9.43; 3 studies, n=4,864,028), and 1.77 for intellectual and developmental disabilities (95% CI 1.21–2.60; 6 studies, n=6,021,857), with the sensory disabilities analysis being not statistically significant. There was significant heterogeneity in all analyses, with the 95% prediction intervals for any and intellectual and developmental disabilities crossing the null value. The statistical significance of the results for intellectual and developmental and sensory disabilities changed after the removal of some studies (Table S4). An insufficient number of studies provided estimates to calculate pooled adjusted ORs; no studies examining "any" disability provided adjusted estimates, and individual studies suggested increased risk for women with intellectual and developmental disabilities but not sensory disabilities after covariate adjustment.

Table S5 includes results related to pregnancy complications from studies that could not be pooled. Women with any disability were at increased risk for emergency department visits and hospital admissions in pregnancy. Those with intellectual and developmental disabilities were at increased risk for emergency department visits, hemorrhage, hospital admissions, placental abruption, and venous thromboembolism. Results for chorioamnionitis and placenta previa were not statistically significant for all disability groups.

Delivery complications—Figure 4 shows the unadjusted results for cesarean sections. Sufficient data were provided to calculate pooled unadjusted ORs for any (Panel A), physical (Panel B), sensory (Panel C), and intellectual and developmental disabilities (Panel D); these were 1.31 for any disability (95% CI 1.02–1.68; 7 studies with 10 cohorts, n=5,119,107), 1.60 for physical disabilities (95% CI 1.21–2.13; 3 studies; n=42,480), and 1.28 for sensory disabilities (95% CI 0.84–1.93; 4 studies, n=314,019), and 1.29 for intellectual and developmental disabilities (95% CI 1.02–1.63; 7 studies, n=2,666,117), with only the sensory disabilities analysis not being statistically significant. There was significant heterogeneity in all analyses, with the 95% prediction intervals for the any, sensory, and intellectual and developmental disabilities analyses crossing the null value. The results for any and intellectual and developmental disabilities were sensitive to the removal of some studies (Table S4). Similar results were seen in adjusted analyses (Figure 5), with the pooled adjusted OR being 1.49 for any disability (95% CI 1.20–1.85, 3 studies with 6 cohorts, n=4,850,062), 1.55 for physical disabilities (95% CI 1.09–2.21; 3 studies, n=4,654,452), 1.27 for sensory disabilities (95% CI 0.84–1.91; 5 studies, n=4,653,435), and 1.46 for intellectual and developmental disabilities (95% CI 0.97–2.20; 6 studies, n=1,556,141), Again, there was heterogeneity in all analyses, with the 95% prediction intervals for the any, sensory, and intellectual and developmental disabilities analyses crossing the null value. The results for intellectual and developmental disabilities became statistically significant after the removal of some studies (Table S4).

Table S6 includes outcomes related to delivery complications from studies that could not be pooled. Only one study showed statistically significant increased risk for labor induction among women with intellectual and developmental disabilities; all other analyses were not statistically significant.

Postpartum complications—Table S7 includes outcomes related to postpartum complications from studies that could not be pooled. Generally, these studies show that women with any disability and those with intellectual and developmental disabilities were at greater risk for postpartum emergency department visits and hospital admission, as well as long postnatal stays compared to women without disabilities. Some evidence of increased risk for long postnatal stays was also observed among women with physical and sensory disabilities.

Sensitivity analyses—We conducted several sensitivity analyses to test the robustness of our findings. When we removed studies that included psychiatric disabilities in their definitions of "any" disability, the impact of any disability on the unadjusted risk of hypertensive disorders of pregnancy (pooled unadjusted OR 1.55, 95% CI 1.23–1.95) and the adjusted risk of cesarean section (pooled adjusted OR 1.59, 95% CI 1.02–2.49) remained unchanged. However, the unadjusted risk of cesarean section, while still elevated, was not statistically significant (pooled unadjusted OR 1.44, 95% CI 0.94–2.18). Results for gestational diabetes, gestational hypertension, and cesarean section were also mostly unchanged when we substituted different studies (from among those using the same data sources and overlapping study periods) into our analyses (Table S8).

Comment

Main Findings

This systematic review and meta-analysis, which included 23 studies representing 19 unique cohorts and 8,514,356 women, found that women with physical, sensory, and intellectual and developmental disabilities may be at increased risk for several pregnancy, delivery, and postpartum complications compared to women without these disabilities. The findings were strongest for cesarean section, wherein pooled analyses demonstrated that women with any disability and those with physical disabilities were at increased risk for cesarean section, even after covariate adjustment. However, while risks were elevated for most outcomes, several were not statistically significant. Further, there was considerable heterogeneity across studies, reflected in wide 95% prediction intervals, and the statistical significance of several analyses changed when individual studies were removed, showing the influential nature of some studies on the results. Overall, these findings suggest the need to better support women with disabilities during the perinatal period and to produce high-quality research to further explore factors that may contribute to their increased risk for perinatal complications.

Comparison with Existing Literature

To our knowledge, this is the first systematic review and meta-analysis to examine the risk of pregnancy, delivery, and postpartum complications associated with maternal physical, sensory, and intellectual and developmental disabilities. Our findings are consistent with a previous review[67] which found elevated cesarean section rates among women with physical disabilities (including spinal cord injuries, Rheumatoid arthritis, and multiple sclerosis) and with other studies of women with diagnoses associated with specific physical, sensory, and intellectual and developmental disabilities (e.g., autism spectrum disorder[68]). Our review

adds to this literature by comprehensively describing perinatal outcomes among women with a range of disabilities.

Explanation for Findings

There are several potential explanations for our finding of increased risk for perinatal complications among women with disabilities. First, a growing body of research shows that women with disabilities have disproportionately high rates of preconception health risk factors including diabetes, obesity, asthma, mental illness, and exposure to violence—all of which are known risk factors for adverse perinatal outcomes.[11,69,70] Research has demonstrated the importance of intervening in the preconception period to address such risk factors in order to optimize perinatal outcomes. However, because their medical care is often focused on their disability, women with disabilities are less likely than their peers to be offered preventive health care services.[71–73] Further, the lack of information available to many women with disabilities about contraception, as well as lower rates of contraception use overall and lower rates of long-acting reversible contraceptive methods specifically (e.g., intrauterine device (IUD))[74] put them at greater risk of unplanned pregnancy.

Second, women with disabilities experience many barriers to prenatal and postpartum care and may therefore not receive adequate support in the perinatal period. Women with disabilities, particularly those with intellectual and developmental disabilities, enter prenatal care later than women without disabilities. [50,56,57,64,75] Perinatal care environments may be inaccessible, in terms of both the built environment (e.g., examination tables that do not accommodate mobility limitations) and care delivery (e.g., lack of interpreters for women with hearing impairments, complex medical terminology used with women with intellectual and developmental disabilities). Studies[76–79] have also found that obstetricians and midwives receive limited training on provision of care to women with disabilities. These provider-level barriers may also give insight into why women with disabilities have high cesarean section rates. While in some cases, cesarean delivery may be indicated for “high risk” pregnancies, growing evidence also suggests that, due to lack of training, providers assume that cesarean sections are safer or more manageable for women with disabilities, even when they can delivery vaginally.[67,81,81] Findings from a recent population-based study comparing medical indications for cesarean delivery among women with and without disabilities in California indeed suggests that disability itself may be treated as an indication for cesarean delivery in many cases.[82] Specifically, the authors found that women with disabilities who had pre-labor scheduled cesareans had significantly lower odds of having a medical indication for cesarean, compared to women without disabilities.[82] These individual, provider, and system-level factors should be investigated further to understand reasons for perinatal complications in women with disabilities.

Limitations

Our findings should be considered in light of the limitations of the included studies and the review itself. Many studies (n=13) were rated as weak in quality. Several did not control for any confounders or only controlled for demographics such as maternal age and parity. Unclear reporting by authors made it difficult to include all outcomes in the meta-analysis (e.g., diabetes not specified as pre-existing or gestational), and some authors did not provide

enough information for the quality assessment (e.g., few reported on missing data). As well, there was some variability in how disability was defined and measured (e.g., diagnoses only or questions related to functional limitations) and when it was measured (e.g., at delivery or using past records).

With regard to the review itself, our somewhat narrow inclusion criteria may be considered a limitation. By requiring that studies have a comparison group of women with no disabilities, we may have excluded some clinical studies that only included women with disabilities. We also did not capture studies that focused on some specific diagnoses (e.g., autism spectrum disorder,[68] multiple sclerosis,[83] spinal cord injury,[84]). Conversely, our broad inclusion criteria with regard to disability may also be considered a limitation. We recognize that the definition of disability is broad, including women with physical, sensory, and intellectual and developmental disabilities who may have different social contexts and medical risk factors. For this reason, we did not conduct an overall meta-analysis combining the results of studies examining these groups separately; we only meta-analyzed studies of “any” disability when disabilities were combined by the original study authors. Some definitions of “any disability” included women with psychiatric disabilities (n=6). However, it is notable that our findings were largely unchanged when we removed these studies from our meta-analysis. Moreover, we included women with both vision and hearing loss in our definition of sensory disabilities, because two of the five studies included in our review included both groups in their definition of sensory disability.[54,64] However, we acknowledge that combining vision and hearing loss in a single category may obscure the impact of either one on the results because of different patterns of medical comorbidities. For example, diabetic retinopathy is a common cause of vision loss, and the underlying medical condition may carry increased risk for metabolic and cardiovascular complications in pregnancy.[85] However, women with hearing loss may also have higher rates of chronic disease compared to those without hearing loss, but for social reasons (e.g., socioeconomic disparities) rather than medical ones.[86] The decision to combine these groups may explain the wide confidence intervals observed for the sensory disability analyses. We had an insufficient number of studies to calculate pooled ORs for several outcomes and an insufficient number of studies for any given analysis to examine publication bias using a funnel plot. Due to our own resource limitations, we included only peer-reviewed studies written in the English language; we acknowledge that only including studies written in English potentially excludes studies conducted in other regions of the world where women’s experiences of disability, perinatal health, and health care access may be different. Further, the inclusion of only English language studies increases the risk of publication bias.

Implications and Future Directions

Our findings have important implications for research and clinical practice. The earliest study in our review was published in 2006,[50] and most (n=17) were published between 2015 and 2018. The recent increase in research on perinatal health in women with disabilities, in the United States at least, is arguably due in large part to initiatives led by major health authorities, including the National Institutes of Health (NIH). In 2010, the NIH’s Eunice Kennedy Shriver National Institute of Child Health and Human Development held a workshop to assess research on pregnancy in women with physical disabilities,[67] and shortly

after launched a funding opportunity specifically on pregnancy in women with disabilities.[21] Nine of the 13 U.S.-based studies included in our review were funded by this initiative. This attention to the perinatal health of women with disabilities is promising. However, many gaps in research and practice must be addressed to improve the perinatal health and health care experiences of women with disabilities.

First, there is a need to better understand and address the preconception health of women with disabilities. Preconception health care, which aims to promote health in all individuals of reproductive age, can reduce the risk of adverse pregnancy outcomes by providing opportunities to address modifiable risk factors before pregnancy.[13] Although tailored preconception health care programs have been developed for women with specific chronic diseases such as diabetes and HIV, such systematic efforts have not been extended to women with disabilities. Such programs could be an opportunity to address health disparities and counsel women with disabilities about issues such as medication use in pregnancy[67,84] and the potential impact of pregnancy on the course of their disability.[84] Intervention in the preconception period would also allow women with disabilities, their support persons, and health care providers to plan ahead in terms of what resources and supports they may need in the perinatal period.[71]

Second, there is a need to better support women with disabilities who are already pregnant. This includes not only working with them to modify their health behaviors to decrease perinatal risk, but also supporting them more broadly in recognition that women with disabilities are marginalized in many ways (e.g., low socioeconomic status, little social support, high rates of abuse, experiences of stigma and discrimination).[10,12,70,87] During the perinatal period, some women with disabilities may require close monitoring by their health care providers through more frequent and longer visits as well as specialized care. In addition to the perinatal complications examined herein, issues that are common in pregnancy such as fatigue, fluid retention, and urinary tract infections can be more pronounced in some women with disabilites,[67,71,81,84,88] and pregnancy may also impact the course of the disability.[84] A more comprehensive obstetric visit should include considerations of physical and communication barriers; obstetric settings should accommodate women with disabilities in a flexible manner such that they are comfortable, communicated to in a way that makes most sense to them, and confident that their health concerns will be looked after. Such care should use a multi-disciplinary, team-based approach that encompasses not only perinatal care providers but also disability-related health care providers and other allied health and social services professionals.[18,67,84,89] In addition to better attending to the unique needs of women with disabilities, a team-based approach can improve patients' comfort levels by addressing multiple facets of their health.[71] For women with disabilities overall and for those with intellectual and developmental disabilities especially, meaningfully including support persons or caregivers, if desired by the women themselves, in perinatal care may be crucial to improve access to care and decrease risk for complications.[90,91] Finally, listening to women's own knowledge of their bodies and meaningfully involving them in the training of health care providers and in their own preconception and perinatal care is vital.[18,77,92–96]

Underlying these activities is a need to provide education and training on disability to perinatal care providers. This training should address not only the medical aspects of care, but also attitudes toward disability and sexuality that may impact delivery of care.[97] Mitra et al.'s perinatal health framework for women with physical disabilities[97] may serve as an important tool for perinatal care providers, as it highlights multiple determinants of perinatal health specific to women with disabilities, including individual factors, such as health conditions and body functions; mediating factors, such as access to resources, provider knowledge, and social support; and the environmental context, including attitudes and physical accessibility.

Conclusion

Women with physical, sensory, and intellectual and developmental disabilities may be at increased risk for perinatal complications compared to women without disabilities. In particular, we found that women with disabilities are at increased risk for cesarean sections. Findings should be interpreted with some caution, in light of the studies' limitations, the heterogeneity in the analyses, and the influential nature of some larger studies. Overall, findings from this systematic review and meta-analysis suggest that there is a need to explore what might be contributing to perinatal health disparities among women with disabilities and to consider what interventions might best support women with disabilities in the perinatal period and in turn prevent perinatal health disparities. Addressing preconception risk factors, providing more specialized support in the perinatal period, and increasing disability-related training for health care providers may contribute to better perinatal health and health care experiences for women with disabilities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Condensation:

Women with physical, sensory, and intellectual and developmental disabilities may be at greater risk for pregnancy, delivery, and postpartum complications than women without these disabilities.

AJOG at a Glance

Why was this study conducted?

This study was conducted to synthesize and evaluate the evidence related to risk for perinatal complications based on maternal disability status.

What are the key findings?

Women with physical, sensory, and intellectual and developmental disabilities may be at greater risk for pregnancy, delivery, and postpartum complications than women without these disabilities.

What does this study add to what is already known?

This is the first systematic review and meta-analysis examining risk for perinatal complications associated with maternal disability. Findings show that women with disabilities may be at increased risk for perinatal complications compared to women without disabilities. More high-quality research is needed to determine why women with disabilities have heightened risk for adverse perinatal outcomes and what interventions could be implemented to better support them in pregnancy, delivery, and the postpartum period.

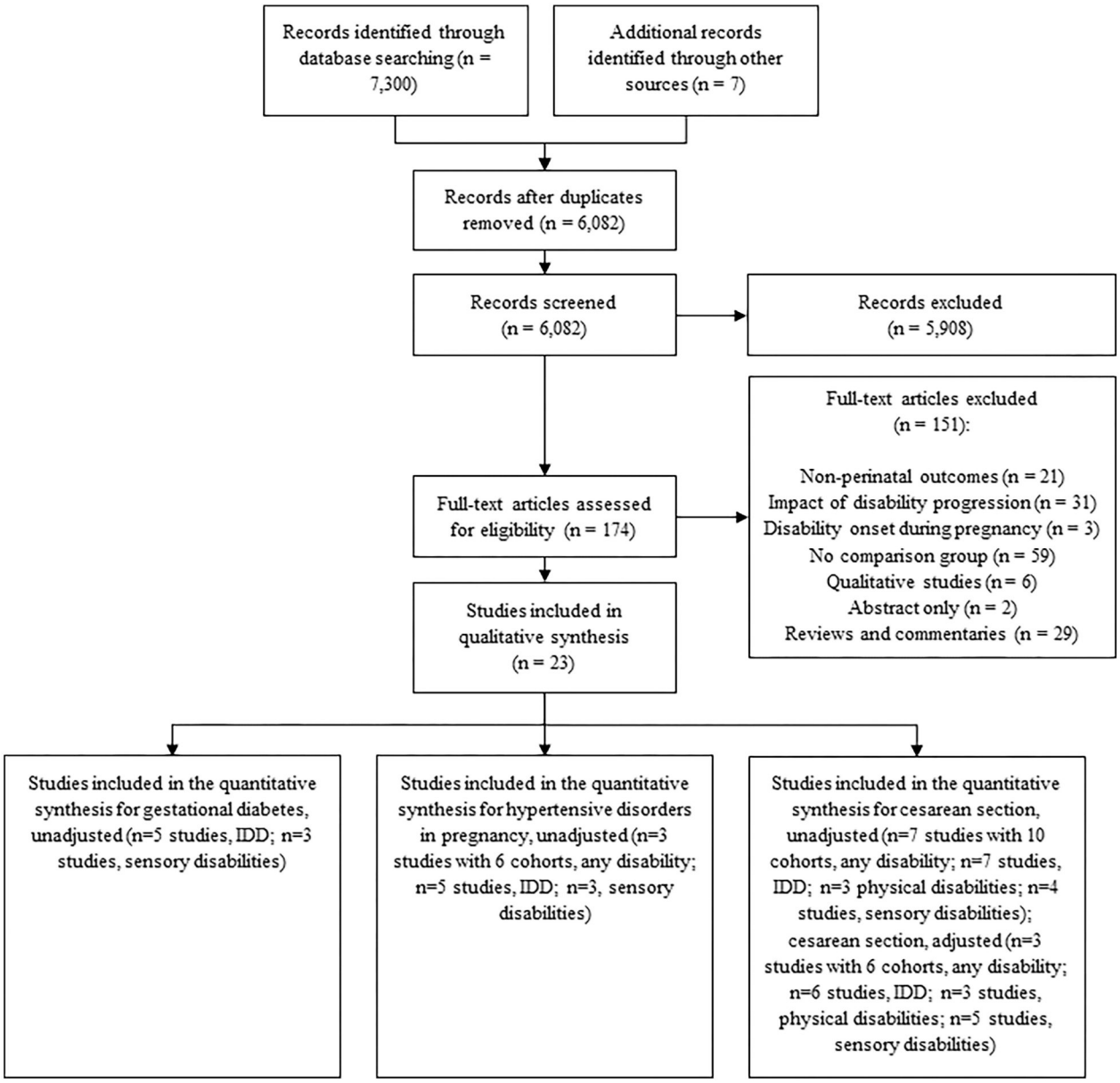

Figure 1.
PRISMA diagram for study selection

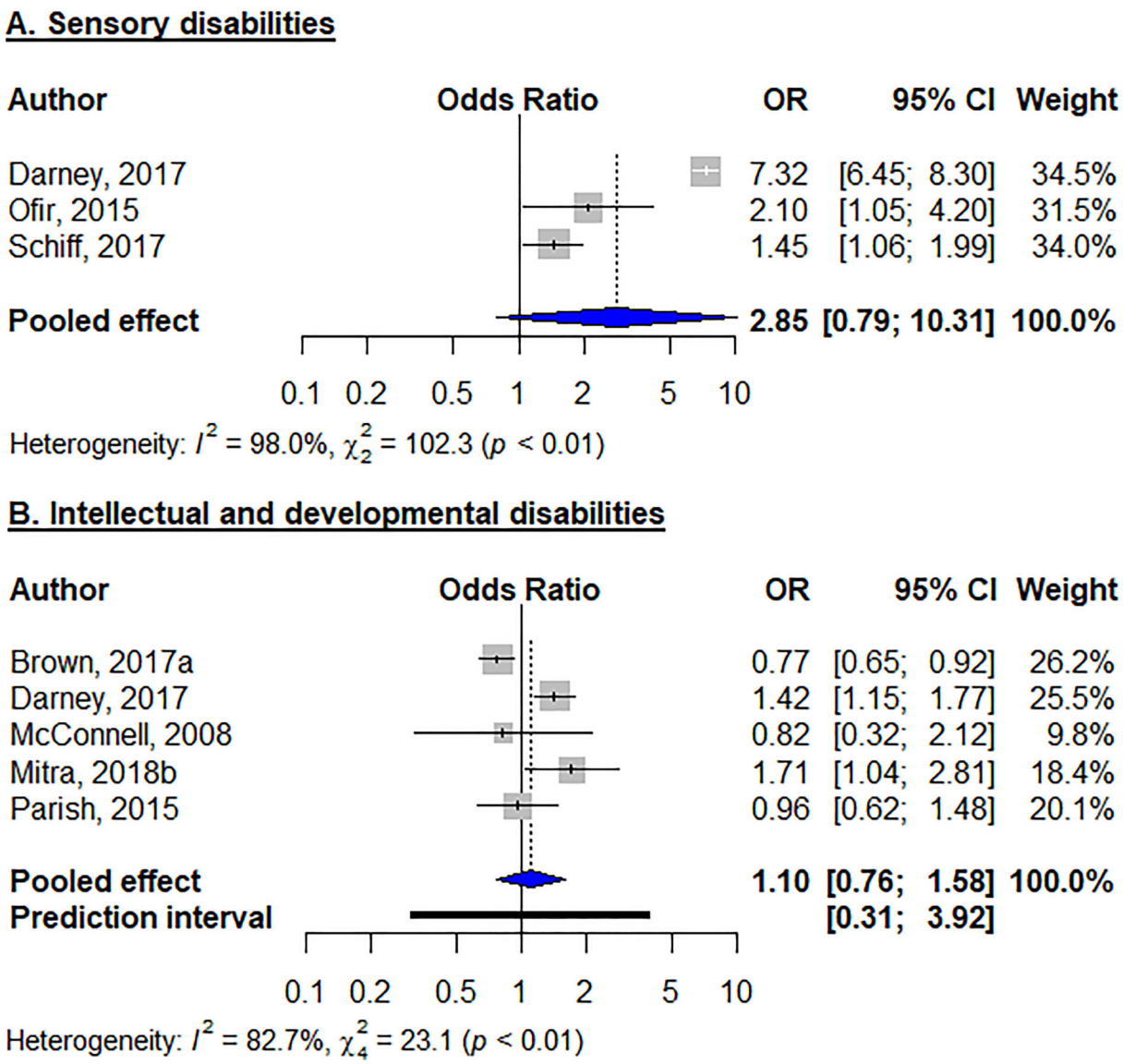

Figure 2.
Unadjusted association between maternal disability status and gestational diabetes.

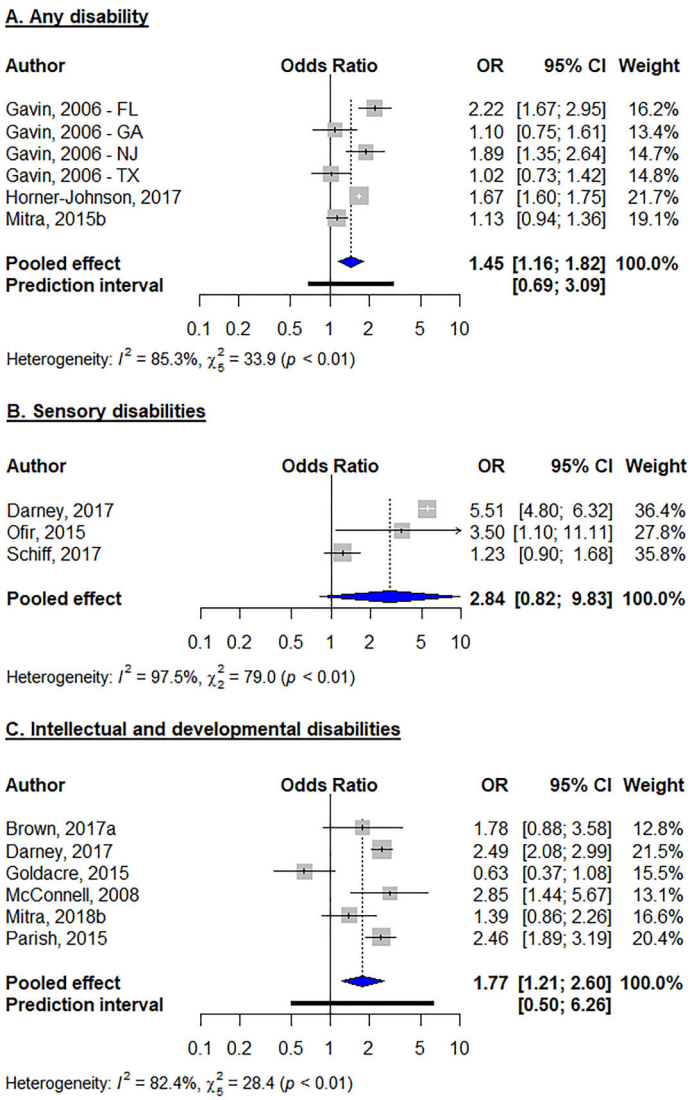

Figure 3.

Unadjusted association between maternal disability status and hypertensive disorders of pregnancy.

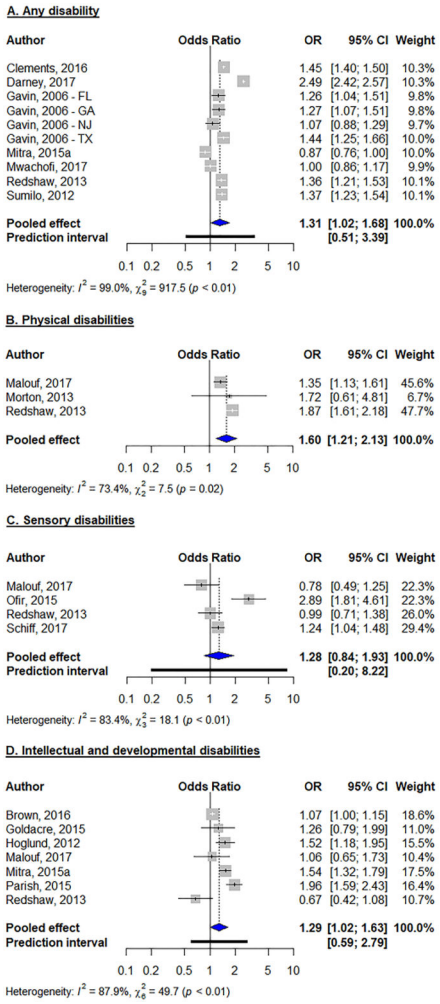

Figure 4.
Unadjusted association between maternal disability status and cesarean section.

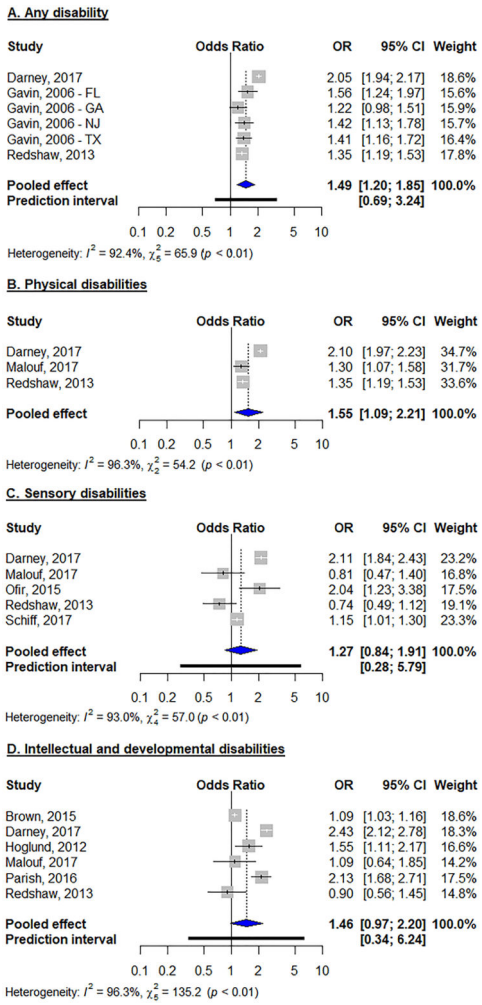

Figure 5.
Adjusted association between maternal disability status and cesarean section.

Table 1.

Risk of bias in studies examining the association between maternal disability and pregnancy, delivery, and postpartum complications.

Authors, years	Study Design	Selection bias	Confounding	Detection bias	Attrition bias and missing data	Overall quality
Brown et al., 2016[44] *	Moderate	Low	High	Low	High	Weak
Brown et al., 2017a[45] *	Moderate	Low	Moderate	Low	Low	Strong
Brown et al., 2017b[46] *	Moderate	Low	Moderate	Low	High	Moderate
Clements et al., 2016[47]	Moderate	Low	Low	Low	High	Moderate
Clements et al. 2018[48]	Moderate	Low	Low	Low	High	Moderate
Darney et al.,2017[49]	Moderate	Low	Moderate	Low	Low	Strong
Gavin et al., 2006[50]	Moderate	Moderate	Low	High	High	Weak
Goldacre et al., 2015[51]	Moderate	Low	High	High	High	Weak
Höglund et al., 2012[52]	Moderate	Low	Low	Moderate	Low	Strong
Horner-Johnson et al.,2017[53]	Moderate	Low	Moderate	Low	Low	Strong
Malouf et al., 2017[54]	High	High	High	High	High	Weak
McConnell et al., 2008[55]	Moderate	Moderate	High	Low	High	Weak
Mitra et al.,2015a[56]	Moderate	Low	High	Moderate	High	Weak
Mitra et al., 2015b[57]	High	Moderate	High	High	High	Weak
Mitra et al.,2018a[58]	Moderate	Low	Low	Low	High	Moderate
Mitra et al.,2018b[59]	Moderate	Low	Low	Low	High	Moderate
Morton et al.,2013[60]	Moderate	Moderate	High	Low	High	Weak
Mwachofi, 2017[61]	High	Moderate	High	High	High	Weak
Ofir et al.,2015[62]	Moderate	Low	High	Low	High	Weak
Parish et al., 2015[63]	High	Low	High	Moderate	High	Weak
Redshaw et al., 2013[64]	High	High	High	High	High	Weak
Schiff et al.,2017[65]	Moderate	Low	High	Moderate	Low	Moderate
Šumilo et al.,2012[66]	Moderate	High	High	High	High	Weak

* While the senior author on this review led these Canadian studies, data extraction and quality ratings of these studies were performed by two review authors who were not involved in the original Canadian studies.