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Cesarean birth and adverse birth outcomes among sub-populations of deaf and hard-of-hearing people

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Abstract

Background: Deaf and hard-of-hearing (DHH) people are at higher risk than their non-DHH counterparts of experiencing adverse birth outcomes. There is a lack of research focusing on social, linguistic, and medical factors related to being DHH which may identify groups of DHH people who experience more inequity.

Objective: Examine difference in prevalence of cesarean and adverse birth outcomes among diverse sub-groups of DHH people.

Methods: We conducted a cross-sectional survey of DHH birthing people in the U.S. who gave birth within the past 10 years. The sample was predominantly white, college educated, and married. We assessed cesarean birth and three adverse birth outcomes: preterm birth, low birthweight, and NICU admission post-delivery. DHH-specific variables were genetic etiology of hearing loss, preferred language (i.e., American Sign Language, English, or bilingual), severity of hearing loss, age of onset of hearing loss, and self-reported quality of perinatal care communication. We estimated prevalence, 95 % confidence intervals, and unadjusted prevalence ratios.

Results: Thirty-one percent of our sample reported a cesarean birth. Overall, there were no significant differences in prevalence across the outcome variables with respect to preferred

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Declaration of competing interest

The authors have no conflicts of interest to disclose.

Ethics approval statement

The procedures used to collect data in this study were reviewed and approved by the University of Michigan's Institutional Review Board.

CRedit authorship contribution statement

Tyler G. James: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Kimberly S. McKee:** Writing – review & editing, Methodology, Conceptualization. **Tiffany A. Moore Simas:** Writing – review & editing. **Lauren D. Smith:** Writing – review & editing, Project administration, Investigation. **Michael M. McKee:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Monika Mitra:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.dhjo.2024.101639>.

language, genetic etiology, severity, and age of onset. Poorer perinatal care communication quality was associated with higher prevalence of preterm birth (PR = 2.37) and NICU admission (PR = 1.91).

Conclusions: Our study found no evidence supporting differences in obstetric outcomes among DHH birthing people across medical factors related to deafness. Findings support the important role of communication access for DHH people in healthcare environments.

Keywords

Deaf and hard-of-hearing; Obstetrics; Pregnancy; Communication

1. Introduction

Over the past decade, empirical evidence highlighting inequities in obstetric care and outcomes among people with disabilities,¹ including people who are deaf and hard-of-hearing (DHH),²⁻⁷ has grown. DHH people are at higher risk than non-DHH people of experiencing inadequate healthcare communication access during pregnancy,^{4,5} delivering preterm and low birthweight babies,² having cesarean births,^{3,7} and experiencing antenatal and postpartum complications.^{6,7} Understanding DHH sub-groups who experience these negative outcomes can help develop interventions to achieve national health priorities.⁸

The DHH population is heterogenous with respect to multiple social, linguistic, and medical factors. The existing scientific base widely relies on claims data which lack these important social and environmental variables that can help explain health inequities. For example, the age a person becomes DHH can significantly impact their socioeconomic position and health behavior, potentially affecting their risk of adverse maternal and birth outcomes.⁹ Among DHH people with early onset hearing loss, failure to be exposed to an accessible language during the critical period of language acquisition may have negative effects on their mental and physical health, and health literacy.^{10,11} The etiology of hearing loss may cause additional health complications (e.g., syndromic hearing loss).¹²⁻¹⁵ Furthermore, the severity of hearing loss impacts communication access and may also influence health behavior.¹⁶ Lastly, the language modality used by a DHH person is associated with myriad of differences in health and health service outcomes,^{17,18} communication access,^{19,20} and receipt of preventive screenings and immunizations, all of which bear upon birthing persons' preconception and prenatal health.²¹⁻²⁴

Despite the relevance of these factors on the health of DHH persons, the evidence relating their impact on DHH obstetric care is sparse and inadequately addresses the medico-social aspects of hearing loss. These limitations include reliance on diagnostic codes and lack of DHH-specific variables, including communication access during care.^{2,3,6,7} Addressing these limitations is necessary to explain differences in pregnancy complications and outcomes among DHH birthing people.²

1.1. Objectives

This study aimed to examine the associations between neonatal and birth outcomes and DHH-specific factors, specifically: language use, etiology, age of hearing loss onset, hearing loss severity, and communication satisfaction during perinatal care.

2. Methods

2.1. Data source and sample

Data were from the cross-sectional *Survey on Pregnancy Experiences of Deaf and Hard-of-Hearing Women* collected between May 2020 and July 2021. This survey was designed to collect information on the experiences of DHH birthing parents, with focus on their most recent pregnancy (i.e., those with multiple births were only able to provide experiences related to the most recent birth in close-ended questions). Participants were recruited from across the U.S. through convenience and snowball sampling using social media and community-based organizations; consequently, a response rate cannot be calculated as the number of prospective participants exposed to the survey recruitment materials is unknown. A recruitment incentive in the form of a drawing of five \$50 gift cards was included. Participants were 21 years or older, self-reported a birth within the past 10 years in the U.S., and were DHH before their most recent birth. The survey was web-based, available in ASL, English, and Spanish. This analysis includes 583 respondents who reported ASL, English, or bilingual ASL and English as their preferred language. Due to small sample size, participants reporting other languages were excluded. The study was approved by the University of Michigan Institutional Review Board.

2.2. Measures

Full item measures used in this paper are reported in Supplemental Appendix 1.

Exposures.—DHH-related variables were: (1) genetic etiology of hearing loss (compared to non-genetic etiology); (2) preferred language (i.e., ASL, English, or bilingual ASL and English); (3) severity of hearing loss (severe or profound versus not); (4) age of onset of hearing loss (prelingual versus postlingual); and, (5) self-reported quality of communication during perinatal care ('very good' or 'good' versus not).

Outcomes.—We measured three adverse birth outcomes: (1) preterm birth, defined as gestational age at delivery less than 37 weeks; (2) low birthweight (<2500 g); and, (3) NICU admission post-delivery. We also assessed cesarean birth prevalence. Outcomes were dichotomous.

2.3. Data analysis

Data were analyzed in SAS 9.4 (SAS Institute, Cary, NC) and all observed variables are described through frequencies and percentages. Percentages are reported with Clopper-Pearson exact 95 % confidence interval, which are more conservative than other 95 % CIs.²⁵ We calculated unadjusted prevalence ratios using generalized linear models with a Poisson distribution and log-link function. We were unable to estimate adjusted prevalence ratios due to sparse cell sizes.

3. Results

The sample was predominantly white, married, and college educated (see Table 1). Overall, 43.9 % of respondents had experienced any of the four measured birth outcomes. The least frequent adverse outcome was low birthweight (occurring among 8.3 % of births). Thirty-one percent of respondents reported a cesarean birth (see Table 2). Overall, there were no significant differences in prevalence of outcomes across variables (i.e., preferred language, genetic etiology, severity, and age of onset) with exception of communication quality where preterm birth and NICU admission occurred at higher prevalence among respondents who experienced worse perinatal care communication. Results were similar when estimating crude prevalence ratios (Table 3), with significant associations observed for worse perinatal care communication and higher prevalence of preterm birth (PR = 2.37; 95 % CI: 1.34 to 4.18), and NICU admission (PR = 1.91; 95 % CI: 1.20 to 3.03).

4. Discussion

This study describes the prevalence of cesarean birth and three adverse birth outcomes among DHH birthing people and identifies associations with DHH-specific variables. Overall, the prevalence of cesarean births, preterm birth, and low birthweight was consistent with published literature focused on DHH patients' birth outcomes.^{2,3,7} Despite the consistency among other DHH samples, the prevalence of preterm birth and low birthweight was higher than the non-DHH population.^{2,3} Prevalence of cesarean birth, however, was consistent with non-DHH samples.^{2,3}

There were no differences in prevalence of cesarean birth or adverse birth outcomes for preferred language, genetic etiology, severity of hearing loss, or prelingual age of onset. However, preterm birth and NICU admission were more prevalent among DHH birthing people who reported poorer quality perinatal care communication. This finding is consistent with DHH health literature demonstrating the impact of patient-provider communication on care processes.^{21,23} Our research group previously identified that DHH birthing parents report not receiving interpersonal communication accommodations (e.g., removing a mask, facing the patient while speaking) in obstetric care.²⁶ Therefore, obstetricians should take additional efforts to ensure DHH patients are receiving effective communication throughout their pregnancy.

There are several directions for future research to improve DHH patient health outcomes. First, mechanisms of the relation between communication access and adverse birth outcomes remain unclear. *Why* would communication quality during perinatal care be related to preterm birth or NICU admission, rather than low birthweight? For example, could adverse birth outcomes confound this relation by influencing how patients describe the quality of communication? In addition to better understanding mechanisms through which communication impacts patient health outcomes, population-based studies using larger samples of DHH people are needed to account for small cell sizes. Lastly, we strongly encourage additional studies investigating potential relations between DHH-specific variables and health outcomes.

4.1. Limitations

Our sample was predominantly white and college educated; this is juxtaposed to evidence that DHH people are more likely than non-DHH people to have lower socioeconomic position. Small sample sizes also impacted our ability to estimate adjusted prevalence ratios, and may have impacted statistical power. This is particularly important given known disparities in birth outcomes across gradients of socioeconomic position and race. The variables in this study are also potentially biased. For example, the variable of genetic etiology of hearing loss suffers from potential misclassification (e.g., access to genetic testing) and is also impacted by lumping bias (i.e., multiple genetic etiologies grouped into one variable). Similarly, the exposure of prenatal care communication quality was measured as a single item, and there are no adequate scales measuring this construct among DHH patients; future research should expand the number of items to ensure appropriate construct representation regarding aspects of high quality patient-provided communication. Although some of our exposures are focused on pre-pregnancy (i.e., genetic etiology), we are unable to assume directionality and causality in this cross-sectional analysis. Lastly, we only asked participants about their most recent pregnancy experiences rather than previous births. Although this may have limited information on past adverse experiences, experiencing cesarean delivery or adverse pregnancy outcomes increases risk in these outcomes in subsequent births.²⁷

5. Conclusion

DHH people are at higher risk for worse pregnancy outcomes when compared to non-DHH people, but limited research has explored disparities within the DHH population. We found significantly higher risk of preterm birth and NICU admission among DHH people who reported worse communication quality during perinatal care. Additional research is needed to better understand mechanisms through which communication access impacts obstetric outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data availability statement

Data reported in this study are not available for secondary use due to limitations placed on the data during informed consent.

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Table 1

Sample characteristics of DHH respondents.

Demographic Characteristics	% (n)
Age (in years)	<i>M</i> = 35.2 SD = 5.5 Range: 22–49
White race	89.1 % (366)
4-year college degree or higher	59.7 % (261)
Married	74.0 % (322)
Parity	
One	39.8 % (232)
Two	40.5 % (236)
Three or more	19.7 % (115)
DHH focal variables	
Preferred language	
ASL-only	40.1 % (234)
English-only	19.0 % (111)
Bilingual ASL and English	40.8 % (283)
Genetic etiology	37.8 % (198)
Profound or severe loss	84.4 % (491)
Prelingual age of onset	84.8 % (474)
Not 'very good' or 'good' communication during perinatal care	26.3 % (138)

Note. Some cases missing across variables, sample size ranged from n = 411 (race) to n = 583 (preferred language and parity).

Table 2

Prevalence of adverse birth outcome and cesarean births by DHH-specific variables.

Total Sample	Preferred language			Genetic etiology		Severity		Age of onset			Communication quality	
	ASL-only	English-only	Bilingual	No	Yes	Not profound or severe loss	Profound or severe loss	Postlingual	Prelingual	Very good or good comm.	Not very good or good comm.	
Cesarean birth 31.2 % (27.0 to 35.5 %)	32.0 % (25.3 to 39.4 %)	32.6 % (23.4 to 43.0 %)	29.6 % (23.4 to 36.5 %)	35.3 % (29.6 to 41.3 %)	28.2 % (21.3 to 36.0 %)	23.7 % (14.7 to 34.8 %)	32.7 % (28.1 to 37.5 %)	25 % (15.8 to 36.3 %)	31.4 % (26.8 to 36.3 %)	31.7 % (26.9 to 36.9 %)	29.6 % (21.8 to 37.4 %)	
Preterm birth 10.0 % (7.5 to 13.1 %)	11.6 % (7.3 to 17.2 %)	9.4 % (4.4 to 17.1 %)	8.9 % (5.4 to 13.7 %)	11.3 % (7.8 to 15.6 %)	6.4 % (3.1 to 11.4 %)	10.4 % (4.6 to 19.5 %)	10.0 % (7.2 to 13.3 %)	10.4 % (4.6 to 19.5 %)	9.9 % (7.1 to 13.3 %)	7.4 % (4.9 to 10.6 %)	17.5 % (11.3 to 25.2 %)	
Low birthweight 8.3 % (5.8 to 11.3 %)	9.6 % (5.6 to 15.2 %)	9.8 % (4.3 to 18.3 %)	6.3 % (3.2 to 10.9 %)	9.9 % (6.4 to 14.4 %)	4.8 % (1.9 to 9.6 %)	6.2 % (1.7 to 15.0 %)	8.7 % (5.9 to 12.1 %)	6.8 % (1.9 to 16.5 %)	8.6 % (5.9 to 12.0 %)	7.5 % (4.9 to 11.0 %)	10.6 % (5.4 to 18.1 %)	
NICU admission 15.7 % (12.5 to 19.3 %)	16.6 % (11.5 to 22.8 %)	19.0 % (11.6 to 28.3 %)	13.3 % (8.9 to 18.9 %)	16.2 % (12.1 to 21.2 %)	13.6 % (8.6 to 20.1 %)	18.4 % (10.5 to 29.0 %)	15.2 % (11.8 to 19.2 %)	16.9 % (9.3 to 27.1 %)	15.6 % (12.1 to 19.7 %)	12.7 % (9.4 to 16.7 %)	24.2 % (17.0 to 32.7 %)	
Any measured outcome (i.e., cesarean birth, preterm birth, low birthweight, or NICU admission) 43.9 % (39.5 to 48.5 %)	44.5 % (37.2 to 52.0 %)	47.9 % (37.6 to 58.4 %)	41.4 % (34.5 to 48.5 %)	47.7 % (41.6 to 53.5 %)	39.5 % (31.8 to 47.6 %)	41.6 % (30.4 to 53.4 %)	44.2 % (39.5 to 49.4 %)	41.6 % (30.4 to 53.4 %)	44.0 % (39.0 to 49.1 %)	42.4 % (37.2 to 47.7 %)	48.0 % (39.1 to 57.1 %)	

Note. Reporting column percentages with Clopper-Pearson exact confidence intervals.

Table 3

Crude (unadjusted) prevalence ratios of adverse birth outcome and cesarean births by DHH-specific variables.

Focal characteristic	Cesarean delivery	Preterm birth	Low birth weight	NICU admission	Any measured outcome
Language (ref. English-speaker)					
ASL-user	0.98 (0.63 to 1.52)	1.24 (0.57 to 2.70)	0.99 (0.42 to 2.31)	0.87 (0.49 to 1.57)	0.93 (0.65 to 1.33)
Bilingual	0.95 (0.77 to 1.18)	0.97 (0.65 to 1.45)	0.80 (0.51 to 1.26)	0.84 (0.62 to 1.13)	0.93 (0.78 to 1.11)
Genetic etiology (ref. not genetic)	0.80 (0.56 to 1.14)	0.57 (0.28 to 1.15)	0.48 (0.21 to 1.12)	0.84 (0.50 to 1.41)	0.83 (0.61 to 1.12)
Profound or severe hearing loss (ref. not profound or severe loss)	1.38 (0.84 to 2.26)	0.96 (0.45 to 2.05)	1.41 (0.50 to 3.99)	0.83 (0.46 to 1.48)	1.07 (0.73 to 1.56)
Prelingual age of onset (ref. postlingual onset)	1.26 (0.77 to 2.04)	0.95 (0.44 to 2.04)	1.27 (0.45 to 3.60)	0.93 (0.51 to 1.69)	1.06 (0.73 to 1.55)
Not 'very good' or 'good' perinatal care communication (ref. 'good' or 'very good' perinatal care communication)	0.93 (0.64 to 1.35)	2.37 (1.34 to 4.18)	1.41 (0.69 to 2.79)	1.91 (1.20 to 3.03)	1.13 (0.84 to 1.53)

Note. Modeled using a generalized linear model with Poisson distribution and log-link function in SAS.