Perinatal Characteristics and Healthcare Utilization among Newborns with Sickle Cell Disease and Sickle Cell Trait, Michigan, 2004-2008
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In Michigan, newborn screening (NBS) for hemoglobinopathies began in 1987. Since the inception of NBS for hemoglobinopathies, more than one thousand newborns have been diagnosed with sickle cell disease (SCD) and tens of thousands have been diagnosed with sickle cell trait (SCT). However, little is known about the perinatal characteristics and healthcare experiences of these newborns.

Methods

Study Population
All black infants born in Michigan from 2004 through 2008 who were identified with SCD or SCT through NBS

Data Sources
- NBS records
- Live births records
- Michigan Inpatient Database (MIDB)
  - The MIDB is a database of hospital discharge records. Nearly all hospitals in the state provide their records to the Michigan Health & Hospital Association (MHA). MDCH purchases this database from the MHA.

Core Linkage
- Probabilistic linkage of NBS and Live Births Records
  - In Michigan, this linkage began in 2007 and is now routinely conducted. The matching rate is typically 99.0% or greater.

Other Linkage
- Probabilistic:
  - Live Births and MIDB Records
    - Maternal file resulting from the linkage of these two datasets has been created every year at MDCH
  - Newborn file has been first developed for a study related to NICU utilization (Grigorescu, 2005)

Final Linkage
- Deterministic:
  - NBS and MIDB Records
  - Linked through the live birth certificate unique identifier

Dataset of birth hospitalization records among black infants with SCD and SCT born 2004 through 2008 was created.

Analytic Method
- Chi-square tests to compare the two groups (SCD and SCT) in regards to:
  - Birth weight (BW)
  - Gestational age
  - One-minute Apgar score
  - Type of delivery
  - Sex

- Regression modeling to assess the relations between disease status (SCD vs. SCT) and the following healthcare utilization outcomes:
  - Length of stay (LOS)
  - Total charges
  - NICU admission

- Generalized linear modeling (GLM) for LOS and total charges
- Logistic regression modeling for NICU admission

Crude and adjusted models (controlling for dichotomous BW) were constructed using SAS version 9.1

Results

- Of 14,827 newborns identified with SCD or SCT, 14,387 (97.0%) of the records were linked to MIDB records (94.5% overall).
- After restricting to black infants only, the final study population included 11,471 newborns: 11,119 with SCT and 272 with SCD

- None of the demographic or perinatal characteristics differed significantly between newborns with SCD and those with SCT (Table 1).
- Newborns with SCD had non-significantly increased odds of being preterm compared to newborns with SCT (OR 1.3, 95% CI 0.9, 1.8).

Table 1. Demographic and Perinatal Characteristics of African American Newborns by Disease Status, MIDB linked with Newborn Screening Records, Michigan, 2004-2008

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sickle Cell Disease</th>
<th>Sickle Cell Trait</th>
<th>Unadjusted OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Weight</td>
<td>2500 g</td>
<td>&gt;2500 g</td>
<td>1.1</td>
<td>0.9, 1.2</td>
</tr>
<tr>
<td>Gestational Age</td>
<td>37 weeks</td>
<td>&lt;37 weeks</td>
<td>1.1</td>
<td>0.7, 1.6</td>
</tr>
<tr>
<td>NICU Admission</td>
<td>Yes</td>
<td>No</td>
<td>1.1</td>
<td>0.6, 1.7</td>
</tr>
<tr>
<td>Apgar score</td>
<td>1&lt;8</td>
<td>&gt;8</td>
<td>1.1</td>
<td>0.9, 1.2</td>
</tr>
<tr>
<td>Type of Delivery</td>
<td>Vaginal</td>
<td>CS</td>
<td>1.1</td>
<td>0.9, 1.2</td>
</tr>
<tr>
<td>Birth Weight</td>
<td>2&lt;2000 g</td>
<td>&gt;2000 g</td>
<td>1.1</td>
<td>0.6, 1.6</td>
</tr>
<tr>
<td>Gestational Age</td>
<td>38 weeks</td>
<td>&lt;38 weeks</td>
<td>1.1</td>
<td>1.0, 1.8</td>
</tr>
<tr>
<td>NICU Admission</td>
<td>Yes</td>
<td>No</td>
<td>1.1</td>
<td>0.6, 1.7</td>
</tr>
</tbody>
</table>

- No significant differences were found between mean LOS or mean charges for newborns with SCD compared to those with SCT in crude models or after adjustment for BW (Table 2).
- The odds of NICU admission did not differ between newborns with SCD and those with SCT in either crude or adjusted models (Table 3).

Conclusions

- Perinatal characteristics and healthcare utilization of newborns with SCD are similar to those of newborns with SCT.
- Similar short-term follow-up strategies may be used for newborns with SCD and newborns with SCT due to their comparable perinatal characteristics and healthcare utilization during the birth hospitalization.

Public Health Implications

- Routine link of NBS data with live births records allows for linkages with other files which contain useful information not available otherwise.

References


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