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Parity effect on preterm birth and growth outcomes among infants with isolated omphalocele

Hamisu M. Salihu [d,*], Donath Emusu [a], Puza P. Sharma [a], Zakari Y. Aliyu [b], Yinka Oyelese [d], Charlotte M. Druschel [c], Russell S. Kirby [a]

[a] *Department of Maternal and Child Health, University of Alabama at Birmingham, Birmingham, USA*
[b] *National Institutes of Health, Bethesda, MD, USA*
[c] *Congenital Malformations Registry, New York State Department of Health, Troy, NY, USA*
[d] *Department of Obstetrics, Gynecology, and Reproductive Sciences, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School, New Brunswick, NJ, USA*

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Abstract

Objective: To assess the association between parity and fetal morbidity outcomes among omphalocele-affected fetuses.
Study design: We carried out a retrospective study of 498 cases of isolated omphalocele (210 born to nulliparous and 288 to multiparous mothers) in New York State from 1983 through 1999. Infants of nulliparous mothers were compared to those of multiparous gravidas using adjusted odds ratios generated from a logistic regression.
Results: Omphalocele-affected fetuses of nulliparous mothers had a lower risk of being delivered preterm (odds ratio (OR) = 0.49; 95% CI = 0.27–0.90) but comparable risks for low birth weight (OR = 1.01; 95% CI = 0.60–1.72), very low birth weight (OR = 0.33; 95% CI = 0.09–1.20), very preterm birth (OR = 0.42; 95% CI = 0.15–1.16), and small size for gestational age (SGA) [OR = 0.61; 95% CI = 0.23–1.63].
Conclusion: Omphalocele-affected fetuses of multiparous mothers have double the risk for preterm birth compared to their nulliparous counterparts. This information is potentially useful in counseling parents whose fetuses have omphaloceles.

Keywords: Omphalocele; Fetal morbidity; Nulliparity; Multiparity

1. Introduction

The impact of maternal parity status on the outcome of pregnancy has been studied for several decades with divergent results. A likely explanation for these inconsistencies in study findings is the heterogeneity of study populations in terms of their risk threshold profiles. Previous investigations have demonstrated that both perinatal morbidity and mortality are variably impacted by the parity of the mother depending on whether the population of interest comprises of singletons, twins or triplets since these groups of individuals differ substantially in terms of baseline risk [1–5]. These earlier reports highlight the need to assess pregnancy risks within groups of individuals that represent homogeneous entities in terms of baseline risk thresholds when considering the influence of a specific factor that may alter risk profiles during pregnancy.

Omphaloceles are congenital abdominal wall defects which, when they occur in the fetus, are associated with high perinatal morbidity and mortality [6–9]. While fetal factors (e.g., concomitant defects or presence of karyotype aberrations) have been extensively examined in relation to outcomes of pregnancies affected by omphaloceles [6,7,9], the role of maternal factors, such as parity, on fetal outcome,

* Corresponding author at: Department of Obstetrics, Gynecology, and Reproductive Sciences, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School, 125 Paterson Street, New Brunswick, NJ 08901-1977, USA. Tel.: +1 205 934 6469; fax: +1 205 934 8248.
E-mail address: hsalihu@uab.edu (H.M. Salihu).

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remains poorly assessed. This study was conducted to determine whether parity (nulliparity or multiparity) is an independent risk factor for poor fetal outcomes among omphalocele-affected fetuses. We set out with the following working hypotheses:

1. For all fetal growth parameters, the parity effect is more pronounced in omphalocele-affected fetuses than in anomaly free individuals because the former are more vulnerable to added negative insults due to their compromised condition.
2. Fetuses in nulliparous uteri, in general, are at higher risk for diminished growth and shortened gestation leading to unfavorable patterns of fetal growth.

2. Materials and methods

The New York State Congenital Malformations Registry (NYCMR), one of the largest statewide population-based birth defects registries in the nation, was the source of data for this analysis. The NYCMR uses passive case ascertainment, relying on reports from hospitals and physicians. State regulations mandate all physicians and other hospital staff to report malformations at birth through the age of 2 years. All new case reports are matched against existing registry data to eliminate duplication. For each case, reporting physicians, hospitals and genetics laboratories are asked to provide a narrative description of the congenital anomaly, and NYCMR staff review all such reports carefully. Incomplete reports and non-specific diagnoses are followed up with the reporting source.

Most NYCMR prevalences for major birth defects are similar to those of other registries that use active case-finding, such as the California Birth Defects Monitoring Program and the Metropolitan Atlanta Congenital Defects program [10]. The NYCMR data have also been validated by other sources [11].

2.1. Case definition

For this study, we used data covering the period 1983–1999 for all diagnosed cases of omphalocele among live-born infants in the State of New York. Based on the diagnosis and narrative information provided by the reporting entity, the following case definitions were used to codify a case as omphalocele; a midline abdominal wall defect limited to an open umbilical ring. The viscera herniate into the base of the umbilical cord and are covered by an amnioperitoneal membrane. Within limits of variations across hospital settings and standards, recognition of omphalocele antenatally is followed by more specialized investigation to rule out concomitant malformations and establish the karyotype status of the fetus. This information is then used for appropriate counseling of affected parents. Decision regarding continuation or termination of the pregnancy is left to the parents.

We compared birth outcomes between neonates born to nulliparous mothers and those born to multiparous mothers. We defined mothers as nulliparous or multiparous by applying the ''live-born'' parity definition. Using this description, nulliparous mothers were those without a previous live birth while multiparous mothers were gravidas that had at least one previous live birth. We also considered the following covariates: race/ethnicity, maternal education, place of residence at the time of live birth of the infant and level of care facility. The race/ethnicity variable referred to that of the mother, and was subdivided into White non-Hispanic, Black non-Hispanic and others. Maternal education levels were subdivided into mothers with at least a high school level of education and those with less than high school education. The place of residence was categorized into living either in New York City or outside New York City. The level of prenatal care was classified into lower, defined as centers where specialized surgery was not offered, and higher, comprising health facilities where specialized surgery was conducted.

In this study, the main outcomes of interest were fetal morbidity or findings indicative of fetal growth inhibition, including small-for-gestational age (SGA), low birth weight ($<$2500 g), very low birth weight ($<$1500 g), preterm and very preterm births (defined as births at $<$37 and $<$33 weeks of gestation). Gestational age in completed weeks was calculated in almost all cases based on the recorded date of the last menstrual period and the date of birth. SGA was defined as less than the 10th percentile of birth weight for gestational age using population-based national reference curves for singletons [12].

In this study, only isolated cases of omphalocele were considered. If the abdominal defect was the only anomaly in the infant then it was considered isolated. Infants with minor congenital anomalies (e.g., isolated polydactyly) or gastrointestinal anomalies associated with the ventral wall defect were also classified as isolated [13]. The reason for limiting our analysis to isolated cases is that omphaloceles, when present with other major structural anomalies, are often associated with chromosomal aneuploidies and other genetic syndromes, which represent heterogeneous conditions carrying significantly higher mortality and morbidity than isolated omphaloceles. Thus, interpretations drawn from analysis on an admixture of the isolated and non-isolated omphaloceles will lead to misleading conclusions about the outcomes of isolated omphaloceles.

In a comparative analysis to provide background information on the study cohort, we generated a random and representative sample of 25% of the yearly average number of all anomaly free singleton live births that occurred in the State of New York within that period using the Vital Statistics records. We then proceeded and conducted a retrospective cohort analysis to estimate the risk of each of the fetal morbidity outcomes (low and very low birth weight, preterm and very preterm, and small for