

# Perinatal and Infant Risk Factors for Incidence of Idiopathic Clubfoot

Dhruv Mendiratta, Isabel Herzog<sup>1</sup>, Alice Chu<sup>2</sup>

<sup>1</sup>Rutgers New Jersey Medical School, <sup>2</sup>NYU Faculty Grp Practice

**INTRODUCTION:** Each year, approximately 1 in 1,000 newborns is born with talipes equinovarus (clubfoot) in the United States. Patients with congenital clubfoot may experience pain, limited function, and arthritis later in life. Previous literature has suggested that idiopathic clubfoot could be associated with vascular deficiencies, environmental factors, in utero positioning, and genetics. Despite effective casting methods, some patients can still experience limited foot and ankle motion later in life. The purpose of this retrospective cohort study is to identify both maternal and pediatric risk factors for presentation of clubfoot.

## METHODS:

The 2016 Kids' Inpatient Database (KID) was queried for newborns (ICD-10: Z38) diagnosed with clubfoot (ICD-10: Q66.0). Patient and hospital demographics and risk factors in the mother and neonate were identified. Univariate chi-square analyses were performed on demographic and risk factor data. Multivariate analyses were performed to determine statistical associations of risk factors with clubfoot. All confidence intervals were determined at the 95% level. All analyses were conducted using same software.

**RESULTS:** Of the 1,323,148 newborns identified, 1,590 (0.12%) newborns had clubfoot. There were differences in sex, race, hospital teaching status, perinatal and postpartum factors, and perinatal complications between newborns with clubfoot and those without clubfoot (**Table 1**). **Table 2** contains adjusted odds ratios for risk factors of clubfoot. Males were 1.388 times more likely to have clubfoot than females. White patients were 1.253 times more likely to have clubfoot than Black patients. Patients who had oligohydramnios were 2.677 times more likely to have clubfoot than those with normal amniotic fluid levels. Patients with transitory hypocalcemia as newborns were 1.559 times more likely to have clubfoot than those with normal calcium levels. Maternal tobacco use and maternal infections disease were associated with 1.517 times higher likelihood and 1.202 times higher likelihood, respectively, of giving birth to a child with clubfoot.

**DISCUSSION AND CONCLUSION:** In this national cohort of neonates, clubfoot occurred at an incidence of 1.20 per 1000 live births. This study found male sex, White race, oligohydramnios, transitory hypocalcemia of the newborn, maternal tobacco use, and maternal infectious disease to be risk factors for presentation of idiopathic clubfoot. After controlling for preoperative variance, race, transitory hypocalcemia, oligohydramnios, maternal tobacco use, and maternal infectious disease were identified as potential risk factors for clubfoot. This difference could not be explained by other factors in this study. Previous studies have identified oligohydramnios, maternal tobacco use, and low birth weight as risk factors for clubfoot. However, this study identified transitory hypocalcemia and maternal infectious disease as novel risk factors. Preventative strategies targeted at these risk factors can be developed by the healthcare team to decrease incidence of clubfoot.

		Adjusted Odds Ratio	
		Clubfoot	
<b>Sex</b>	Male vs. Female	1.388 [1.248 - 1.545]	<b>&lt; 0.001</b>
<b>Race</b>	Black vs. White	0.798 [0.693 - 0.933]	<b>0.005</b>
	Hispanic vs. White	0.991 [0.865 - 1.134]	0.894
	Other vs White	0.742 [0.625 - 0.882]	<b>&lt; 0.001</b>
	Urban Nonteaching vs. Rural	1.251 [0.982 - 1.594]	0.070
<b>Teaching Status</b>	Urban Teaching vs. Rural	1.404 [1.121 - 1.758]	<b>0.003</b>
	<b>Risk Factors</b>		
	Light Birthweight/Preterm	1.100 [0.972 - 1.244]	0.132
	Heavy Birthweight	0.853 [0.708 - 1.027]	0.094
	Oligohydramnios	2.677 [1.719 - 4.169]	<b>&lt; 0.001</b>
	Transitory Hypocalcemia of Newborn	1.559 [1.101 - 2.208]	<b>0.012</b>
	Maternal Tobacco Use	1.517 [1.012 - 2.275]	<b>0.044</b>
	Maternal Infectious Disease	1.202 [1.038 - 1.393]	<b>0.014</b>

Table 2.

		Newborns w/ Clubfoot n = 1523/148	Newborns w/ No Clubfoot n = 1199	p-value
<b>Sex</b>	Male	7055 (23.9%)	965 (80.7%)	<b>&lt; 0.001</b>
	Female	22847 (87.1%)	625 (59.3%)	
<b>Race</b>	White	10180 (69.7%)	762 (63.7%)	<b>0.003</b>
	Black	31173 (16.2%)	204 (14.4%)	
	Hispanic	22889 (10.8%)	296 (20.9%)	
	Other	15486 (13.9%)	158 (11.3%)	
<b>Median Income Quartile - Parent Zip Code</b>	0 - 25%	37702 (24.8%)	476 (30.2%)	0.003
	26 - 50%	11996 (24.1%)	406 (25.8%)	
	51 - 75%	25123 (24.8%)	381 (24.2%)	
	76 - 100%	29229 (22.3%)	113 (8.9%)	
<b>Region of Hospital</b>	Northeast	21635 (16.8%)	245 (15.4%)	0.003
	Midwest	28143 (21.8%)	387 (24.3%)	
	South	38153 (28.1%)	387 (24.9%)	
	West	31524 (23.9%)	371 (23.3%)	
<b>Teaching Status</b>	Not	10477 (7.9%)	92 (6.8%)	<b>&lt; 0.001</b>
	Urban Nonteaching	30789 (23.2%)	337 (21.2%)	
	Urban Teaching	91920 (69.9%)	1161 (73.0%)	
	Other Teaching			
<b>Risk Factors</b>	Light Birthweight/preterm infant	30163 (23.9%)	423 (26.6%)	<b>0.002</b>
	Heavy Birthweight	13309 (10.1%)	138 (8.5%)	
	Oligohydramnios	46163 (9%)	23 (1.5%)	
	Transitory Hypocalcemia of Newborn	17611 (13%)	38 (2.4%)	
	Maternal Tobacco Use	14431 (11.1%)	26 (1.6%)	
	Maternal Drug Use	37281 (28.9%)	47 (3.0%)	
	Maternal Infections	16426 (12.8%)	209 (13.6%)	
	None	12297 (9.6%)	82 (5.1%)	
	Respiratory	21491 (16.5%)	482 (30.7%)	
	Diabetes/Miscelans	42441 (32.8%)	48 (4.3%)	

Table 1.