Obstetric and Neonatal Adversities, Parity, and Tourette Syndrome: A Nationwide Registry

Leivonen, Susanna

2016


http://hdl.handle.net/10138/223855
https://doi.org/10.1016/j.jpeds.2015.10.063

Downloaded from Helda, University of Helsinki institutional repository.
This is an electronic reprint of the original article.
This reprint may differ from the original in pagination and typographic detail.
Please cite the original version.
Obstetric and Neonatal Adversities, Parity, and Tourette Syndrome: A Nationwide Registry

Susanna Leivonen, MD1,2, Arja Voutilainen, MD2, Roshan Chudal, PhD1, Auli Suominen, MSc1, Mika Gissler, PhD3,4, and Andre Sourander, MD1,5,6

Objective To determine the relationships between parity, obstetric adversities, neonatal factors, and Tourette syndrome in a large nationwide cohort.

Study design This nationwide, register-based, nested case-control study identified all children diagnosed with Tourette syndrome born between 1991 and 2010 from the Finnish Hospital Discharge Register (n = 767). Each case was matched to 4 controls. Information on parity, obstetric, and neonatal factors was obtained from the Finnish Medical Birth Register. Conditional logistic regression was used to determine the relationship between parity, obstetric, and neonatal factors, and Tourette syndrome.

Results Nulliparity was associated with increased odds for Tourette syndrome (OR 1.7, 95% CI 1.4-2.2), and 3 or more previous births was associated with decreased odds for Tourette syndrome (OR 0.5, 95% CI 0.3-0.9) compared with parity 1-2. Birth weight 4000-4499 g was associated with decreased odds for Tourette syndrome (OR 0.7, 95% CI 0.5-0.9). Low birth weight, gestational age, weight for gestational age, Apgar score at 1 minute, induced labor, birth type or presentation, neonatal treatment, or maternal blood pressure were not associated with Tourette syndrome.

Conclusions Increasing parity and high birth weight are associated with decreased odds for Tourette syndrome. (J Pediatr 2016;171:213-9)

See editorial, p 17

Tourette syndrome is a childhood onset neurodevelopmental disorder characterized by multiple motor and 1 or more vocal tics that have been present for more than a year. The complex etiology of Tourette syndrome is likely to involve multifactorial genetic and environmental influences, although underlying pathophysiological mechanisms and the role of potential gene-environmental interactions are as yet unclear.

Both obstetric and neonatal factors have been associated with neurodevelopmental disorders, such as attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD). A growing body of evidence suggests that parity, particularly being the first born, is associated with an increased risk of autism. Most previous studies on the association between obstetric and neonatal factors and Tourette syndrome were retrospective in design and conducted on clinical samples. Low birth weight, complications during pregnancy, and Apgar scores at 5 minutes have been reported to be associated with Tourette syndrome or tic severity. These findings, however, have not been replicated or have been inconsistent. Two population-based studies have examined the association between perinatal factors and Tourette syndrome: one from Sweden and one derived from the Avon Longitudinal Study of Parents and Children (ALSPAC) birth cohort. The Swedish study included only 25 children with Tourette syndrome and examined the association between combined pre- and perinatal optimality score and Tourette syndrome. No specific perinatal factors were evaluated. The ALSPAC birth cohort study included 50 children with Tourette syndrome; no associations were found between birth weight, prematurity, delivery complications, Apgar score, or maternal blood pressure and Tourette syndrome. However, a negative, statistically significant (OR 0.7 95% CI 0.5-0.97) association was found between parity (second or later born vs first born) and Tourette syndrome/chronic tic disorder. Of note, Tourette syndrome and chronic tic disorder diagnoses in the ALSPAC cohort were based...
on questionnaires completed by mothers. Specific obstetric and neonatal adversities are relatively uncommon. Therefore, the low statistical power because of small sample sizes used by these studies may have resulted in failure to demonstrate subtle but important associations between obstetric and neonatal factors and Tourette syndrome. A design based on using national health register data overcomes many limitations (eg, retrospectively collected data, small sample sizes, geographically restricted area, and lack of healthcare professional assessments) of the previous clinical and population-based studies.

The present study is a nationwide register-based study examining the relationships between several obstetric adversities, perinatal factors, parity, and Tourette syndrome. The aim of the study was to examine if birth weight, gestational age, weight for gestational age, Apgar score at 1 minute, induced labor, birth presentation, birth type, maternal blood pressure, neonatal treatment, or parity are associated with Tourette syndrome after adjusting for other parental background variables.

### Methods

This nested case-control study used data derived from 3 Finnish national registries. The sampling frame included all children born between January 1, 1991, and December 31, 2010, in Finland (n = 1,199,112). Children diagnosed with Tourette syndrome (n = 767) during the same time period were identified from the Finnish Hospital Discharge Register (FHDR). The characteristics of the sample have been described previously. Each case was matched to 4 controls, identified from the Central Population Register, by sex, date of birth, and place of birth. Personal identity codes were used to link the data collected from the FHDR, the Finnish Medical Birth Register (FMBR), and the Central Population Register used in the study. The study was authorized by the Ministry of Social Affairs and Health (STM/1528/2007) and the National Institute of Health and Welfare with approval from the ethics committee of the hospital district of Southwest Finland.

The FHDR contains all somatic and psychiatric diagnoses given in hospitals in Finland, including inpatient wards, military, health center, and prison wards, and private hospitals from 1969 onward and public hospital outpatients from 1998 onward. Diagnoses are based on the International Classification of Diseases (ICD) (ICD Ninth Revision [ICD-9] from 1987-1995 and ICD Tenth Revision [ICD-10] from 1996 onward). FHDR data have been shown to be of good quality, and more specifically, Tourette syndrome diagnoses in the FHDR have been validated by chart reviews and telephone interviews using the Yale Global Tic Severity scale. The Central Population Register contains information about Finnish citizens and foreign citizens residing permanently in Finland, and includes name, personal identity code, address, citizenship, native language, family relations, and dates of emigration, immigration, birth, and death. The FMBR, established in 1987 and maintained by the National Institute of Health and Welfare, includes detailed comprehensive data on maternal background, pregnancies, and the perinatal period up to 7 days of age.

Children with diagnosed Tourette syndrome (ICD-10: F95.2, ICD-9: 3072D) without comorbid severe or profound intellectual disability (ICD-10: F72, F73, ICD-9: 3181, 3182) were identified from the FHDR (n = 767). Children born from twin (n = 24) or triple (n = 1) pregnancies were excluded. Data on perinatal factors were available for 738 of the remaining 742 children (99.5%). There were 207 Tourette syndrome cases with comorbid hyperkinetic disorder, 120 cases with comorbid ASD, and 58 cases with comorbid obsessive compulsive disorder.

The controls, defined as children without any tic disorder or severe or profound intellectual disability, were identified from the Central Population Register. Controls were excluded if they had emigrated from Finland (n = 9), had died before the case was diagnosed (n = 12), were born from multiple pregnancies (n = 87), or if their case was born from a multiple pregnancy (n = 98). The data on perinatal factors was available on 2810 of the remaining 2825 controls (99.5%).

### Data on Exposures

Data on parity, obstetric, and neonatal factors were derived from the FMBR. The studied obstetric and neonatal factors were: (1) birth weight classified as <1500, 1500-2499, 2500-3999, 4000-4499, and ≥4500 g; (2) gestational age classified as <32, 32-37, 38-41, and ≥42 weeks; and (3) weight for gestational age as small for gestational age (≤ < −2 SD), appropriate for gestational age (−2 SD to <2 SD), and large for gestational age (≥2 SD). Weight for gestational age was calculated according to national sex-specific weight distribution standards at a given gestational age among children born between 1996 and 2008. Apgar scores at 1 minute were classified as 9-10, 7-8, and 0-6. Neonatal treatment was classified as either normal follow-up or monitoring either in a maternal postpartum department or a neonatal intensive care unit. Birth presentation classified as cephalic, breech, or other. Birth type was classified as vaginal cephalic, vacuum extractor or forceps, or vaginal breech, planned cesarean, other cesarean including urgent and emergency cesarean, and unknown. Induced labor was classified as either yes or no. Maternal high blood pressure that required hospitalization was either yes or no. Parity was classified as 0, 1-2, and 3 or more previous births.

### Covariates

Five parental factors that showed a trend of association (P < .10 calculated using Pearson χ² test) with Tourette syndrome in this sample and at least one of the perinatal factors in the literature were included in the analyses as covariates. These covariates were maternal age (P = .003), maternal psychiatric history (P < .001), maternal socioeconomic status (SES) (P = .001), paternal age (P = .001), and paternal psychiatric history (P < .001). In addition, number of the siblings in the sibship (P = .006) was added as a covariate into final
nulliparity was associated with increased odds for Tourette syndrome. In addition, the odds for Tourette syndrome decreased with increasing parity: parity greater than 2 was associated with lower odds of Tourette syndrome than parity of 1 or 2. Nulliparity has been associated with increased risk for autism, ADHD, Tourette syndrome was not associated with low birth weight, prematurity, or other obstetric or neonatal adversities. Nulliparity was associated with increased odds for Tourette syndrome.

This large nationwide register-based study reports the relationship between parity, obstetric adversities, neonatal factors, and Tourette syndrome. Both increasing parity and high birth weight were significantly associated with decreased odds for Tourette syndrome. In contrast with previous findings related to other neuropsychiatric disorders, such as ASD and ADHD, Tourette syndrome was not associated with low birth weight, prematurity, or other obstetric or neonatal adversities.

Discussion

The mechanisms underlying the association between nulliparity and adverse neurodevelopmental outcomes remain unknown. Given the expected multifactorial etiology for Tourette syndrome, it seems reasonable to consider both biological and behavioral mechanisms whereby the experience of one pregnancy changes fetal exposure and/or parental behavior in the next pregnancy in early infancy. Previously suggested biological explanations include the hygiene hypothesis, and exposure to higher lipophilic chemicals during the first pregnancy. The hygiene hypothesis suggests that lack of early infectious disease exposure leads to an autoimmune susceptibility among first born children and increased exposure to infections among the later born children would rather be protective. This mechanism could be of relevance because abnormal regulation of the immune system could be associated with Tourette syndrome. A fetus in an earlier pregnancy is exposed to higher concentrations of lipophilic chemicals than a fetus in a later pregnancy, and some of these chemicals have been associated with adverse neurodevelopmental outcomes. Altered maternal behavior relative to parity might also lead to different toxic exposures depending on birth order. For instance, binge drinking and cannabis use during pregnancy

nulliparity was associated with increased odds for Tourette syndrome. In addition, the odds for Tourette syndrome decreased with increasing parity: parity greater than 2 was associated with lower odds of Tourette syndrome than parity of 1 or 2. Nulliparity has been associated with increased risk for autism, ADHD, Tourette syndrome was not associated with low birth weight, prematurity, or other obstetric or neonatal adversities. Nulliparity was associated with increased odds for Tourette syndrome. In addition, the odds for Tourette syndrome decreased with increasing parity: parity greater than 2 was associated with lower odds of Tourette syndrome than parity of 1 or 2. Nulliparity has been associated with increased risk for autism, ADHD, Tourette syndrome was not associated with low birth weight, prematurity, or other obstetric or neonatal adversities. Nulliparity was associated with increased odds for Tourette syndrome.

This large nationwide register-based study reports the relationship between parity, obstetric adversities, neonatal factors, and Tourette syndrome. Both increasing parity and high birth weight were significantly associated with decreased odds for Tourette syndrome. In contrast with previous findings related to other neuropsychiatric disorders, such as ASD and ADHD, Tourette syndrome was not associated with low birth weight, prematurity, or other obstetric or neonatal adversities. Nulliparity was associated with increased odds for Tourette syndrome. In addition, the odds for Tourette syndrome decreased with increasing parity: parity greater than 2 was associated with lower odds of Tourette syndrome than parity of 1 or 2. Nulliparity has been associated with increased risk for autism, ADHD, Tourette syndrome was not associated with low birth weight, prematurity, or other obstetric or neonatal adversities. Nulliparity was associated with increased odds for Tourette syndrome. In addition, the odds for Tourette syndrome decreased with increasing parity: parity greater than 2 was associated with lower odds of Tourette syndrome than parity of 1 or 2. Nulliparity has been associated with increased risk for autism, ADHD, Tourette syndrome was not associated with low birth weight, prematurity, or other obstetric or neonatal adversities. Nulliparity was associated with increased odds for Tourette syndrome.
have both been associated with both nulliparity and Tourette syndrome. In addition, changes in maternal hormonal environment, including higher testosterone levels in the first pregnancy, have been associated with parity. The role of neuroendocrine mechanisms and Tourette syndrome is understudied, though there is a hypothesis, based on indirect measures, that patients with Tourette syndrome are exposed to higher concentrations of androgens in utero. It has been suggested that autism in the child might lead to reproductive stoppage in the family, leading to reproductive choice biasing the relationship between parity and autism. However, in our study the sibship size was added as a covariate, and Tourette syndrome is also likely to be diagnosed later than autism.

Birth weight of 4000-4499 g was associated with decreased odds for Tourette syndrome. In general, the infant’s size is an indicator of prenatal well-being, and both low and high birth weights have been associated with adverse long-term consequences such as obesity, metabolic disorders, and neurodevelopmental disorders. Therefore, our finding was unexpected and intriguing. Some explanations associated with factors affecting birth weight can be hypothesized. Birth size is mediated by both genetic and environmental factors, such as parity, maternal size, medication, smoking, and nutrition. Thus, our finding raises the question of whether some of the factors associated with high birth weight (genetic or maternal size or nutrition), could have protective effects for Tourette syndrome. Replication of our findings and further studies examining the possible mechanisms are desirable to confirm the results and understand nature of the found association.

### Table I. The associations between neonatal factors, obstetric factors, parity, and Tourette syndrome

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cases</th>
<th>Controls</th>
<th>Unadjusted OR (95% CI)</th>
<th>P</th>
<th>Adjusted model* OR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight (g)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1500</td>
<td>6 (0.8)</td>
<td>16 (0.6)</td>
<td>1.3 (0.5-3.4)</td>
<td>.566</td>
<td>1.1 (0.4-3.0)</td>
<td>.847</td>
</tr>
<tr>
<td>1500-2499</td>
<td>26 (3.5)</td>
<td>68 (2.4)</td>
<td>1.4 (0.8-2.2)</td>
<td>.204</td>
<td>1.3 (0.7-2.1)</td>
<td>.403</td>
</tr>
<tr>
<td>2500-3999</td>
<td>588 (79.7)</td>
<td>2074 (73.8)</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>4000-4499</td>
<td>101 (13.7)</td>
<td>527 (18.8)</td>
<td>0.7 (0.5-0.8)</td>
<td>.001</td>
<td>0.7 (0.5-0.9)</td>
<td>.002</td>
</tr>
<tr>
<td>≥4500</td>
<td>17 (2.3)</td>
<td>125 (4.5)</td>
<td>0.5 (0.3-0.8)</td>
<td>.005</td>
<td>0.6 (0.3-1.1)</td>
<td>.084</td>
</tr>
<tr>
<td>Gestational age (wk)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥31</td>
<td>8 (1.1)</td>
<td>14 (0.5)</td>
<td>2.2 (0.9-5.3)</td>
<td>.074</td>
<td>1.8 (0.7-4.7)</td>
<td>.264</td>
</tr>
<tr>
<td>32-37</td>
<td>76 (10.3)</td>
<td>248 (8.9)</td>
<td>1.2 (0.9-1.6)</td>
<td>.207</td>
<td>1.2 (0.9-1.6)</td>
<td>.312</td>
</tr>
<tr>
<td>38-41</td>
<td>624 (84.6)</td>
<td>2421 (86.2)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight for gestational age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SGA</td>
<td>21 (2.9)</td>
<td>80 (2.9)</td>
<td>1.0 (0.6-1.6)</td>
<td>.998</td>
<td>1.0 (0.5-1.7)</td>
<td>.913</td>
</tr>
<tr>
<td>AGA</td>
<td>702 (95.1)</td>
<td>2628 (93.5)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LGA</td>
<td>7 (1.0)</td>
<td>39 (1.5)</td>
<td>0.5 (0.3-0.96)</td>
<td>.034</td>
<td>0.7 (0.4-1.2)</td>
<td>.171</td>
</tr>
<tr>
<td>Apgar at 1 min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-10</td>
<td>547 (74.1)</td>
<td>2147 (76.4)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-8</td>
<td>152 (20.6)</td>
<td>561 (20.0)</td>
<td>1.1 (0.9-1.3)</td>
<td>.549</td>
<td>1.0 (0.8-1.3)</td>
<td>.828</td>
</tr>
<tr>
<td>0-6</td>
<td>39 (5.3)</td>
<td>102 (3.6)</td>
<td>1.5 (1.01-2.2)</td>
<td>.044</td>
<td>1.5 (0.98-2.3)</td>
<td>.062</td>
</tr>
<tr>
<td>Induced labor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>617 (83.6)</td>
<td>2360 (84.0)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>121 (16.4)</td>
<td>571 (16.1)</td>
<td>1.0 (0.8-1.3)</td>
<td>.747</td>
<td>1.1 (0.9-1.4)</td>
<td>.408</td>
</tr>
<tr>
<td>Birth type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal cephalic</td>
<td>547 (74.1)</td>
<td>2173 (77.3)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum extractor/orceps/vaginal breech</td>
<td>63 (8.5)</td>
<td>178 (6.3)</td>
<td>1.4 (1.04-1.9)</td>
<td>.028</td>
<td>1.5 (1.1-2.1)</td>
<td>.020</td>
</tr>
<tr>
<td>Planned cesarean</td>
<td>58 (7.9)</td>
<td>220 (7.8)</td>
<td>1.0 (0.8-1.4)</td>
<td>.792</td>
<td>1.0 (0.7-1.4)</td>
<td>.982</td>
</tr>
<tr>
<td>Emergency/urgent cesarean</td>
<td>70 (9.5)</td>
<td>233 (8.3)</td>
<td>1.2 (0.9-1.6)</td>
<td>.204</td>
<td>1.1 (0.8-1.6)</td>
<td>.435</td>
</tr>
<tr>
<td>Unknown</td>
<td>0</td>
<td>6 (0.2)</td>
<td>N/A</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Birth presentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalic</td>
<td>695 (94.2)</td>
<td>2646 (94.2)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breech</td>
<td>23 (3.1)</td>
<td>66 (2.4)</td>
<td>1.3 (0.8-2.2)</td>
<td>.236</td>
<td>1.2 (0.7-2.0)</td>
<td>.536</td>
</tr>
<tr>
<td>Other</td>
<td>20 (2.7)</td>
<td>98 (3.5)</td>
<td>0.8 (0.5-1.3)</td>
<td>.294</td>
<td>0.8 (0.4-1.4)</td>
<td>.379</td>
</tr>
<tr>
<td>Neonatal treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>665 (90.1)</td>
<td>2583 (91.9)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring/NICU</td>
<td>73 (9.9)</td>
<td>227 (8.1)</td>
<td>1.3 (0.95-1.7)</td>
<td>.104</td>
<td>1.2 (0.9-1.6)</td>
<td>.210</td>
</tr>
<tr>
<td>Maternal high blood pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>699 (94.7)</td>
<td>2694 (95.9)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>39 (5.3)</td>
<td>116 (4.1)</td>
<td>1.3 (0.9-1.9)</td>
<td>.189</td>
<td>1.2 (0.8-1.8)</td>
<td>.384</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>414 (56.1)</td>
<td>1150 (41.0)</td>
<td>1.7 (1.4-2.0)</td>
<td>&lt;.001</td>
<td>1.8 (1.5-2.2)</td>
<td>.001</td>
</tr>
<tr>
<td>1-2</td>
<td>296 (40.1)</td>
<td>1406 (50.1)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥3</td>
<td>29 (3.8)</td>
<td>248 (8.6)</td>
<td>0.5 (0.3-0.8)</td>
<td>.002</td>
<td>0.5 (0.3-0.7)</td>
<td>.001</td>
</tr>
</tbody>
</table>

AGA, appropriate for gestational age; LGA, large for gestational age; NICU, neonatal intensive care unit; N/A, not applicable; SGA, small for gestational age.

*Adjusted with maternal age, maternal SES, maternal psychiatric history, paternal age, and paternal psychiatric history.
pressure were not associated with Tourette syndrome. Interestingly, associations between low birth weight and ADHD and autism, respectively, have been shown in several studies.6-9 Furthermore, small for gestational age, low Apgar and autism, respectively, have been shown in several obstetric and neonatal adversities, parity, and Tourette syndrome: a nationwide registry.

In conclusion, previously unrecognized factors as high birth weight and 3 or more previous births were associated with decreased odds for Tourette syndrome. In addition to examining the risk factors, identification of protective factors for Tourette syndrome may lead to better understanding of the etiology of the disorder. Further examination of the factors associated with prenatal growth or parity (eg, prenatal maternal nutrition, maternal hormonal levels during pregnancy, exposure to infections, or genetic factors) and their relationship with Tourette syndrome could help to clarify the nature of the detected associations.

We thank our colleagues at the Research Center for Child Psychiatry, University of Turku, particularly Juha-Pekka Virtanen, for data management. We thank Michael Doube, PhD, for assistance with language.

Submitted for publication Apr 11, 2015; last revision received Oct 6, 2015; accepted Oct 20, 2015.

Reprint requests: Susanna Leivonen, MD, Department of Child Psychiatry, University of Turku, 20014 Turun yliopisto, Turku, Finland. E-mail: susanna.leivonen@utu.fi

References


I n 1966, Helen Pryor described the use of charts to aid parental understanding of their child’s growth. Although Pryor used some variables and terms that are no longer used to define childhood growth (eg, “big boned” vs “small boned”), the challenge she described exists to this day. Parents get easily confused by the terminology we readily use as medical providers. In the study by Pryor, using charts and sharing a graphical description of growth points was found to improve parental understanding of childhood growth.

Numerous studies show that parents do not recognize when their children are above ideal body weight. Several challenges exist with using body mass index percentile (BMI%) even though it is the standard for discussing weight status with parents. Body composition, unexpected effects of greater height, and BMI rebound at age 4- to 6 years can make BMI% interpretation confusing for healthcare providers and parents. In an era when higher percentiles identify academic and athletic prowess, high BMI% may sound desirable to parents. Additionally, medical providers use BMI% to define the terms obese and overweight, but these terms have the potential to be off-putting or offensive to parents when not put into a clear medical context. Color-coded BMI charts to identify children in green (BMI% 5%-85%), yellow (BMI% 85%-95%), and red (BMI% >95%) zones have been shown as one way to enhance parent understanding of weight status.1 Other strategies are also being employed or are under development.

Whether BMI% remains the vernacular for discussing childhood weight status or whether it goes the way of “big boned” remains to be seen. Regardless, if we are to engage parents and other caregivers to meet the challenge of this nation’s pediatric obesity crisis, it is necessary for medical providers to use terminology and techniques that empower them and avoid those that stigmatize or confuse them.

Christopher F. Bolling, MD, FAAP
Division of General and Community Pediatrics
Department of Pediatrics
University of Cincinnati College of Medicine
Crestview Hills, Kentucky
http://dx.doi.org/10.1016/j.jpeds.2015.10.056

Reference