Birth defects incidence in children from single and twin pregnancies in the Czech Republic - current data

Horacek Jiri ¹, Sipek Antonin ², Gregor Vladimir ², Sipek Antonin jr ³, Langhammer Pavel ⁴

¹ Gennet Ltd, Prague, Czech Republic
² Dept of Medical Genetics, Thomayer’s University Hospital, Prague, Czech Republic
³ 1st Medical Faculty, Charles University, Prague, Czech Republic
⁴ Institute of Health Information and Statistics, Prague, Czech Republic

http://www.vrozenevady.cz
• **Aim of study:** An analysis of occurrence of birth defects in children from single and twin pregnancies in the Czech Republic in 1994 - 2007. An assessment of total numbers and relative incidences of birth defects in births according to 10\textsuperscript{th} Revision of International Classification of Diseases (ICD-10).

• **Type of study:** Retrospective epidemiological analysis of birth defects incidences from the Czech National Birth Defects Register database.
Material and methods:

• Data from the National Birth Defects Register (Institute for Health Information and Statistics) in the Czech Republic in the 1994 – 2007 period were used.

• In this study, particular diagnoses - as they were registered in the National Register - were analyzed.

• Birth defects were analyzed separately for children from single and twin pregnancies.
The diagnoses in study were divided into following eleven birth defects groups according to ICD-10 classification:

- (Q00 - Q07) nervous system,
- (Q10 - Q18) eye, ear, face and neck,
- (Q20 - Q28) circulatory system,
- (Q30 - Q34) respiratory system,
- (Q35 - Q37) cleft lip and cleft palate,
- (Q38 - Q45) digestive system,
- (Q50 - Q56) genital organs,
- (Q60 - Q64) urinary system,
- (Q65 - Q79) musculoskeletal system,
- (Q80 - Q89) other defects and
- (Q90 - Q99) chromosomal abnormalities, not elsewhere classified.

Total numbers and mean incidences of birth defects separately for children from single and twin pregnancies were assessed for all these 11 groups.
Statistical analysis

• For statistical evaluation confidence intervals were estimated. Confidence intervals for incidences were calculated per 10,000 livebirths from confidence limits for number of cases providing Poisson distribution.

• These limits were calculated using an exact method (Johnson, Kotz, 1969) in BD with less than 10 registered cases, in other BD Byar approximation (Breslow a Day, 1989) was used.

• Relative frequencies were compared using Z-statistics with arsin transformation based approximation.
Twins frequency
Czech Republic, 1994 – 2007

\[ y = 0.0138x - 27.47 \]
\[ r = 0.966 \]
Children born with birth defect according to multiplicity of pregnancy (singletons/twins), Czech Republic, 1994 – 2007

per 10 000 live births

- singletons
- twins
Diagnosed birth defects according to multiplicity of pregnancy
(singletons/twins), Czech Republic, 1994 – 2007

Singletons 1.50 of BD per child
Twins 1.56 of BD per child
Diagnosed birth defects according to multiplicity of pregnancy
(singleton/twins), Czech Republic, 1994 – 2007

Frequency of diagnoses groups - %

- Q90-Q99
- Q80-Q89
- Q65-Q79
- Q60-Q64
- Q50-Q56
- Q38-Q45
- Q35-Q37
- Q30-Q34
- Q20-Q28
- Q10-Q18
- Q00-Q07

singletons twins
Birth defects diagnosed in live births according to multiplicity of pregnancy (singleton/twins), Czech Republic, 1994 – 2007

Congenital malformations of the nervous system (Q00-Q07)

Number of congenital malformations of the nervous system per 10,000 live births by year and multiplicity of pregnancy.
Birth defects diagnosed in live births according to multiplicity of pregnancy (singletons/twins), Czech Republic, 1994 – 2007

Congenital malformations of the circulatory system (Q20-Q28)

per 10 000 live births

- **Singletons**
- **Twins**

Year:
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
Birth defects diagnosed in live births according to multiplicity of pregnancy (singletons/twins), Czech Republic, 1994 – 2007

Other congenital malformations of the digestive system (Q38-Q45)
Birth defects diagnosed in live births according to multiplicity of pregnancy (singletons/twins), Czech Republic, 1994 – 2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Singletons</th>
<th>Twins</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>1995</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>1996</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>1997</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>1998</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>1999</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>2000</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>2001</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>2002</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>2003</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2004</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>2005</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>2006</td>
<td>130</td>
<td>130</td>
</tr>
<tr>
<td>2007</td>
<td>140</td>
<td>140</td>
</tr>
</tbody>
</table>

Congenital malformations of the urinary system (Q60-Q64)

Graph showing the number of congenital malformations of the urinary system diagnosed per 10,000 live births for singletons and twins from 1994 to 2007.
Results

- In the Czech Republic during 1994 – 2007 period, totally 1 312 930 children were born (live births and stillbirths) from single pregnancies, whereas 42 448 from twin pregnancies.
- A twin rate (out of a total number of births) increased from 2.33 % in 1997 to 4.17 % in 2004.
- An overall incidence of diagnosed birth defects was 436.03 per 10 000 live births in singletons and 598.38 in twins.
- Birth defects incidence (per 10 000 live births) in singletons and twins in each of 11 birth defects groups under the study was during the 1994 – 2007 period as follows:
  - (Q00 - Q07) nervous system 9.45 in singletons and 17.20 in twins,
  - (Q10 - Q18) eye, ear, face and neck 21.69 in singletons, and 18.38 in twins,
  - (Q20 - Q28) circulatory system 154.16 in singletons and 272.57 in twins,
  - (Q30 - Q34) respiratory system 4.92 in singletons and 5.65 in twins,
  - (Q35 - Q37) cleft lip and cleft palate 16.79 in singletons and 20.02 in twins,
  - (Q38 - Q45) digestive system 18.97 in singletons and 28.74 in twins,
  - (Q50 - Q56) genital organs 52.07 in singletons and 56.30 in twins,
  - (Q60 - Q64) urinary system 34.21 in singletons and 56.78 in twins,
  - (Q65 - Q79) musculoskeletal system 87.49 in singletons and 90.93 in twins,
  - (Q80 - Q89) other defects 26.06 in singletons and 22.14 in twins and
  - (Q90 - Q99) chromosomal abnormalities 10.20 in singletons and 9.66 in twins.
Proportion of singletons and twins

Naturally conceived children group (NC) x IVF children group (IVF)

- **NC**:
  - Singletons: 96.94%
  - Twins: 3.06%

- **IVF**:
  - Singletons: 53.12%
  - Twins: 46.88%
Comparison of birth defects incidence

naturally conceived children group (NC) x IVF children group (IVF)

- Congenital malformations of the nervous system
- Congenital malformations of eye, ear, face and neck
- Congenital malformations of the circulatory system
- Congenital malformations of genital organs
- Congenital malformations of the urinary system
- Congenital malformations and deformations of the musculoskeletal system
- Cleft lip and cleft palate
- Other congenital malformations of the digestive system
- Other congenital malformations
- Chromosomal abnormalities, not elsewhere classified

Birth defects incidence in naturally conceived children (NC) and IVF children (IVF)
Conclusions I

• The study gives differentiated results of incidences of selected types of birth defects in births according to pregnancy multiplicity.

• A statistically significant difference (p< 0.001) in total birth defects incidence in twins compared to singletons was confirmed.

• Same statistical significance (p<0.001) was also found (twins compared to singletons) in following birth defects or their groups: (Q00 - Q07) nervous system, (Q20 - Q28) circulatory system, (Q38 - Q45) digestive system, (Q60 - Q64) urinary system.
Conclusions II

• Same statistical significance ($p<0.001$) was also found (twins compared to singletons) in following birth defects: congenital hydrocephalus, some congenital heart defects, cleft lip and/or palateoesophageal atresia, anorectal malformation, hypospadia, congenital hydronephrosis, polydactyly and syndactyly.

• A statistically significant difference ($p<0.01$) was found in spina bifida, hypoplastic left heart syndrome, duodenal atresia/stenosis, diaphragmatic hernia and Down syndrome.
We would like to express our thanks to all our colleagues and co-workers who have been and still are involved in birth defects reporting and data collecting in our country.