

## Aim

Caesarean delivery may disturb the colonization of microflora of the baby. Generally, the bacterial colonization starts with birth and is determined by environmental variables such as microflora of the vaginal flora. After CS colonization of the microflora of the infant may be delayed, which in turn may affect the maturation of the immune system. The aim of this study is to examine the association of caesarean section (CS) and the presence of asthma in twins.

Hypotheses:

- Asthma prevalence is larger in children born after CS compared to Ss born after vaginal delivery (VD).
- VD and CS differences in asthma prevalence are larger in first-born than in second-born twins.

## Participants & measures

- The study included about 8000 twins from an ongoing longitudinal study of the Netherlands Twin Registry (NTR) and born between 1990 and 1997.
- Shortly after birth of the twin, information about birth delivery, birth weight, gestational age and smoking behavior of the mother during pregnancy was acquired from a questionnaire filled in by the mother.
- Information about asthma and allergy was obtained at age 5 and 7. At age 5, the mother was asked about doctor-diagnosed asthma (yes/no) and at age 7 the mother was asked whether the diseases asthma could be applied to their twin (yes/no).
- The prevalence of asthma was compared between twins born after VD and after CS, separately for smoking and non-smoking mothers.

## Results

Table I: characteristics of the study population

|                                       | VD   |      | CS                   |                      | Asthma at age 5 (% yes) |                      |
|---------------------------------------|------|------|----------------------|----------------------|-------------------------|----------------------|
|                                       | %    | %    | 1 <sup>st</sup> born | 2 <sup>nd</sup> born | 1 <sup>st</sup> born    | 2 <sup>nd</sup> born |
| <b>gestational age</b>                |      |      |                      |                      |                         |                      |
| >=37 weeks                            | 63,0 | 57,7 | 7,2                  | 7,3                  |                         |                      |
| >32 weeks and < 37 weeks              | 31,4 | 33,8 | 10,5                 | 9,5                  |                         |                      |
| <=32 weeks                            | 5,6  | 8,4  | 15,4                 | 16,4                 |                         |                      |
| <b>age mother</b>                     |      |      |                      |                      |                         |                      |
| <30 years                             | 40,9 | 38,3 | 9                    | 8,5                  |                         |                      |
| <=30 and <34 years                    | 37,6 | 35,1 | 9                    | 8,5                  |                         |                      |
| >=34 years                            | 21,5 | 26,6 | 7,8                  | 9                    |                         |                      |
| <b>smoking during pregnancy</b>       |      |      |                      |                      |                         |                      |
| no                                    | 77,0 | 78,1 | 9,4                  | 9,0                  |                         |                      |
| pipes                                 | 0,3  | 0,1  | 10                   | 9,1                  |                         |                      |
| < 10 cigarettes                       | 17,7 | 18,4 | 10,2                 | 10,5                 |                         |                      |
| >10 cigarettes                        | 5,0  | 3,4  | 10,4                 | 11,6                 |                         |                      |
| <b>current smoking father (age 5)</b> |      |      |                      |                      |                         |                      |
| no                                    | 69,1 | 69,1 | 9,5                  | 7,9                  |                         |                      |
| yes                                   | 30,9 | 30,9 | 9,3                  | 10,1                 |                         |                      |
| <b>current smoking mother (age 5)</b> |      |      |                      |                      |                         |                      |
| no                                    | 73,6 | 72,3 | 8,6                  | 8,1                  |                         |                      |
| Yes                                   | 26,4 | 27,7 | 9,1                  | 9,9                  |                         |                      |
| <b>first child</b>                    |      |      |                      |                      |                         |                      |
| no                                    | 59,4 | 31,6 | 8,9                  | 7,9                  |                         |                      |
| yes                                   | 40,6 | 68,4 | 8,5                  | 9,3                  |                         |                      |
| <b>breast feeding</b>                 |      |      |                      |                      |                         |                      |
| no                                    | 46,8 | 49,5 | 9,3                  | 8,9                  |                         |                      |
| 1-6 weeks                             | 23,5 | 25,7 | 8,5                  | 8,4                  |                         |                      |
| 6 weeks - 6 months                    | 21,5 | 19,0 | 7,6                  | 8,5                  |                         |                      |
| > 6 months                            | 8,2  | 5,9  | 8,4                  | 7,7                  |                         |                      |
| <b>sex (1st born)</b>                 |      |      |                      |                      |                         |                      |
| Boys                                  | 48,9 | 49,3 | 10,4                 | 10,0                 |                         |                      |
| Girls                                 | 51,1 | 50,7 | 7,1                  | 7,3                  |                         |                      |
| <b>birthweight (1st born)</b>         |      |      |                      |                      |                         |                      |
| < 2000 gram                           | 14,4 | 19   | 12,2                 | 11,6                 |                         |                      |
| >= 2000 gram                          | 85,6 | 81   | 8,1                  | 8,0                  |                         |                      |

orange = frequencies differ significantly between groups VD and CS (p<0.05)

green = frequencies differ significantly between asthma and no asthma (p <0.05)

Table II: Association between mode of delivery and asthma.

|                           | CS %  | VD %  | odds ratio | Adjusted* odds ratio (95%CI) |
|---------------------------|-------|-------|------------|------------------------------|
| <b>non-smoking mother</b> |       |       |            |                              |
| <b>first born</b>         |       |       |            |                              |
| asthma at age 5           | 10,24 | 9,80  | 1,05       | 1,14 (0,90 - 1,45)           |
| asthma at age 5 & 7       | 4,28  | 4,32  | 1,01       | 1,07 (0,75 - 1,54)           |
| <b>second born</b>        |       |       |            |                              |
| asthma at age 5           | 8,99  | 9,81  | 0,91       | 0,82 (0,63 - 1,06)           |
| asthma at age 5 & 7       | 3,17  | 3,64  | 0,88       | 0,80 (0,52 - 1,23)           |
| <b>smoking mother</b>     |       |       |            |                              |
| <b>first born</b>         |       |       |            |                              |
| asthma at age 5           | 14,17 | 9,38  | 1,60       | 1,64 (1,06 - 2,52)           |
| asthma at age 5 & 7       | 6,89  | 4,59  | 1,54       | 1,90 (1,05 - 3,44)           |
| <b>second born</b>        |       |       |            |                              |
| asthma at age 5           | 12,96 | 10,12 | 1,32       | 1,31 (0,83 - 2,05)           |
| asthma at age 5 & 7       | 6,20  | 4,09  | 1,16       | 1,40 (0,73 - 2,67)           |

\* = adjusted for sex, gestational age, age mother, breastfeeding, firstchild (yes/no)

## Conclusion

- The association between CS and asthma is seen in first-born twins, but is only significant in Ss whose mother smoked during pregnancy.
- The risk for asthma after CS was smaller for second born twins than for first born twins.
- The risk for asthma after VD differ very little between first and second born twins.