Cohort study

Among infants at hereditary risk for type 1 diabetes, the introduction of solid foods before or after 4–5 months of age is associated with increased diabetes risk

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Lagerros Trolle Ylva

Department of Medicine, Unit of Clinical Epidemiology, Karolinska Instituet, Stockholm, Sweden

Correspondence to: Dr Lagerros Trolle Ylva, Department of Medicine, Unit of Clinical Epidemiology, Karolinska Institutet, T2, Stockholm SE 171 76, Sweden; ylva.trolle@ki.se

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Implications for practice and research

- The safe age to introduce solid foods in children genetically susceptible for type 1 diabetes is between 4 and 5 months of age.
- Continued breastfeeding during the introduction of solid foods may reduce the risk of type 1 diabetes.
- Large prospective studies are still required to disentangle the associations between perinatal and infant food exposures and type 1diabetes.

Context

While the increasing incidence of type 2 diabetes in children is receiving much attention, the predicted doubling of new type 1 diabetes cases younger than 5 years between 2005 and 2020 is also worrisome.[1] Environmental factors, such as the timing of introducing solid foods to infants, have been on the agenda in the search for reasons for the rapid rise in type 1 diabetes in children. However, results from retrospective studies are inconclusive. Frederiksen and colleagues prospectively assessed infant diet in a birth cohort of children who were at increased genetic risk for type 1 diabetes.

Methods

The Diabetes Autoimmunity Study in the Young (DAISY) is a prospective observational cohort study set in Colorado, USA, investigating genetic and environmental risk factors for developing type 1 diabetes. Cohort studies follow exposed and non-exposed individuals to track their outcomes over time. Two groups of children with an increased risk of type 1 diabetes were followed: children with either a parent or a sibling with diabetes, and children without a parent or a sibling with diabetes but at genetic risk (human leucocyte antigen (HLA) genotype identified by umbilical cord blood). The children were all enrolled at birth.

Infant diet was assessed during face-to-face or telephone interviews at 3, 6, 9, 12 and 15 months of age. Of special interest were numbers of breast milk feeding months and if the child was breastfed during the introduction of solid foods. Cox proportional hazard models to estimate HR with 95% CIs were used to analyse data. Covariates considered as potential confounding factors were: HLA, first relative with type 1 diabetes, mode of delivery, gender, race/ethnicity and maternal age and education.

Findings

The DAISY cohort comprised 2547 genetically susceptible children; complete exposure data was assessed in 1835 children for this study. From these, 53 children developed type 1 diabetes during follow-up. Both early (<4 months) and late (≥6 months) introduction to solid foods were associated with greater risk of developing type 1 diabetes (<4 months: HR=1.91, 95% CI 1.04 to 3.51; ≥6 months: HR=3.02, 95% CI 1.26 to 7.24), adjusting for first relative with type 1 diabetes, HLA genotype, mode of delivery and maternal education. More specifically, early exposure to fruit (HR=2.23, 95% CI 1.14 to 4.39) and late exposure to rice or oats (HR=2.88, 95% CI 1.36 to 6.11) increased the risk of type 1 diabetes. Timing of the introduction to vegetables and meat was not associated with type 1 diabetes. Furthermore, if wheat or barley was introduced while the child was still breastfed, a significantly lower risk for type 1 diabetes was observed.

Commentary

Frederiksen and colleagues found that introducing solid foods between 4 and 6 months of age conferred the lowest risk of type 1 diabetes. This is in line with the results of another prospective study, where the introduction to root vegetables before the age of 4 months was associated with islet autoimmunity, the preclinical stage of type 1 diabetes.[2] A strength of both studies is the fact that diet was assessed prospectively every third month, starting at birth. Given that diabetes may occur many years later, it is unlikely that parents would be able to accurately remember the timing of introduction of different foods to the same detailed degree when asked at the time of diagnosis, as in a retrospective study.

Frederiksen and colleagues noted that mothers with high education achievement were more likely to breastfeed for longer and introduced solid foods later; the findings were adjusted for maternal education. The distribution of ages at first exposure to solid foods was also explored; almost half of the children (42.3%) were introduced to rice or oats, the most common first solid foods introduced in this cohort on the day of their 6-month birthday. Birthdays seem to be yardsticks in decisions about diet. Consequently similar age cut-offs are important when comparing studies in this type of research.

Despite a fairly low number of children developing type 1 diabetes during follow-up, the results add to our understanding of the complexity of timing, type of food exposures and type 1 diabetes risk. Nevertheless, the American Academy of Pediatrics' recommendation to introduce solid foods between 4 and 6 months of age still holds. To promote these recommendations, it is important that health professionals in contact with infants explore the infant's diet with parents.

Competing interests None.

References

1. **Patterson CC**, Dahlquist GG, Gyurus E, *et al*. Incidence trends for childhood type 1 diabetes in Europe during 1989–2003 and predicted new cases 2005–20: a multicentre prospective registration study. *Lancet* 2009;**373**:2027–33.
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