Infection and vaccination in childhood and risk of allergy and multiple sclerosis

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ABSTRACT

The PhD study was carried out at the Department of Epidemiology Research, Statens Serum Institut Copenhagen. Addressed are two recognised hypotheses on the aetiology of allergy and multiple sclerosis (MS), which both suggest a possible association between age at childhood infections and later development of the diseases. The study is among others based on a large material of school health records from the capital of Denmark with very accurate information on age at specific infections recalled in childhood and thus long before MS onset and often before development of allergic disease.

The hygiene hypothesis suggests that the rise in allergy in Western countries is due to a more hygienic lifestyle, which has led to a lower prevalence of infections in early life when the immune system matures. It is biologically possible that early age at infection, and also early age at specific vaccinations, might have protected against allergy and asthma, and this hypothesis is investigated for selected childhood infections and vaccinations mentioned below (studies I-III). The hypothesis is also investigated using number of older siblings as an approximation of age at infection (study IV). A parallel hypothesis suggests that babies born by cesarean section are at increased risk of allergy and asthma because they have a disturbed intestinal flora since they are not exposed to bacteria from the mother's vaginal and perianal parts during birth, but only to bacteria from the hospital environment. We therefore investigated whether the risk of allergy and asthma is associated with cesarean delivery (study IV).

The cause of the relatively rare but disabling neurological disease MS is unknown. Genetic factors are of importance. A possible infectious aetiology has been suspected, and epidemiological studies suggest that environmental exposures occurring in late childhood or early adulthood are of particular importance to the development of MS. In particular, it has been suggested that MS could be the result of an aberrant immune response possibly triggered by delayed age at a childhood infection. Because the vast majority of previous studies testing this hypothesis used information on age at infection recalled years to decades later in adulthood, we addressed the hypothesis using information on age at the infections mentioned below recalled already in childhood (study V). In addition, we investigated whether children who later in life develop MS often had attended the same school classes (study V), and whether the number of older siblings is associated with risk of MS in the Danish population (study VI).

MATERIALS AND METHODS

In the allergy and MS studies we collected school health records for persons who had attended school in the capital from 1940 or later, and for whom we also had information on allergy and MS. There was overall three allergy studies of 2224 women, and one study of 455 MS cases and their 1801 controls. The school health records contained information on age at measles, varicella, mumps, rubella, pertussis, scarlet fever, tuberculoses- and smallpox vaccination. Information on allergy was obtained from pregnant women, who participated in a Danish national birth cohort study (DNBC) from 1997 to 2001: Atopic status was determined by a specific response to 11 inhalant allergens using blood samples obtained during pregnancy, and also information on doctor-diagnosed allergic rhinitis and asthma was obtained from telephone interviews with the women during pregnancy. Furthermore, women in DNBC also registered in the Danish Medical Birth Register and born from 1973 to 1977 were included in a study of mode of delivery and risk of allergic rhinitis and asthma (n=9722). In both the allergy and MS studies information on number of older siblings was obtained from Danish Civil Registration System.

RESULTS

The allergy studies showed that early age at the above-mentioned childhood infections and vaccinations were not associated with a reduced risk of atopy, allergic rhinitis, or asthma. Being born by cesarean section was not associated with an increased risk of allergic rhinitis (OR 1.2, CI 95% 0.9-1.5), but with a slightly increased risk of asthma up until young adulthood (OR 1.3, CI 95% 1.0-1.7). There was an association between number of older siblings and risk of allergic rhinitis, but not with risk of asthma.

The MS studies showed that late age at the studied infections was not associated with increased risk of MS and there was no association with the number of infections acquired late in childhood (age 10-14 years). In addition, there was no clustering of MS among classmates. There was no inverse association between number of older siblings and risk of MS in the Danish population (study VI).

CONCLUSION

For allergy, the results do not support the hypothesis that early age at the studied childhood infections and vaccinations is important in the development of atopy, allergic rhinitis, or asthma. Being born by cesarean section was not associated with increased risk of allergic rhinitis, but asthma, which together does not support the addressed hypothesis. The explanation to the association with asthma remains unclear. The finding of an inverse association between number of older siblings and risk of allergic rhinitis, but not asthma, is consistent with previous findings.

For MS, the results do not support the hypothesis that late age at the studied infections or number of older siblings influences the development of MS.