Symposium 1: What do we learn from birth cohort study?

What do we learn from birth cohort study? Indoor and outdoor environment for the development of allergic diseases

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Cohort studies are considered to be the best available scientific method for measuring the effects of a suspected risk factor. The prospective and longitudinal observation of a birth cohort allows the evaluation of exposure to certain environmental factors from prenatal or early life, while cross-sectional or case-control studies just reveal possible associations between exposure factors and the development of diseases.[1] Various prospective birth cohort studies have been performed to evaluate the natural course of allergic diseases and to identify early risk factors, because the early symptoms of atopic diseases are often found in infancy and early childhood.

Previous birth cohort studies have revealed positive associations between various environmental risk factors and asthma by following babies and children. It is presumed that environmental factors including air pollution during prenatal period induce fetal oxidative stress and affect the developing respiratory system. For example, a birth cohort study in the USA showed that increased exposure to particulate matter with a diameter less than or equal to 2.5 μm ($PM_{2.5}$) at 16-25 weeks gestation was associated with the development of early childhood asthma (OR [odds ratio], 1.3).[2] The GINI (German Infant Nutritional Intervention) study and the LISA (Influences of Lifestyle-related Factors on the Immune System and the Development of Allergies in East and West Germany) study in the Munich metropolitan area used a pool of geographical information systems variables and reported significant association between nitrogen dioxide at birth address and dry cough at night during the first year of life.[3]

In addition, birth cohort studies have suggested that both indoor and outdoor environmental factors were associated with the development of atopic dermatitis (AD). Two birth cohort studies showed strong positive relationship between the distance to the nearest main road and AD.[4] They also demonstrated that NO_2 exposure was positively associated with physician-diagnosed eczema (OR, 1.2). In a German birth cohort

study, redecorating activities, such as painting, floor covering, and new furniture, before birth and in the first year of life increased the risk of AD development during the study period of 6 years (OR, 1.9).[5] In particular, prenatal exposure to environmental tobacco smoke is likely to induce a Th2-shifted immunity or the development of AD after birth.[6-8]

In our prospective birth cohort study, we followed 75 infants in a risk group and 12 in a control group for 2 years.[9] Tape stripping was done on the volar surface of the baby's forearm at 2 months, and epidermal protein levels were measured by mass spectrometry. The cumulative incidence of AD was higher in the risk group than in the control group at 24 months (64.8% vs 16.7%). When the expression of thymic stromal lymphopoietin (TSLP) was added to family history in a logistic regression model, OR for AD development was higher in children with family history and high TSLP expression than in those with family history alone (OR, 20.2 vs. 12.6). Our results suggest that the avoidance of environmental factors to increase TSLP level during pregnancy and during early infancy could be a part of primary preventive measures.

References

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