Association of active and passive smoking with allergic disorders in pregnant Japanese women: baseline data from the Osaka Maternal and Child Health Study

Yoshihiro Miyake, MD, PhD*; Shoichi Miyamoto, MBA†; Yukihiro Ohya, MD, PhD‡; Satoshi Sasaki, MD, PhD§; Ichiro Matsunaga, ME¶; Toshiaki Yoshida, PhD¶; Yoshio Hirota, MD, PhD†; and Hajime Oda, MD, PhD¶; for the Osaka Maternal and Child Health Study Group

Background: Evidence remains inconclusive as to whether smoking is a risk factor for allergic disorders in adults.

Objective: To investigate the relationship between active and passive smoking exposure and allergic disorders in pregnant Japanese women.

Methods: This cross-sectional study included 1,002 pregnant women. Participants were classified as having asthma after the age of 18 years if they had used an asthma medication at any time after reaching the age of 18 years. Current atopic eczema and allergic rhinitis (including cedar pollinosis) were defined as being present if participants had received any drug treatment during the previous 12 months. Adjustment was made for age; gestation; parity; family history of asthma, atopic eczema, and allergic rhinitis; indoor domestic pets; family income; education; and the mite antigen level in house dust.

Results: Current smoking, but not environmental tobacco smoke exposure, was independently related to an increased prevalence of asthma after the age of 18 years (adjusted odds ratio [OR], 2.66; 95% confidence interval [CI], 1.30–5.38). A significant positive association of current passive smoking exposure at home (adjusted OR, 1.89; 95% CI, 1.10–3.30) and at work (adjusted OR, 2.50; 95% CI, 1.29–4.76) with the prevalence of current allergic rhinitis was observed, whereas no measurable association with active smoking exposure was found. Neither active nor passive smoking was statistically significantly related to the prevalence of current atopic eczema.

Conclusions: These findings suggest that active smoking and environmental tobacco smoke exposure may increase the likelihood of asthma and allergic rhinitis, respectively, in pregnant Japanese women.

Ann Allergy Asthma Immunol. 2005;94:644–651.

INTRODUCTION

Although many epidemiologic studies[1–16] have investigated a possible association between exposure to tobacco smoke and allergic disorders, evidence remains inconclusive as to whether smoking is a risk factor for allergic disorders, especially in adults. A prospective study[1] in Swedish adults showed that current and former smoking presented significant risk factors for self-reported asthma compared with nonsmok-

* Department of Public Health, Fukuoka University School of Medicine, Fukuoka, Japan.
† Department of Public Health, Osaka City University School of Medicine, Osaka, Japan.
‡ Division of Allergy, Department of Medical Specialties, National Center for Child Health and Development, Tokyo, Japan.
§ Project of Scientific Evaluation of Dietary Reference Intakes, National Institute of Health and Nutrition, Tokyo, Japan.
¶ Osaka Prefectural Institute of Public Health, Osaka, Japan.
The other members of the Osaka Maternal and Child Health Study Group are as follows: Hideharu Kanzaki, MD, PhD, and Mitsuyoshi Kitada, MD, PhD (Department of Obstetrics and Gynecology, Kansai Medical University); Yorihiko Horikoshi, MD, PhD (Department of Obstetrics and Gynecology, Kansai Medical University Kori); Osamu Ishiko, MD, PhD, Yuichiro Nakai, MD, PhD, Junko Nishio, MD, PhD, and Seiichi Yamamasu, MD, PhD (Department of Obstetrics and Gynecology, Osaka City University Graduate School of Medicine); Jinsuke Yasuda, MD, PhD (Department of Obstetrics and Gynecology, Matsushita Memorial Hospital); Seigo Kawai, MD, PhD (Department of Obstetrics and Gynecology, Hoshigaoka Koseinenkin Hospital); Kazumi Yanagihara, MD, PhD (Yanagihara Clinic); Koji Wakuda, MD, PhD (Department of Obstetrics and Gynecology, Fujimoto Hospital); Tokio Kawashima, MD, PhD (Kyohritsu Women's Clinic); Katsuhiko Narimoto, MD, PhD (Ishida Hospital Obstetrics, Gynecology); Yoshihiko Iwasa, MD, PhD (Iwasa Women's Clinic); Katsuhiko Orino, MD, PhD (Orino Lady's Clinic); Itsuo Tsunetoh, MD, PhD (Tsunetoh Obstetrics and Gynecology); Junichi Yoshida, MD, PhD (Yoshida Clinic); Junichi Iito, MD, PhD (Iito Obstetrics and Gynecology Clinic); Takuzi Kaneko, MD, PhD (Kaneko Sanfujinka); Takao Kamiya, MD, PhD (Kamiya Ladies Clinic); Hiroyuki Kuribayashi, MD, PhD (Kuribayashi Clinic); Takeshi Taniguchi, MD, PhD (Taniguchi Hospital); Hideo Takemura, MD, PhD (Kosaka Women's Hospital); and Yasuhiko Morimoto, MD, PhD (Aizenbashi Hospital).
This study was supported by a Grant-in-Aid (13770206) for Scientific Research from the Ministry of Education, Culture, Sports, Science, and Technology and by Health and Labour Sciences Research Grants from the Ministry of Health, Labour, and Welfare, Japan.
Received for publication July 5, 2004.
Accepted for publication in revised form January 31, 2005.

ing. The National Population Health Survey in Canada demonstrated that the incidence of asthma was not related to smoking status in males and females 12 years and older, although a significant positive association between smoking and asthma was observed among females who had pets at home.[2] The Nurses' Health Study found that current smokers were at lower risk for asthma than women who had never smoked and that the risk of asthma in past smokers was initially elevated but decreased as the time since they quit smoking increased.[3] The healthy smoker effect may have concealed true increases in the risk of asthma in relation to smoking in that study, however. Few epidemiologic studies[4–6,15,16] have reported a relationship between smoking habits and atopic eczema and allergic rhinitis in adults.

On the other hand, limited epidemiologic studies[5,6,17–21] have examined the relationship between exposure to environmental tobacco smoke (ETS) and allergic disorders in adults. A cross-sectional study[17] in Swiss adults who had never smoked found that passive smoking exposure at home or at work was significantly associated with an increased prevalence of physician-diagnosed asthma, with evidence of a dose-dependent increase with hours per day of exposure. There was no measurable relationship between exposure to ETS and allergic rhinitis in cross-sectional studies in Switzerland[17] and Singapore[6] or in the European Community Respiratory Health Survey.[21]

In view of the scarcity of epidemiologic information regarding the relationship between exposure to smoking and allergic disorders in Japan, we analyzed baseline data from the Osaka Maternal and Child Health Study to investigate the effects of active and passive smoking on the prevalence of asthma, atopic eczema, and allergic rhinitis in pregnant Japanese women using a cross-sectional design. In pregnant women, a significant positive association between active, but not passive, smoking and total serum IgE levels was reported in a previous study,[22] whereas spousal smoking was significantly positively related to maternal total IgE levels in France.[23]

METHODS

Study Population

The Osaka Maternal and Child Health Study is an ongoing prospective cohort study that investigates preventive and risk factors for maternal and child health problems, such as allergic disorders and postpartum depression. The Osaka Maternal and Child Health Study consists of a baseline survey completed by pregnant women and several postnatal follow-up surveys. In Japan, when women become pregnant, they notify the municipality of the domicile of the conception and the municipality provides them with a maternal and child health handbook. Eligible women were those who became pregnant in Neyagawa City, which is 1 of the 44 municipalities in Osaka Prefecture, a metropolis in Japan with a total population of approximately 8.8 million. Between November 1, 2001, and March 31, 2003, all pregnant women received a set of leaflets explaining the study, an application form, and a self-addressed and stamped return envelop along with the maternal and child health handbook from the Neyagawa City government. Research technicians asked all of the eligible women to participate in this study by telephone, excluding pregnant women who had already returned the application form to the data management center. Of the 3,639 eligible women, 627 (17.2%) in Neyagawa City took part in this study. Eight pregnant women who did not live in Neyagawa City but who had become aware of the study at an obstetric clinic before August 2002 decided by themselves to participate in this study. Also, there were 77 participants who received explanations regarding the Osaka Maternal and Child Health Study from public health nurses in 6 other municipalities between August 1, 2002, and March 31, 2003. Between October 1, 2002, and March 31, 2003, 290 participants were recruited from a university hospital and 3 obstetric hospitals in 3 other municipalities; these women were recommended for participation in the Osaka Maternal and Child Health Study by an obstetrician. Finally, a total of 1,002 pregnant women gave their fully informed consent in writing and completed a baseline survey. The ethics committees of the Osaka City University School of Medicine and the Osaka Prefectural Institute of Public Health approved this study.

Measurements

In the baseline survey, each participant filled out a set of 2 self-administered questionnaires, put a passive diffusion sampling tube on her clothes for 24 hours on a usual day to measure concentrations of nitrogen dioxide and formaldehyde, and collected 2 dust samples from a 1-m^2 area of the bedclothes and flooring for 1 minute using a vacuum cleaner fitted with a collection apparatus. Participants then mailed these materials to the data management center. Research technicians completed missing or illogical data by telephone interview.

One of the self-administered questionnaires elicited information on age; gestation; parity; indoor domestic pets; family income; education; personal history of asthma, atopic eczema, and allergic rhinitis; family history of asthma, atopic eczema, and allergic rhinitis; smoking habits; and passive smoking exposure. Current asthma, atopic eczema, and allergic rhinitis (including cedar pollinosis) were defined as being present if participants had been treated with medications at some time in the previous 12 months, although data on the types of medications and the duration of their use were not available. Participants were classified as having asthma after the age of 18 years if they had used an asthma medication at any time after reaching the age of 18 years. A family history of asthma, atopic eczema, and allergic rhinitis (including cedar pollinosis) was considered to be present if 1 or more parents or siblings of the study participant had manifested any of these allergic disorders.

Antigen levels from extracts of fine dust fractions were measured using a double-antibody sandwich enzyme-linked immunosorbent assay using a soluble antigen prepared from whole *Dermatophagoides farinae* mite bodies as a reference standard and were expressed as antigen equivalent in micro-