

Table 1

Clinical and demographic characteristics of the study and control patients

Characteristic	Peach allergic patients	Apple allergic patients	Nonatopic controls	Atopic controls
No. of patients	86	34	43	37
Age, mean (SD), y	29.7 (9.1)	29.6 (8.7)	47.3 (15.4)	39 (14.2)
Male sex, %	28.2	27.7	25.6	37.8
Symptoms with the triggering fruit, No. (%)				
OAS	34 (40)	13 (38)		
SS	31 (36)	15 (44)		
Anaphylaxis	21 (24)	6 (18)		
slgE to fruit, median (IQR), kU _A /L	5.51 (1.83–10.1)	2.65 (1.28–4.95)		
Patients with ISAC slgE Pru p 1 >0.3 ISU, No. (%)	4 (5)	3 (9)	0	0
ISAC slgE Pru p 1, median (IQR), ISU	6.41 (0.92–13.53)	11.85 (1.04–24.37)		
Patients with ISAC slgE Pru p 3 >0.3 ISU, No. (%)	76 (88)	30 (88)	0	1 (3)
ISAC slgE Pru p 3, median (IQR), ISU	2.55 (1.21–5.46)	2.71 (1.27–5.32)		0.36
Patients with ISAC slgE Mal d 1 >0.3 ISU	4 (5)	3 (8)	0	0
ISAC slgE Mal d 1, median (IQR), ISU	10.26 (3.63–18.51)	21.49 (4.76–43.77)		

Abbreviations: IQR, interquartile range; ISAC, ImmunoCAP ISAC 112; ISU, ISAC standardized units; OAS, oral allergy syndrome; SPT, skin prick test; SS, systemic symptoms.

However, regarding the diagnosis of apple allergy, we suggest that Mal d 3 be included in the allergen panel to identify the recognition pattern of the allergic patients and its correlation with the clinical manifestations⁵ in the Mediterranean population. In addition, we believe that considering the slgE to Pru p 3 would improve the performance of ISAC in the diagnosis of apple allergy in the Mediterranean area.

Finally, the limitations of our study include the lack of oral food challenge test due to financial constraints. Further studies are needed to evaluate the usefulness of ISAC in the diagnosis of other fruits allergies.

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Association between healthy eating in pregnancy and allergic status of the offspring in childhood



During the past few decades there has been a steady increase in the prevalence of noncommunicable diseases, including allergic

Disclosures: Authors have nothing to disclose.

Funding Sources: The birth cohort was funded by project grant T07023 from the Food Standards Agency. The 10-year follow-up was funded by a National Institute for Health Research—funded postdoctorate fellowship awarded to Dr Venter. This research also forms part of Ms Moonesinghe's PhD studies for which the Fish-monger's Company provide a small contribution.

disease. Changing lifestyle and subsequent diet may explain this increase seen in the prevalence of atopic disease. Epidemiologic evidence also suggests that diet may be key in the prevention of allergic disease.¹ There are 3 important characteristics in terms of the maternal diet that have been investigated for the prevention of allergic disease: (1) the role of particular nutrients, such as vitamins (A, D, and E), zinc, and fatty acids; (2) the role of particular foods, such as fruits and vegetables and fish; and (3) the total dietary intake, such as a Mediterranean diet or a healthy diet.

Research using the healthy eating index tool, specific to the pregnancy diet, found no association between overall healthy eating score and recurrent wheeze in infants at the age of 3 years.² However, maternal intake of celery and citrus fruit specifically has been associated with an increased risk of sensitization to food allergens in 2-year-olds.³ One case-control study found no effect of consumption of fish, butter, and margarine on the development of atopic sensitization in the offspring of allergic mothers; however, a protective effect of fish intake (2–3 times a week or more) was identified in the nonallergic mothers' group with the risk of food sensitization in the offspring reduced by greater than a third.⁴ Thus, the question is whether the associations seen are due to the individual nutrients or foods or whether it is part of an overall nutritional composition of the weaning diet. In this study, we aimed to investigate whether maternal diet, specifically seafood intake during pregnancy, is associated with the infant's allergic outcomes in a well-characterized birth cohort with allergy at 3 and 10 years of age.

The Food Allergy and Intolerance Research (FAIR) study method has been described previously.⁵ In short, pregnant women with an estimated delivery time during September 1, 2001, through August 31, 2002, were approached at antenatal clinics on the Isle of Wight. The study comprised a whole population birth cohort (FAIR). Ethical approval for the study was obtained from the Isle of Wight, Portsmouth, and South East Hampshire Local Research Ethics Committee and the National Research Ethics Service South Central–Southampton B Research Ethics Committee. After consent, a validated food frequency questionnaire was completed at 36 weeks' gestation. At 3, 6, and 9 months, as well as 1, 2, 3, and 10 years, information regarding feeding practices and reported symptoms of allergic disease in the offspring was obtained using a standardized questionnaire. We adapted the Alternative Healthy Eating Index (AHEI-P)⁶ suited for pregnancy for our study. The AHEI-P is a 90-point scale with the following 9 components contributing 10 maximum points each: vegetables, fruit, ratio of white to red meat, fiber, trans fat, ratio of polyunsaturated to saturated fatty acids, folate, calcium, and iron from foods. For the purpose of this study, an allergy-focused healthy eating indicator with a score of 70 was devised using the same scoring system as above for the following intake of nutrients, which influence allergy outcomes.^{1,7} (wheat and fiber = 10, fruit and vegetables = 10, calcium = 10, iron = 10, white fish = 10, oily fish = 10, omega 3 fatty acids = 10).

The original birth cohort consisted of 969 pregnant women (91% of the target population). The age of the pregnant women ranged from 15 to 44 years old, with a mean age of 27 years 10 months. Maternal history of allergy was reported in 558 mothers (57.6%).

Frequency of intake of foods during pregnancy, as determined by the validated food frequency questionnaire, was available from 937 mothers. Most mothers consumed white fish during pregnancy (85.2%), 44.8% consumed oily fish, and 38.4% consumed shellfish. Healthy eating indicator scores were low, with most mothers scoring 10 to 20 points of a possible 70 (79.3%).

Healthy eating indicator (Table 1) as a continuous score was not significantly associated at 3 years of age with atopy (odds ratio [OR], 1.005; 95% confidence interval [CI], 0.978–1.032; $P = .74$) or allergic disease (OR, 1.001; 95% CI, 0.986–1.016; $P = .91$). This was also the case at 10 years of age for atopy (OR, 1.013; 95% CI, 0.992–1.034; $P = .23$) and allergic disease (OR, 1.004; 95% CI, 0.989–1.019; $P = .62$). White fish consumption and shellfish consumption by itself (Table 1) were not significantly associated with any of the allergy outcomes at 3 and 10 years of age. However, moderate to frequent consumption of oily fish was significantly associated with atopy at 3 years (OR, 1.751; 95% CI, 1.063–2.887; $P = .03$).

In summary, maternal food intake and the consumption of white fish and shellfish were not found to be associated with sensitization or allergic disease during childhood. However, maternal consumption of oily fish was found to be a risk for atopy at 3 years of age and allergic disease at 10 years of age; this finding remained significant after controlling for the presence of allergic history in the mother. In terms of healthy eating in pregnancy, Nurmatov et al¹ concluded that although epidemiologic data are weak, there is support for vitamins A, D, and E, zinc, fruits and vegetables, and a Mediterranean diet being preventive of asthma. However, similar to our results, Lange et al² found no association with overall healthy eating during pregnancy and recurrent wheeze. With regard to the consumption of fish and shellfish, it has been hypothesized that because oily fish contains eicosapentaenoic acid, which inhibits the formation of prostaglandin E₂, maternal consumption may be protective against allergic disease. Equally fatty fish consumption during pregnancy is hypothesized to reduce the child's allergy risk by modulating early-life immune development.⁸ In the present study, no associations of maternal white fish and shellfish consumption with risk of atopy or allergic disease in the offspring were found. Surprisingly, we found that moderate to frequent consumption of oily fish increased the risk of atopy at 3 years. These results conflict with previous studies, which mainly, however not solely, suggest that maternal fish intake during pregnancy is protective against the development of asthma and atopy.^{3,4,8–10} A possible explanation for this finding is that the beneficial effects of n-3 polyunsaturated fatty acids could be counterbalanced with the harmful impact of pollution of seafood

Table 1
Maternal healthy eating indicator score and fish/shellfish consumption and risks of atopy, allergic disease, and food allergy

Variable	OR (95% CI)			
	Atopy at 3 years	Atopy at 10 years	Allergic disease at 3 years	Allergic disease at 10 years
Healthy eating index	1.005 (0.978–1.032)	1.013 (0.992–1.034)	1.001 (0.986–1.016)	1.004 (0.989–1.019)
White fish consumption				
No	1	1	1	1
Moderate or frequent	1.234 (.569–2.676)	1.074 (0.591–1.950)	.871 (0.572–1.326)	.871 (0.562–1.351)
Oily fish consumption				
No	1	1	1	1
Moderate to frequent	1.751 (1.063–2.887)^a	1.348 (0.922–1.970)	1.015 (.777–1.325)	1.320 (0.997–1.747)^a
Shellfish consumption				
No	1	1	1	1
Moderate or frequent	1.096 (0.673–1.786)	.915 (0.623–1.346)	.990 (0.754–1.299)	.996 (0.751–1.322)
Maternal allergy				
No	1	1	1	1
Yes	1.651 (0.988–2.759)	1.839 (1.236–2.737)	1.589 (1.213–2.082)	1.270 (0.961–1.678)

Abbreviations: CI, confidence interval; OR, odds ratio.

^aAdjusted for maternal allergy. Bold indicates statistically significant at $P < .05$.

because the concentration of contaminants is higher in fatty fish and shellfish than in lean fish. Further research is needed to explore if the observed results could be replicated.

Acknowledgments

We acknowledge the cooperation of the children and parents who have participated in this study. We also thank Linda Terry and Lisa Matthews for their considerable assistance with many aspects of this study.

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Cost analysis of asthma maintenance medications in a veteran population



Asthma is a disease that is characterized by hyperresponsiveness of bronchi due to various stimuli. An estimated 22.9 million Americans have asthma. Asthma accounts for 17 million ambulatory care visits and 456,000 hospitalizations per year.¹ It affects 7.7% of US adults and 9.4% of US children.² In the United States, in 2007, the annual total economic burden of asthma-related cost is estimated to be \$56 billion.³ Previous reports have found that economic burden of asthma increases with severity of the disease, and poorly controlled disease results in even higher costs.

Both the Global Initiative for Asthma and the National Asthma Education Prevention Program (NAEPP) guidelines emphasize stepwise management of asthma based on disease severity.^{4,5} The current asthma guidelines recommend daily use of asthma controller medications to achieve and maintain control of persistent asthma. The preferred initial treatment is inhaled corticosteroids (ICSs), with leukotriene modifiers listed as an alternative controller. The recommendations are based on data from controlled trials in which ICSs, when compared with long-acting β -agonists (LABAs) alone, have produced significantly greater clinical improvement, such as peak expiratory flow, percentage of symptom-free days, and percentage of rescue-free days.⁶

However, estimates of efficiency from tightly controlled clinical trials may not translate to clinical practice, particularly when real-world asthma medication adherence plays an important role. One of the most important factors influencing adherence is the cost of controller medications. Controller medications are expensive and can be a barrier to optimal control. Poor baseline asthma control often results in higher total health care cost due to exacerbations.⁷

A retrospective clinical database analysis was performed using a computerized clinical database at the Veterans Affairs (VA) West Los Angeles Hospital, Allergy/Immunology Clinic. Patients who

presented to the clinic between July and August 2009 were identified. Inclusion criteria was defined by (1) diagnosis of persistent and well-controlled asthma as defined by NAEPP criteria and (2) use of ICSs or combination ICSs and LABAs. Exclusion criteria included patients receiving omalizumab and/or allergen immunotherapy. The number of asthma maintenance medications, such as montelukast, ICSs, LABAs, and ICS-LABA combination, were collected. Patients were divided into 3 groups of disease severity based on type of controller medication used. The groups were use of low- to medium-dose ICSs, use of high-dose ICSs, and use of ICS-LABA combination. Cost of asthma medications were calculated based on VA West Los Angeles Pharmacy pricing. Costs of emergency department visits, office visits, and hospitalizations were not included. SAS statistical software (SAS Institute Inc, Cary, North Carolina) was used for data analysis.

A total of 112 patients were recruited, of whom 99 patients met the inclusion criteria. The mean age of the patients was 65 years. Twenty-two patients used low- to medium-dose ICSs, 6 patients used high-dose ICSs, and 71 patients used the LABA-ICS combination. The total medication cost per month ranged from \$1.73 to \$279.84. For patients using low- to medium-dose ICSs, the mean total medication cost per month was \$46.19. For patients who were using high-dose ICSs, the mean total medication cost per month was \$132.45. For patients who were using the LABA-ICS combination, the total mean medication cost per month was \$156.28 (Fig 1). In addition, patients who were atopic, defined by skin or blood test positivity to at least one aeroallergen, have higher medication cost per month. Cost for patients with atopic vs nonatopic asthma was \$134.69 vs \$113.30.

The expense of medications in chronic disease, such as asthma, affects the growing burden of medical care in the United States. Drug prices have increased in the troubled economy, and patients often cannot afford their medications, further compounding this crisis.