**"Temporal change in maternal dietary intake during pregnancy and lactation between and within two pregnancy cohorts assembled in the United Kingdom"**

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**Clinical implications:**

Advice regarding peanut intake during pregnancy has changed over the last 20 years. Future guidance on peanut intake during pregnancy, lactation and complementary feeding should be clearly communicated by the government and professional bodies, to prevent unnecessary dietary exclusion.

**Key words:** pregnancy, lactation, allergy prevention, maternal diet, maternal nutrition, peanut, birth cohort.

Abstract

Background: The association between maternal and infant dietary exposures and risk of allergic disease development is an area of considerable scientific uncertainty.

Objective: This study aims to compare dietary habits during pregnancy and lactation in two pre-birth cohorts from the same location approximately 10 years apart, a timeframe characterised by changes in government dietary advice.

Methods: The FAIR cohort is an unselected birth cohort born between 2001-2002. The 3rd generation cohort was born between 2010-2018. Both cohorts were established on the Isle of Wight (UK) to investigate prevalence of allergic diseases. Nutrition and allergy data was collected prospectively from recruitment and throughout the infant’s early life. Here we present dietary data collected in the third trimester of pregnancy and at three months of age. Differences between cohorts were tested using t-tests, Wilcoxon rank sum tests, chi-squared and Fisher’s exact tests.

Results: Data was available for 1331 participants (969 FAIR and 362 3rd generation). The proportion of mothers that reported excluding peanuts during pregnancy was significantly lower for the 3rd generation compared to the FAIR cohort (16.0% vs. 55.6%, p < 0.01). Cohort membership, primiparity, and maternal education were significantly associated with excluding peanuts during pregnancy (p < 0.01). The proportion of mothers who reported excluding any foods during breastfeeding was significantly lower for the 3rd generation compared to the FAIR cohort (22.8% vs. 43.4%, p < 0.01).

Conclusion: Maternal exclusion of peanut during pregnancy was lower for mothers giving birth between 2012-2018, compared to mothers giving birth between 2001-2002.

To The Editor

The association between maternal and infant dietary exposures and risk of allergic disease development has been an area of considerable scientific uncertainty and debate in recent years (1). Overall research has been largely inconclusive, with no evidence supporting maternal exclusion diets for the prevention of food allergy or atopic disease in the offspring (2). The inconsistency in scientific evidence is reflected in contradictory dietary guidelines about peanut intake over the past 20 years. In the United Kingdom, the Department of Health issued a report in 1998, advising that pregnant mothers with a family history of atopy should avoid peanuts during pregnancy/lactation (3). Ten years later, this advice was no longer deemed appropriate and was rescinded based on data from our group (4, 5) (see Figure 1). Similar advice was recommended internationally. Since then, the concept that exposure to potential food allergens could be protective of allergic disease has now been widely adopted. The aim of this study was to compare dietary habits during pregnancy and lactation in two allergy birth cohorts born in the same geographical location approximately 10 years apart.

The FAIR cohort is a whole population birth cohort born on the Isle of Wight, United Kingdom, between 2001-2002 (n = 969) (Figure 1).   Demographic, socioeconomic and family history of allergy information was collected from pregnant women at 12 weeks gestation. A validated food frequency questionnaire was completed at 36 weeks gestation (6) (see file 1 in online repository). Information about infant feeding was collected prospectively via a standardized questionnaire at 3 and 6 months postpartum.The 3rd generation cohort is the offspring of the Isle of Wight Whole Population Birth Cohort (n = 1456), born in 1989. Participants of this cohort were followed up to 27 years of age. Since 2010 their offspring have been enrolled in the 3rd generation study (7). The majority of 3rd generation participants were recruited antenatally at 12 weeks gestation. Dietary data was collected by questionnaire at 28 weeks gestation using a modified version of the FAIR questionnaire and again at 3 and 6 months postpartum (6). Details of statistical methods are included in supplementary file 2. Ethical approval for both studies was obtained from the Isle of Wight, Portsmouth and South East Hampshire Research Ethics Committee.

Data was available for 1331 participants (969 FAIR and 362 3rd generation). Maternal characteristics are shown in Table E1 (supplementary file 2). The proportion of mothers that reported excluding peanuts during pregnancy was significantly lower for the 3rd generation compared to the FAIR cohort (16.0% vs. 55.6%, p < 0.01). Results of the multivariable logistic regression model showed that cohort membership, primiparity, and maternal education were significantly associated with excluding peanuts during pregnancy (supplementary file 1, Table E2). Specifically, 3rd generation mothers had 0.18 times the odds of excluding peanuts during pregnancy compared to FAIR mothers (OR: 0.18, 95% CI: 0.12-0.27, p < 0.01). First time mothers had 65% greater odds of excluding peanuts during pregnancy (OR: 1.65, 95% CI: 1.25-2.17, p < 0.01). Vegetarian diet, maternal food allergy, and maternal age were not significantly associated with exclusion of peanuts during pregnancy.

Figure 2 illustrates differences between the FAIR and 3rd generation cohorts in terms of maternal frequency of consumption of key food allergens during pregnancy. A significantly greater proportion of 3rd generation mothers reported regular consumption (once per week or more) of peanuts, tree nuts, and seeds during pregnancy compared to FAIR mothers (all p < 0.01). Information regarding infant feeding and maternal dietary intake during lactation is shown in Table E1 (supplementary file 2). The proportion of mothers who reported excluding any foods during breastfeeding was significantly lower for the 3rd generation compared to the FAIR cohort (22.8% vs. 43.4%, p < 0.01).

Figure 3 shows that among participants from the 3rd generation cohort only, exclusion of peanuts during pregnancy showed a decreasing trend over time from 2013 to 2018. The results of the multivariable logistic regression model found an overall significant difference in the proportion of mothers excluding peanuts during pregnancy between any of the offspring years of birth (Wald X2 = 10.27, df = 4, p = 0.036). Results of the pairwise tests (Table E3 supplementary file 2) found that women who gave birth in 2017 had 0.1 times the odds of excluding peanuts during pregnancy compared to women who gave birth in 2013 (OR: 0.10, 95% CI: 0.02-0.57, p = 0.01). Primiparity, maternal education, maternal food allergy, nor maternal age were significantly associated with exclusion of peanuts during pregnancy among the 3rd generation participants.

Dietary data on peanut consumption may not be consistently reported as peanuts are not usually differentiated from tree nuts and may be included under broad categories (e.g. “nuts and seeds”) (8). Qualitative research with mothers of young children suggests that peanuts are considered primarily in the form of whole peanuts, or in the form of peanut butter, rather than being ingredients in food, meaning that study participants may in fact consume more than they realise (8). In both the FAIR and 3rd generation studies, the same validated questionnaire was used (6), which separated peanut, tree nuts and seeds into different categories and gave several examples for each item (supplementary file 1). Research from the Europrevall birth cohort study, a multicentre study in nine European countries indicated wide practices in peanut intake; with only 2.7% of Dutch women avoiding eating peanut in pregnancy, compared to 44.4 % of British women (8). In addition, pregnant women in the UK were the highest avoiders of peanut and tree nuts (16.8%) compared to the other eight countries. The UK was the only country at the time to have any national guidance on peanut consumption during pregnancy, advocating peanut avoidance in high-risk families.

Against a backdrop of changing scientific evidence surrounding food allergy prevention, the importance of providing clear dietary advice to the public, is paramount. In the case of peanut exclusion variations in information provision, a lack of clarity in relation to risks and the importance of atopy have been highlighted as potential issues (9).Due to this confusion, there has been a concern that the 1998 advice (3) could possibly have *increased* the prevalence of peanut allergy in the UK, as the advice may have been acted upon by non–high-risk families, to whom the advice was not targeted (4, 10). Ongoing data collection by our group of the 3rd generation participants will allow us to assess whether any changes in peanut sensitisation and clinical allergy have occurred as a result of changes in their dietary behaviour.

A strength of this study is that it was conducted in one area of the UK, although this limits external generalization. There were some differences between the two cohorts, meaning there is a risk of residual confounding. Maternal food allergy was self-reported and data was collected at one pregnancy time point. In conclusion, maternal exclusion of peanut during pregnancy was lower for mothers giving birth between 2012-2018 when compared to mothers giving birth between 2001-2002. These results align with the change in government dietary advice in 2008 and a paradigm shift towards exposure to dietary allergens via infant feeding, as a preventative approach to food allergy in infancy.

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**Conflicts of interest:** None declared.

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**Figure legends**

Figure 1: Timeline illustrating the two different cohorts and timing of dietary recommendations and new guidance.

COT: Committee on Toxicity of Chemicals in Food (5).

FAIR: Food Allergy and Intolerance Research Study.

LEAP: Learning Early About Peanut Allergy (11).

Figure 2. Percent of participants in the FAIR and 3rd generation cohorts that regularly consumed various food allergens during the third trimester of pregnancy.

\*Significant difference at Bonferroni-corrected alpha level: p < 0.0001

Figure 3. Percent of 3rd generation cohort participants that excluded peanut during pregnancy by child’s year of birth (with exact 95% confidence limits).

Due to a small number of observations (n=2) with a birth year of 2012, Figure 3 only presents data from births between 2013 and 2018.