

Dietary factors during pregnancy and atopic outcomes in childhood: a systematic review from the

European Academy of Allergy and Clinical Immunology



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1. EAACI task force on Immunology and Nutrition



Abstract

BACKGROUND: Allergic diseases are an increasing public health concern and early life environment is critical to immune development. Maternal diet during pregnancy has been linked to offspring allergy risk and is a potentially modifiable factor, which could be targeted as an allergy prevention strategy.

In this systematic review, we focused on maternal diet in pregnancy and related the amount of nutrients, foods or food patterns studied to the USA dietary guidelines.

METHODS: We undertook a systematic review of studies investigating the association between maternal diet during pregnancy and allergic outcomes (asthma/wheeze, hay fever/allergic rhinitis/seasonal allergies, eczema/atopic dermatitis, food allergies and sensitization) in offspring. Studies evaluating the effect of food allergen intake were excluded. Three bibliographic databases were searched: MEDLINE, EMBASE, and Web of Science up to February 26, 2019. Evidence was appraised using modified versions of the Cochrane Collaboration Risk of Bias tool and the National Institute for Clinical Excellence methodological checklist depending on the study.

RESULTS: We identified 95 papers: 17 RCTs and 78 observational (case-control, cross-sectional and cohort) studies. Observational studies varied in design and dietary intakes and often had contradictory findings. Based on our meta-analysis, RCTs showed that vitamin D supplementation (OR: 0.72; 95% CI: 0.56 – 0.92) is associated with a reduced risk of wheeze/asthma. A similar trend for omega-3 fatty acids was observed but this did not reach statistical significance (OR: 0.70; 95% CI: 0.45 – 1.08). Omega-3 supplementation was also associated with a non-significant decreased risk of allergic rhinitis (OR: 0.76; 95% CI: 0.56 – 1.04). Neither vitamin D nor omega-3 fatty acids were associated an altered risk of atopic dermatitis or food allergy.

CONCLUSIONS: Prenatal supplementation with vitamin D may have beneficial effects for prevention of respiratory allergies. Additional nutritional factors seem to be required for modulating the risk of skin and gastrointestinal outcomes. We found no consistent evidence regarding other dietary factors, perhaps due to differences in study design and host features that were not taken into account. Whilst confirmatory studies are required, there is a need for performing RCTs beyond single nutrients/foods.

Background

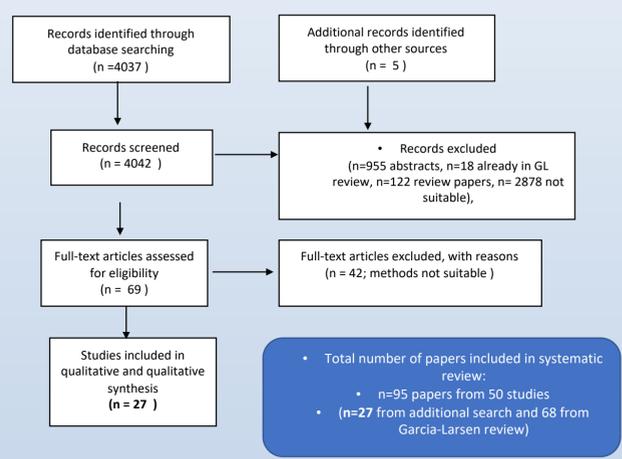
- Allergic diseases are an increasing public health concern and early life environment is critical to immune development.
- Maternal diet during pregnancy has been linked to offspring allergy risk. In turn, maternal diet is a potentially modifiable factor, which could be targeted as an allergy prevention strategy.
- We focused on maternal diet in pregnancy and related the amount of nutrients/foods/food patterns studied to USA dietary guidelines,

Methods

- We undertook a systematic review¹ of studies investigating the association between maternal diet during pregnancy and allergic outcomes (asthma/wheeze, hay fever/allergic rhinitis/seasonal allergies, eczema/atopic dermatitis, food allergies and sensitization) in offspring.
- We searched three bibliographic databases (MEDLINE, EMBASE, and Web of Science up to February 26, 2019).
- Evidence was critically appraised using modified versions of the Cochrane Collaboration Risk of Bias tool for intervention trials and the National Institute for Clinical Excellence methodological checklist for cohort and case-control studies and meta-analysis performed from RCTs.

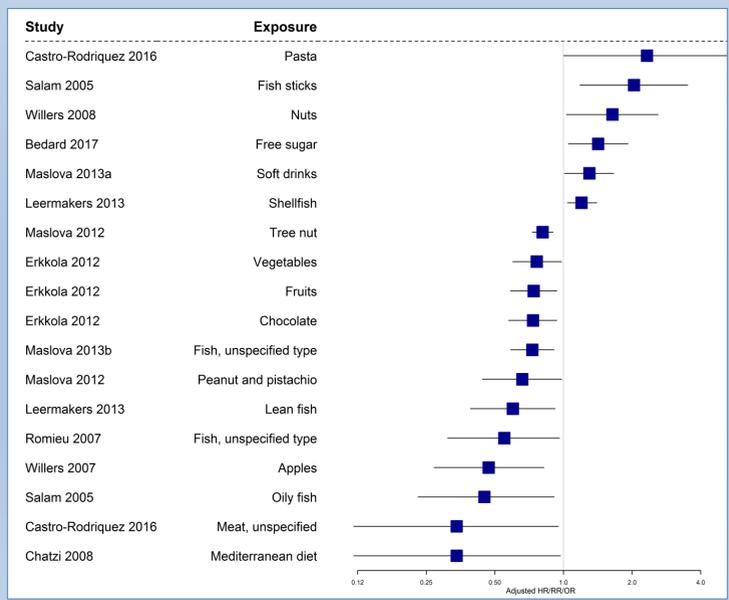
Results

Figure 1: Flow chart for study inclusion



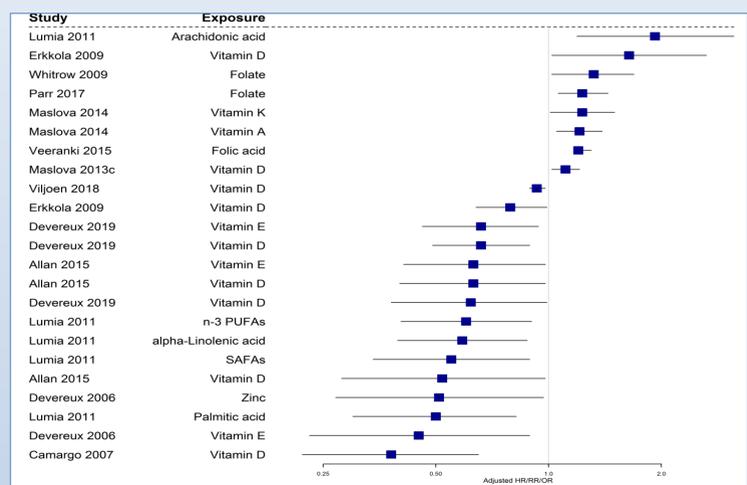
- 17 RCTs and 78 observational studies were identified
- Observational studies varied in design and dietary intakes and often had contradictory findings: Here we focus on asthma/wheeze

Figure 4: Observational studies with asthma/wheeze (age 3 years and above) as an outcome: Foods, Food Groups and Food Patterns



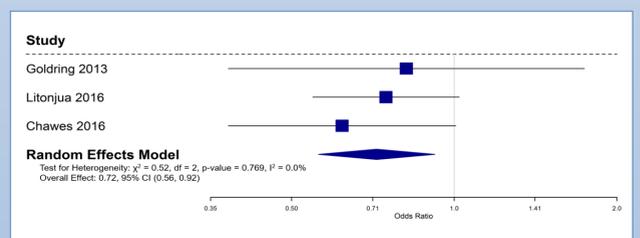
The most significant protective factors were Mediterranean diet, meat and fatty fish. The most significant factors associated with an increased risk were pasta and fish sticks.

Figure 5: Observational studies with asthma/wheeze (age 3 years and above) as an outcome: Nutrient intake



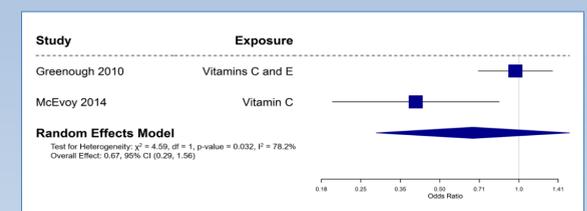
The most significant protective factors were vitamin D and vitamin E. The most significant factors associated with an increased risk were arachidonic acid.

Figure 6: Randomized controlled trials with asthma/wheeze as an outcome (all ages reported)Vitamin D



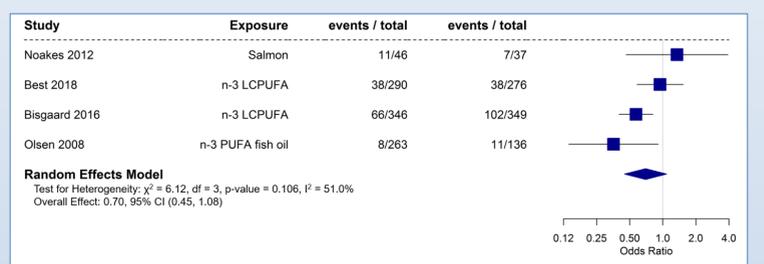
Vitamin D supplementation (OR: 0.72; 95% CI: 0.56 – 0.92) is associated with a reduced risk of wheeze/asthma.

Figure 7: Randomized controlled trials with asthma/wheeze as an outcome (all ages reported)



Anti-oxidant supplementation (OR: 0.67; 95% CI: 0.29 – 1.56) is not associated with a reduced risk of wheeze/asthma.

Figure 8: Randomized controlled trials with asthma/wheeze as an outcome (all ages reported): Omega-3 fatty acid/food containing omega-3 fatty acid



Omega-3 fatty acid supplementation did not reach statistical significance (OR: 0.70; 95% CI: 0.45 – 1.08) for a reduction in wheeze/asthma.

Table 1: Summary table of all findings

Observational trials	Decreased				Increased			
	Vit/Min	Fats/fatty fish	Foods	Diet Pattern	Vit/Min	Fats/fatty fish	Foods	Diet Pattern
Food allergy	Copper Vitamin C	NA	NA	NA	Vitamin D	NA	Vegetables	NA
Atopic Dermatitis	Vitamin E Copper Calcium Zinc Beta-carotene Magnesium	Cholesterol Arachidonic acid	Green vegetables Dairy Fruit Fish Probiotic milk	NA	Vitamin D Vitamin C	Vegetable oil Margarine Omega-3 and 6 fatty acids Total fat Monounsaturated fatty acids	Alcohol Shell fish Meat Fast Food Natto	NA
Asthma/wheeze	Vitamin C, D, E, K Zinc, Copper Manganese Folic acid Alpha-tocopherol Calcium Vitamin K	Palmitic acid Arachidonic acid Saturated fat Olive oil Omega-3 fatty acid	Vegetables Fruit (apples)	Mediterranean Western	Folic acid Vitamin D Vitamin A Vitamin K Alpha-tocopherol Vitamin C	Omega-3 fatty acid	Fruit Vegetables	NA
Allergic Rhinitis	Vitamin D Vitamin A	Fatty fish Poly-unsaturated fatty acid Alpha linolenic acid	Alcohol Fish Probiotics Peanut and pistachio	NA	Vitamin D	Butter Omega 6/omega 3 ratio	Fruit	NA
RCTs	Vit/Min	Fats/fatty fish	Foods	Diet Pattern	Vit/Min	Fats/fatty fish	Foods	Diet Pattern
Food allergy	NA	No effect	NA	NA	NA	No effect	NA	NA
Atopic Dermatitis	No effect	No effect	NA	NA	No effect	No effect	NA	NA
Asthma/wheeze	Vitamin D	No effect	NA	NA	NA	No effect	NA	NA
Allergic Rhinitis	NA	No effect	NA	NA	NA	NA	NA	NA

Studies showed contradicting results. Food portions or nutrients used or identified in studies did not correspond with US dietary guidelines.

Conclusions

Prenatal supplementation with vitamin D may have beneficial effects for prevention of respiratory allergies. Additional nutritional factors seem to be required for modulating the risk of skin and gastrointestinal outcomes. We found no consistent evidence regarding other dietary factors, perhaps due to differences in study design and host features that were not taken into account. Studies focusing on total diet intake are required.

Reference: Venter C, Agostoni C, Arshad S.H., Ben-Abdallah M., Du Toit G., Fleischer D.M., Greenhawt M., Glueck D., Groetch M., Maslin K., Maiorella A., Meyer R., Muraro A., Netting M., Nwaru B.N., Palmer D.J., Palumbo M., Roberts G., Roduit C., Smith P.K., Untersmayr E., Vanderlinden L., O'Mahony L. Dietary factors during pregnancy and atopic outcomes in childhood: a systematic review from the European Academy of Allergy and Clinical Immunology. Under Excom review