

Editorial

PREGNANT WOMEN

A new nutritional risk group without fruit and vegetable consumption?

Fetal nutrition may influence the subsequent risk of chronic childhood and adulthood diseases. Unbalanced food intake together with metabolic changes occurring during pregnancy may influence the mother's health by increasing the risk of obesity, which may be risk factor for metabolic conditions including gestational diabetes mellitus and hypertension.

Although recommendations for dietary intake and weight during pregnancy might be vary, several recommend an adequate (400-500 grams) daily intake of fresh fruit and vegetables for whole population.

What a woman eats during pregnancy should cover her nutritional requirements, facilitate optimum growth of the fetus, prepare the body for a birth without complications, and contribute to a satisfactory lactation period. Given that energy intake need only be raised a little while nutrient intake must be increased much more, it would be advisable to lower fat and simple carbohydrate intakes and increase those of fruit, vegetables, greens and legumes. Along with vegetables, fruits provide antioxidants, especially vitamin C and beta-carotenes, which are essential during pregnancy. Undoubtedly, unless at least 4 - 5 portions of these foods are taken daily, it is impossible to reach the folic acid recommendation for pregnant women.

However, not only are proposed dietary guidelines generally not followed by the population, most women of childbearing age don't even know they exist. They therefore frequently go through pregnancy with suboptimal nutritional status. Dietary counselling combined with the provision of food products during pregnancy is of importance in modifying food and nutrient intake, with potential health benefits.

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Does a Mediterranean-type diet consumed in pregnancy reduce the risk of premature delivery?

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Preterm delivery is delivery earlier than three weeks before expected date of delivery and occurs in 5-10% of pregnancies in European countries. Preterm delivery accounts for the majority of neonatal deaths and is also associated with increased rates of infections and other diseases in the infancy. In addition, preterm born infants have increased rates of significant permanent mental, neurological, or physical malfunctions or handicaps. It is therefore an important task to identify modifiable causes of preterm delivery

Until today few factors with a causal relation to preterm birth have been identified. Many studies have focused on the woman's diet, but most of these studies have been discouraging. Some studies indicated that marine omega-3 fatty acids could prolong duration of pregnancy and reduce recurrence risk of preterm birth, whereas others have been unable to support these findings. A high intake of antioxidants has also been associated with lower risk, but studies have provided contradictory evidence.

Mediterranean diet in pregnancy-results of a dietary intervention study

Recently, Khoury and collaborators provided important input into this field. They randomly allocated 290 healthy pregnant Norwegian women to an intervention group who were advised to change their diet towards a Mediterranean-type diet, and a control group who did not receive advice to change diet. The aim of the study was to investigate the impact of a cholesterol-lowering diet on maternal and cord cholesterol levels and on health of the offspring. The authors showed convincing data from repeated dietary assessments that, compared to controls, the women in the intervention group did change their diet towards the aimed pattern. The women in the intervention group also had lower low-density lipoprotein in maternal blood, as expected. Unexpectedly, however, and interestingly in this context, they found substantially fewer preterm births in the intervention group compared to the control group: only 1 preterm birth occurred in the intervention group, whereas 11 occurred in the control group. This corresponded to a prevalence of 0.7 and 7.4%, respectively, and a relative risk of 0.10.

A prospective cohort study showed similar results

We set out to replicate this unexpected finding in a large observational cohort established in Denmark. During 1996-2002 we assessed dietary intake among 70,000 women by means of a food frequency questionnaire completed in mid-pregnancy. Exposure groups were defined to match as closely as possible the comparison groups in the randomised controlled trial of Khoury and collaborators. Women consuming a Mediterranean-type diet were those who ate fish twice a week or more, used olive or rapeseed oil, consumed 5 fruits and vegetables a day, ate meat (other than poultry and fish) at most twice a week, and drank at most 2 cups of coffee a day. Only non-smokers were included. Of 35,530 women, 1,137 (3.2%) fulfilled all Mediterranean-type diet criteria, and 540 (1.5%) none. Odds ratios for preterm birth and early preterm birth were 0.61 (95% Confidence Interval (CI): 0.35 to 1.05) and 0.28 (0.11 to 0.76), respectively, in Mediterranean-type diet women compared to women fulfilling none of the Mediterranean-type diet criteria. Strengths of our study include its size and prospective design. The main limitation of our study was its observational design, and the possibility that a Mediterranean-type diet may be a marker for a generally healthier lifestyle cannot be ruled out, although we adjusted (by statistical multivariate techniques) the results for factors such as the woman's education and age.

We concluded that shifting towards a Mediterranean-type diet during pregnancy may reduce the risk of early delivery in Danish women. The issue has also been explored in a parallel study based on data from another large observational cohort established in Norway, the Norwegian Mother Child-Cohort. However, in that study it was not possible to detect any association between intake of a Mediterranean-type diet and risk of preterm birth. Clearly there is need for more research. The findings should be replicated in other birth cohorts and trials. One difficulty is that Mediterranean diets may not be a very well-defined entity and may be defined in several different ways according to the emphasis.

<http://www.hsph.harvard.edu/faculty/sjurdur-olsen/>
<http://www.metabolic-programming.org/theme2.htm>



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Mediterranean diet in pregnancy in relation to asthma and atopy in childhood

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The prevalence of asthma and allergic diseases has increased dramatically over the past few decades with the highest incidence occurring in children. Epidemiological and immunological studies suggest that dietary modification or supplementation in the fetal life could reduce the development of atopic diseases, while fetal under-nutrition could detrimentally affect the “programming” of the fetal lung and immune system. We recently observed a reduced risk of wheeze and atopy among children at age 6.5 years whose mothers had a high adherence to the Mediterranean diet during pregnancy¹. To our knowledge, this is the first longitudinal study to assess prospectively in a general population the impact on asthma and atopy outcomes in childhood of maternal adherence to the Mediterranean Diet during pregnancy and children's adherence to this type of diet.

Description of a birth cohort study

The survey is a birth cohort study that started in 1997 in Menorca island, Spain². Four hundred and sixty children were included in the analysis after 6.5 years of follow-up. Maternal dietary intake during pregnancy and children's dietary intake at age of 6.5 years were assessed by food frequency questionnaires, and adherence to a Mediterranean Diet was evaluated through a priori defined scores. During the follow-up, parents answered a questionnaire on a yearly basis (with interviewer) and reported all medical events over the preceding 12 months. Information on parental education, socio-economic background, marital status, maternal disease, parity, and children's cigarette exposures (during mother's pregnancy and at child's age of 6.5 years) was obtained through questionnaires administered at pregnancy and at the follow up at 6.5 years. Four hundred and twelve children (412, 89.6%) underwent skin prick testing at 6.5 years of age using a series of 6 common aeroallergens. Maternal atopy to common aeroallergens was measured by skin prick tests performed six months after delivery.

Results from observations after 6.5 years

The prevalence of persistent wheeze, atopic wheeze, and atopy at age 6.5 years were 13.2%, 5.8%, and 17.0% respectively.

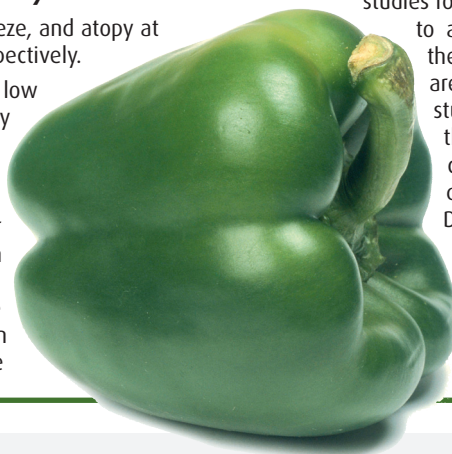
One third (166, 36.1%) of the mothers had low quality of Mediterranean Diet during pregnancy according to the Mediterranean Diet Score, while the rest had a high score. Consumption of vegetables more than 8 times per week during pregnancy was found to be protective for persistent wheeze, and atopy. Similarly, fish intake more than 2-3 times per week and legumes intake more than once per week were inversely associated with persistent wheeze. In contrast, an increased intake of red meat (more

than 3-4 times per week) showed a trend towards positive associations with persistent wheeze and atopic wheeze in offspring.

A high level of adherence to the Mediterranean diet was found to be protective for persistent wheeze, atopic wheeze, and atopy at 6.5 years of age. Maternal Mediterranean Diet during pregnancy was highly associated with the adherence to this type of diet during childhood but the two dietary scores did not interact between each other significantly. When we simultaneously included maternal and children Mediterranean Diet Index in the multivariate models, results remained very similar, showing an independent beneficial effect of maternal diet during pregnancy on wheeze and atopy at 6.5 years of age.

The results of the present study, indicating a protective effect of maternal adherence to the Mediterranean Diet during pregnancy in wheeze and atopy at age 6.5 years, probably reflect a high fetal exposure to several antioxidant compounds and their adverse effect on oxidative stress damage of lung tissues. Cereals (particularly whole grains) are rich in antioxidant compounds (ie vitamin E, phenolic acids and phytic acid) and there have been shown to have a protective effect against asthma in children^{3,4}. Similarly, fruits, vegetables and legumes are known to be high sources of antioxidants (vitamins C, E, carotenoids, selenium, flavonoids) and they may therefore help to protect the airways against oxidative damage. Apart from the most widely known antioxidants, other compounds possess a marked antioxidant activity and other advantageous biological properties, such as oleuropein, hydroxytyrosol and other polyphenols present in olive oil, the principal component of Mediterranean Diet⁵. On the other hand, the polyunsaturated n-3 fatty acids eicosapentaenoic (EPA) and docosahexaenoic (DHA) found in fish oil have anti-inflammatory effects and high intake during pregnancy has been associated with a reduced risk of allergic diseases in childhood⁶⁻⁸.

Although considerable advances in knowledge have been gained from studies focused on single nutrients or food items, these may fail to account for the interactions between nutrients, and they do not take into consideration that some nutrients are inter-correlated⁹. Thus, interest has shifted to the study of food groups and, more recently, dietary patterns that represent a broader picture of food and nutrient consumption and may therefore be more predictive of disease risk. Dietary patterns such as Mediterranean Diet account for cumulative and interactive effects among nutrients, reflect real-world-dietary preferences, and may be particularly suitable for analysis in asthma epidemiology where many dietary components could be related with the outcome of interest.



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Evidence of infant blood pressure programming by maternal nutrition during pregnancy: a prospective randomized controlled intervention study

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The underlying denominators of cardiovascular diseases, including obesity and hypertension, have extended to the pediatric population^{1,2}, warranting an understanding of how early environmental exposures exert their effects on these chronic diseases.

Nutrition in early life (even at the fetal stage) has been documented in several epidemiological and experimental studies as having an impact on cardiovascular diseases risk in later life and on the related risk factors in fetal life³⁻⁸.

The purpose of this intervention study was to evaluate the impact of maternal nutrition during pregnancy on infant blood pressure.

In Turku (Finland), 256 pregnant women were randomized into one control or one of two intervention study groups⁹ with the aim to modify their dietary fatty acid composition in conjunction with a balanced diet, using tools such as dietary counselling supported by the provision of appropriate food products. The control group received standard dietary counselling in well-women clinics and a placebo; the two dietary intervention groups (with probiotics or with placebo) received detailed dietary counseling by a dietician aimed at achieving a healthy diet complying with current recommendations^{10,11,12}. Each mother-infant group was followed from pregnancy through to infant age 6 months, with specific focus on the infant's blood pressure.

Food and Nutrient Intake During Pregnancy

The women in the dietary intervention groups consumed significantly less butter but more margarine and vegetable oil during the follow-up compared with the controls. These changes in food intake were reflected in the intake of nutrients: the intakes of monounsaturated and polyunsaturated fatty acids were higher and the intake of saturated fatty acids was lower in the intervention groups than in the control group, both as absolute quantities and as proportions of energy intake. The intake of protein as a proportion of energy intake and intake of calcium was also lower, whereas the intakes of fiber, vitamin D, vitamin E, and riboflavin were higher in the dietary intervention groups compared with the controls.

Impact of Maternal Dietary Intake During Pregnancy on Infant Blood Pressure

For an in-depth evaluation of the associations between dietary intakes

during pregnancy and infant blood pressure, the mean intakes of energy, foods, and nutrients during pregnancy were divided into quartiles, and their associations with infants' blood pressure were studied.

Maternal dietary intake demonstrated a statistically significant nonlinear association with infants' blood pressure. Most associations showed a U-shaped dose dependency; the highest and lowest quartiles of nutrient intakes during pregnancy resulted in higher blood pressure at age 6 months compared with the middle quartiles. Maternal carbohydrate intake during pregnancy had the strongest impact on infant systolic and diastolic blood pressures. The intake of monounsaturated fatty acids also had a significant effect on diastolic blood pressure. In addition, a trend toward a U-shaped relationship between total energy intake and vitamin B12 intake and infant systolic blood pressure was observed, and a similar tendency emerged between maternal fibre intake and infant diastolic blood pressure. A reverse U-shaped trend was observed between maternal fruit intake and infant systolic blood pressure.

Modeling of Infant Blood Pressure by Maternal Nutrition

Infants' systolic or diastolic blood pressure was not associated with infants' birth weight or with the duration of gestation. Instead, blood pressure was lower in infants breastfed at 6 months compared with those who were not. Likewise, infant length at 6 months correlated positively with blood pressure. Maternal carbohydrate intake was found to best explain infant blood pressure at age 6 months in the multivariate analyses for systolic pressure and diastolic pressure. The U-shaped dose-response remained even after this adjustment for breastfeeding and infant length at age 6 months.

Dietary factors affect blood pressure directly through intake of nutrients, including sodium and fat, as well as indirectly by means of weight gain^{13,14}. A low saturated, high unsaturated fatty acids diet, along with high consumption of fruits and vegetables, is generally considered conducive to reducing the risk of hypertension¹⁵. The results of the present study extend these notions into fetal life through maternal nutrition, further supporting the likely impact of unknown dietary compounds for health¹⁶. Considering the possibility of programming blood pressure from childhood to adulthood¹⁷⁻²⁰, our findings may suggest a novel opportunity for dietary counseling.



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