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QUALITY OF DIET IN PREGNANT MOTHERS IN TWO DIFFERENT REGIONS

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Abstract

Introduction: The quality of diet is very significant for the fetus development. The task of our study was to determine the composition of diet of pregnant mothers in two regions with different level of air pollution, districts of Karviná (K) and České Budějovice (CB).

Methods: Each day, they fulfilled the questionnaire about the consumption of vegetables, fruits, dairy products, type of meat, and diet supplements.

Results: Recent results indicate that the quality of diet of pregnant mothers do not correspond to recommended daily intake. The fruits intake was 61.8% vs. 35.5%, in the vegetables intake 22.8% vs. 15.9%, in the dairy products intake 30.4% vs. 30.2% in CB vs. K, respectively.

Conclusion: Based on the obtained data, the web page for pregnant mothers was prepared to improve present situation. Mothers can find the evaluation of the quality of their diet, model menu, and recommended intake of nutrients.

Keywords: *pregnant mothers; air pollution; diet quality; fruits intake; vegetables intake; milk intake; diet supplements; web page*

ORIGINAL ARTICLE

INTRODUCTION

In the period 2013 to 2017, "Impact of air pollution to genome of newborns" research project was performed in two districts of the Czech Republic: the district of K as region with a high air pollution of fine particles (PM 2.5, < 2.5 μg/m^{-3}) and polycyclic aromatic hydrocarbons (PAHs) as bezo[a]pyrene (B[a]P). As control region was selected the district of CB districts.

The milk, blood and urine was collected from 100 mothers to verify the impact of air pollution to genetic damage in newborns. Also, cord blood and urine was sampled from 100 normal newborns in winter and summer in K and CB. Air pollution in Karvina substantially increased an oxidative damage in the newborns (Ambroz et al. 2016), concentration of PAHs metabolites in urine (Urbancova et al. 2017), as well as in the breast milk (Pulkrabova et al. 2016).

Normal fetal growth depends on a genetically predetermined growth potential but is further modulated by maternal, fetal, placental and environmental factors (Goldenberg and Cliver 1997). It has been proposed that efficient maternal nutrition, before and during pregnancy, improve fetal nutrition, growth and development could form the basis of nutritional prevention strategies for diabetes and cardiovascular disease in adulthood (Le Clair et al. 2009). From the public health perspective, the maternal nutrition is important because it is modifiable and susceptible to public health interventions. In recent years, much evidence has suggested that the role of the mother's diet during pregnancy, affects different birth outcomes, such as birth defects, gestational length and fetal growth (Allen 2005). Previous research has found varying effects of maternal diet (e.g. diet composition, single foods and individual nutrients) on

fetal growth (Kelvin et al. 2009, Pedersen et al. 2013, 2015). A few studies in the western industrialized countries have examined the role of maternal diet during pregnancy on offspring growth. Several aspects of the maternal diet are hypothesized to influence fetal growth, including consumption of fruit and vegetables (Ramón et al. 2009).

In the present study, the impact of diet quality on pregnant mothers was studied in two regions with a different level of air pollution.

MATERIAL AND METHODS

The diet samples were collected in České Budějovice Hospital, Department of Obstetrics and Department of Neonatology, and Karvina Hospital, Department of Obstetrics and Department of Neonatology. The study was approved by the Ethics Committee of both hospitals and the Institute of Experimental Medicine CAS in Prague. Each mother signed the written consent.

Forty pregnant women from the district of Karvina and the district of České Budějovice (10 mothers from each location and season) fulfilled to the form everything, what they ate and drunk, seven to fourteen days before the expected term of delivery. They also recorded information about the use of any diet supplement. The diet of pregnant mothers was evaluated from the point of quantity – the total accepted energy intake, proteins, carbohydrates, fat, and dietary fibre, as well as from the point of quality – the quantity of foods in individual diet groups (according to the questionnaire. Evaluation of the quality of diet of pregnant women (Dvořáková 2007). Specifically, the recommended daily intakes (RDI): for vegetables 300 g, fruits 200 g, milk products 3 servings (a glass of milk, yogurt, 55 g of cheese) were analyzed.

Quality of diet was evaluated according to 10 questions:

1. Were included at least 3 servings of cereals, pasta, baked goods, and rice (1 serving = 60 g of bread, 150 g of boiled pasta) in your diet?
2. Were at least 3 unit servings of vegetables (1 serving = 100 g of vegetables, 125 g of potatoes, dish of salad) in your diet?
3. Were eaten at least 2 servings of raw vegetables?
4. Were at least 2 unit servings of fruits (1 serving = 100 g of fruits, dish of small fruits) in your diet?
5. Was at least 1 serving raw fruits?
6. Were consumed different dishes in each foodstuffs?
7. Had the consumed snacks and dishes any additional or nutritional value to the main dishes?
8. Were consumed at least 3 servings of milk and dairy products (1 serving = 1 glass of milk, 200 ml of yogurt, 55 g of cheese)?
9. Were consumed at least 1 serving from the group of meat, fish, poultry or legumes (1 serving = 80 g of meat, 2 boiled egg white, 1 dish of soya beans)?
10. Were selected preferably non-fat, lean or low fat alternatives of food?

The diet supplement consumption was evaluated from the maternal questionnaires fulfilled in hospitals after their delivery.

RESULTS AND DISCUSSION

Quality of diet

The diet quality was insufficient in most of the mothers. Recommended daily intake was observed only in 46% of cases – 38.9% and 53.1% in K and CB, respectively (Chart 1). The diet quality was better in CB in all indicators. The most significant difference was observed in the fruits intake, when the number of days complying with the recommended daily intakes was almost twice as high in CB vs. K – 61.8% vs. 35.5%, respectively (Chart 2).

In both of the localities, an insufficient vegetable intake (the total vegetable, and especially the raw vegetable intake) was observed. The intake of vegetables was sufficient only in 19% of days (when also boiled potatoes were included). While, intake of raw vegetables was only in 14% of days (Chart 3 and 4).

Also, the milk and dairy product intake was low, sufficient only in 30% of days (Chart 5).

The vegetable, meat and legume intake were affected significantly by the age of mothers. As mothers were older, their intake of these food items was lower (Chart 6–8).

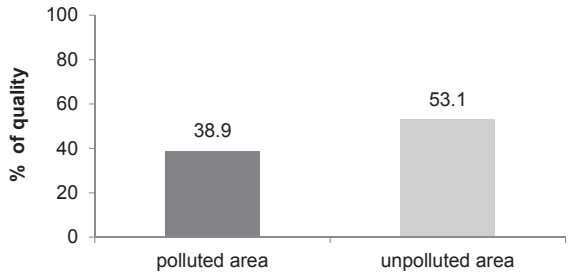

Chart 1 – Mather's diet quality in polluted and unpolluted area

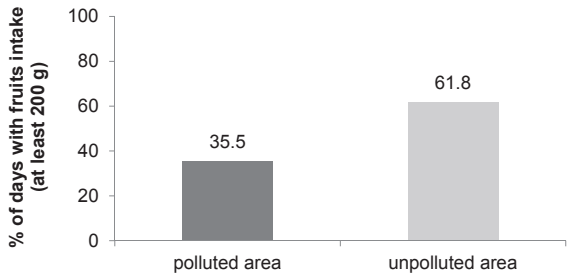

Chart 2 – Mather's fruit intake in polluted and unpolluted area

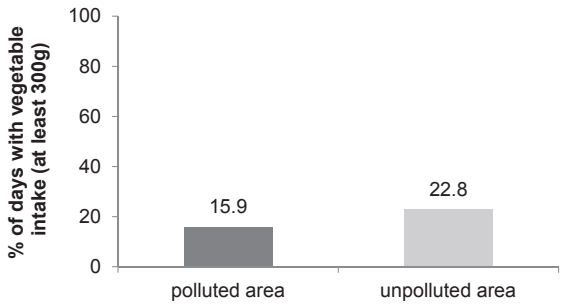

Chart 3 – Mather's vegetable intake in polluted and unpolluted area

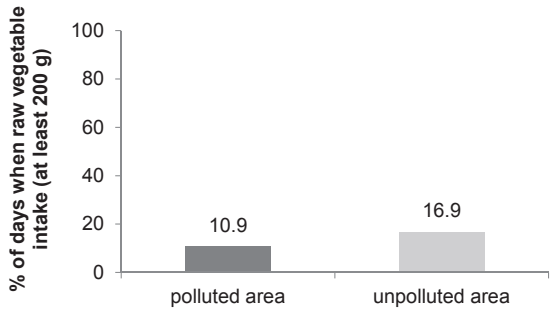

Chart 4 – Mather's raw vegetable intake in polluted and unpolluted area

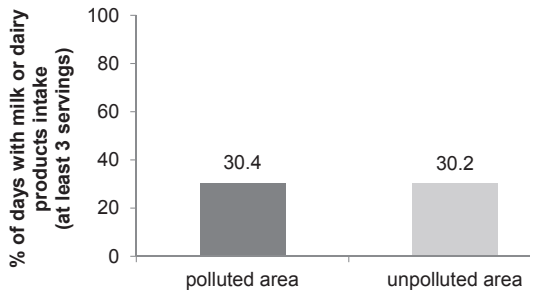

Chart 5 – Mather's milk and dairy products intake in polluted and unpolluted area

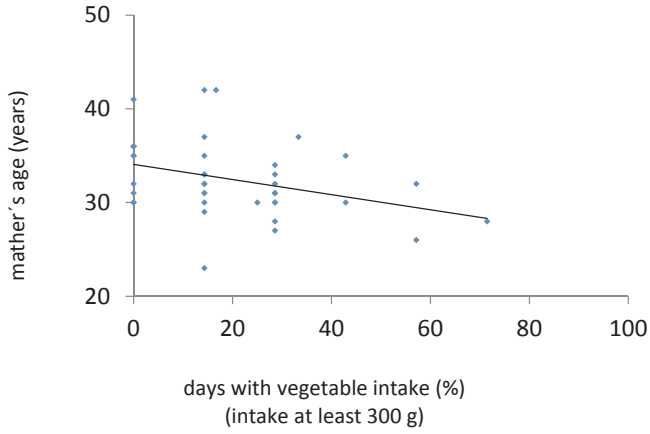

Chart 6 – Vegetable intake in dependency on mather's age (r = –0.3682, p = 0.018)

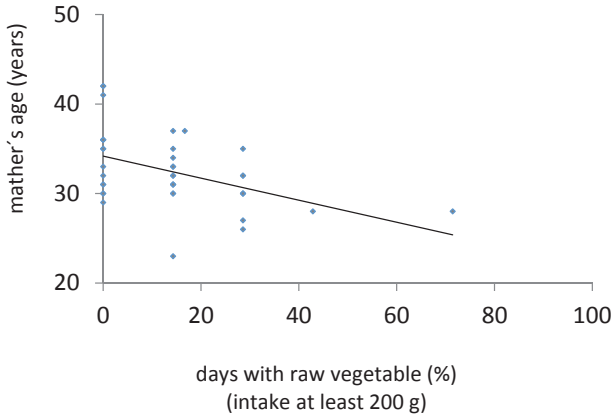

Chart 7 – Raw vegetable intake in dependency on mather's age (r = –0.4746, p = 0.002)

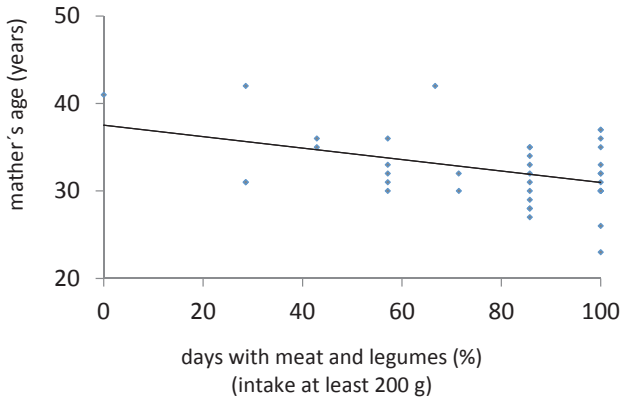

Chart 8 – Meat and legume intake in dependency on mather's age (r = −0.4359, p = 0.004)

Diet supplements

Diet supplements were used by 75% of pregnant mothers. But we did not observe any effect of this supplementation to DNA damage in newborn's cells. Present knowledge about the effect of vitamin supplementation to DNA damage are not unequivocal. For example, Mooney et al. (2005) showed that vitamins in the diet supplements decrease DNA damage, whilst Vrolijk et al. (2015) observed just opposite effect. It seems, that vitamins, minerals and other micronutrients are unambiguously beneficial for child, when they are received during pregnancy in food, which includes them naturally (vegetables, fruits, and fish). Therefore, their use as the diet supplements seems to be questionable in developed countries. Some studies indicate no effect (Ashorn et al. 2015, Chmielewska et al. 2016). Shastri et al. (2016) postulated that intake of diet supplement with iron may decrease the birth weight.

We observed that diet during pregnancy of mothers, who used diet supplements already before pregnancy, was of the better quality. It seems that these women generally try to keep better life style. But the conclusions about the use of the diet supplements and healthy life style are not unequivocal. Barrett et al. (2015) observed the relationship between diet supplements intake and healthy diet, however, Sato et al. (2016) believed, that subjects with a worse life style try to use diet supplements to compensate by this way their unhealthy life style.

Our results indicate that the quality of diet of pregnant mothers in the Czech Republic is insufficient, as do not correspond to recommended daily intake. Until now, there is no coherent system, which would guarantee, that information about the correct catering during pregnancy can reach all future mothers.

Therefore: we try to eliminate this deficit at least partially to propose the web page "Naše zdravé dítě" (2018). This web page is the outcome of our research, studying the relationship between the diet of mothers during pregnancy and its impact to the activity of genes in newborns, as well as the DNA damage in newborn's cells. For the activity of many genes seems to be decisive already various stages of pregnancy. The genes setting at delivery may affect all future life and determine later incidence of several diseases as cardiovascular diseases, diabetes, or immunity malfunction, in some cases transferable to next generations. This future outcome is affected by environmental pollution and stress, but simultaneously by the sufficient intake of proteins, vegetables and fruits.

Web page "Our healthy child"

Diet

Test of the evaluation of quality of diet

To keep principle of healthy diet during pregnancy should not be very demanding. On our web page is prepared interactive test the Evaluation of the quality of diet of pregnant

women (Dvořáková 2007), which should allow them to follow each day, if they ate everything, which is important for developing child.

Model menu
You can find on web page examples of simple preparation of current usual menu in such a way, that quality of diet is sufficient. All changes are provided by explanations as well as their justification, simultaneously are calculated financial costs of these changes.

Recommended intake
Recommended intake of individual nutrients differs in each trimester of pregnancy. These values and recommended changes of weight growth are presented on web page.

Epigenetics

The epigenetic setting of genes is affected by various impacts during prenatal, as well as postnatal development. Therefore, our web page tries to explain to the future and contemporary parents by understandable form basic principles of epigenetics. Parents will obtain information, how is possible to positively affect before and after delivery health status of child by diet, as well as by other factors.

CONCLUSION

The knowledge of women about the right diet during pregnancy and its impact for future health of their children in the Czech Republic is very unsufficient. This circumstance could be changed only by mutual cooperation and effort of different partners, as research institutes, educational institutes, and especially medical doctors, who care about pregnant mothers.

CONFLICT OF INTERESTS

The author has no conflict of interests to declare.

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