

SMOKING – BEHAVIORAL RISK FACTOR FOR THE NUTRITION IN PREGNANCY

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Abstract. Aim. The aim of the study was to determine the relationship between smoking and food ingestion in a pregnant women group. The literature in the field has shown that smoking during pregnancy is harmful, affecting pregnancy evolution, delivery and newborn health. Also, smoking can indirectly influence fetus evolution affecting the alimentary mother behavior. **Material and methods.** The cohort study implied a group of 263 pregnant women, 18-39 years old, from Iași city. They were investigated early in pregnancy, late in pregnancy and about 2 months postpartum. They were asked about the frequencies of food consumption and 24 h recall of food intake and smoking data. Total energy intake and the main nutrients intake were estimated. Urinary cotinine, thiocyanates and creatinine were determined. Relationship smoking-nutrition was investigated using "chi squared" and Anova tests. **Results.** Before pregnancy 43.4% of women smoked; during pregnancy and postpartum about 10% of women smoked. Smoking associated with defavourized socio-economical status (low education, singles, unemployed). The number of smoked cigarettes very well correlated with the urinary level of cotinine and thiocyanates reported by creatinine. Smoking women had a higher ingested energy and consumed more lipids than nonsmoking women. In early pregnancy, smoking women consumed fewer dairy products and in late pregnancy they consumed less fish than the other ones. After delivery, the smoking women consumed less eggs and fish. During the whole study period, they consumed more coffee comparing the nonsmoking women. **Conclusions.** About a quarter of smoking women continued to smoke during pregnancy and after delivery; they had a less healthy nutrition comparing the nonsmoking women. So, smoking pregnant women is a group of particular importance in terms of public health interventions on nutrition.

Key words: smoking, pregnancy, nutrition, cotinine

Rezumat. Scop. Scopul studiului a fost de a determina relația dintre fumat și ingestia de alimente la un grup de femei gravide. Literatura de specialitate a demonstrat faptul că fumatul în timpul sarcinii este dăunător, afectând evoluția sarcinii, nașterea și sănătatea nou-născutului. De asemenea, fumatul poate influența indirect evoluția fătului afectând comportamentul alimentar al mamei. **Material și metode.** Studiul de cohortă a implicat un lot de 263 femei gravide în vârstă de 18-39 de ani din orașul Iași. Ele au fost investigate la începutul sarcinii, la sfârșitul sarcinii și la aproximativ două luni după naștere. Au fost chestionate în legătură cu frecvența de consum a alimentelor, ingestia de alimente din ultimele 24 de ore și obiceiul fumatului. A fost calculată ingestia totală energetică și a principalilor macronutrienți. S-au determinat cotinina, tiocianații și creatinina din urină. Relația dintre fumat și nutriție a fost investigată folosind testele „chi pătrat” și Anova. **Rezultate.** Dacă înainte de sarcină fumau 43.4 % dintre femei, în timpul sarcinii mai fumau aproximativ 10 % dintre ele. Fumatul s-a asociat cu situația socio-economică defavorabilă (nivel redus de

educație, necăsătorit, șomaj). Numărul de țigări fumate s-a corelat foarte bine cu nivelurile urinare de cotinină și tiocianați raportate la creatinină. Femeile fumătoare au avut o ingestie energetică mai mare și au consumat mai multe lipide decât femeile nefumătoare. La începutul sarcinii femeile fumătoare au consumat mai puține produse lactate iar la sfârșitul sarcinii mai puțin pește decât celelalte femei. După naștere, femeile fumătoare au consumat mai puține ouă și pește. Pe tot timpul perioadei de studiu ele au consumat mai multă cafea decât femeile nefumătoare. **Concluzii.** Aproximativ un sfert dintre femeile fumătoare au continuat să fumeze pe timpul sarcinii și după naștere; ele au avut o alimentație mai puțin sănătoasă în comparație cu femeile nefumătoare. Așadar, femeile fumătoare gravide reprezintă un grup populațional specific în ceea ce privește intervențiile de sănătate publică în domeniul nutriției.

Cuvinte cheie: fumat, sarcină, nutriție, cotinină

INTRODUCTION

It is well known that the smoking during pregnancy is harmful and can result in increased spontaneous abortions in the first trimester, premature placenta abruption, preterm delivery, decreased birth weight and sudden infant death syndrome (1). Infant born by mothers who smoke during pregnancy weight on average 150-300 g less than those born by mothers who do not smoke and the risk of small-for-gestational age is at least two times as high among women who smoke as among women who do not smoke (2, 3). Long-term smoking may increase the risk of placental complications. Also, it may reduce uteroplacental circulation causing hypoxia which may particularly affect the development of the brain and thus subsequent intellectual development (4). By the other hand, smoking generally influences the eating habits. Thus, smokers were more likely to skip breakfast compared with nonsmokers (5). Smokers have lower intakes of the antioxidant vitamins and fiber, but higher intakes of energy, fat and caffeine than nonsmokers (6, 7). They also tend to have higher salt intake and eat a greater proportion of saturated

fat, butter, margarine and full-fat milk. Smokers are less likely to consume fruits and vegetables, particularly those high in vitamin C and carotens (8). Cigarette smokers may be less likely to consume micronutrient supplements and more likely to consume alcohol and other substances that may interact with nutrient metabolism (9).

So, smokers are already at risk and the health promotion messages targeted to smokers should include dietary instructions (6).

As concern pregnant women, nutrition is probably most important external factor which influences the mother health and the pregnancy evolution, creating, at the same time prerequisites for the newborn health. It has been suggested that some diseases are "programmed", during fetal development and the mother's diet may play a role in this (10).

So, taking into account all above shown, smoking can also indirectly influence fetus evolution affecting the alimentary mother behavior.

The aim of the study was to determine the relationship between smoking and food ingestion in a pregnant women group.

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MATERIAL AND METHODS

The group of study included 263 pregnant women from Iași county. The study design and other characteristics of pregnant women were shown elsewhere (11).

The questionnaire included data about smoking, besides many other information. Urinary cotinine (spectrophotometric method), thiocyanates (spectrophotometric method with ferric nitrate) and creatinine (Jaffe method with picric acid) were determined (12).

Relationship smoking-nutrition was investigated using "chi squared" test and Anova test.

RESULTS

The nutrition analyze was presented in another paper (11). We just remember that mean energy intake was placed

under the recommended value in all stages in our group of study, only about 20% of pregnant women having a normal intake. Concerning the macronutrients, mean carbohydrate intake was placed under the normal limit (55% calories) while the lipid intake was over the upper limit (30%) taking into account the recommendations of WHO for mean intake of population. Concerning the food intake, we found an insufficient consumption of dairy products, fish, eggs and a high consumption of vegetal lipids and coffee.

From 263 women of our study group, 114 women (43.4%) smoked before pregnancy. About 50% of smoking women smoked maximum 5 cigarettes/day (table 1).

Table 1. Distribution of the pregnant women before pregnancy according to the number of cigarettes smoked by day

| Number of cigarettes | Number of women | % |
|----------------------|-----------------|------|
| 1 – 5 | 59 | 22.4 |
| 6 – 10 | 26 | 9.8 |
| 11 – 15 | 9 | 3.4 |
| 16 – 25 | 20 | 7.6 |

The women began to smoke between 14 and 33 years of age; majority of them used to smoke during a large period of time, even 20 years (table 2).

The women used to smoke before pregnancy within 1 to 20 years; most of them used to smoke within 6 to 10 years (table 3).

Table 2. The age of women at the start of smoking

| Age (years) | Number of women | % |
|-------------|-----------------|------|
| 14 – 19 | 62 | 57.6 |
| 20 – 24 | 39 | 35.1 |
| 25 – 33 | 8 | 7.2 |

Table 3. Distribution of the smoking women before pregnancy according to the period they smoked

| Period (years) | Number of women | % |
|----------------|-----------------|------|
| 1 - 5 | 40 | 36.4 |
| 6 – 10 | 49 | 44.5 |
| 11 - 15 | 16 | 14.5 |
| 16 - 20 | 5 | 4.5 |

At the beginning of pregnancy 32 (12.1 %) women smoked. Most of them (8.7 %) smoked 1-5 cigarettes/

day but some of them smoked more than 15 cigarettes/day (table 4).

Table 4. Attitude towards the smoking of the mother during pregnancy and postpartum

| Number of smoked cigarettes /day | Early pregnancy (n=263) | | Late pregnancy (n=214) | | Postpartum (n=205) | |
|----------------------------------|-------------------------|------|------------------------|------|--------------------|------|
| | Number of women | % | Number of women | % | Number of women | % |
| 0 | 231 | 87.8 | 196 | 92.7 | 186 | 90.7 |
| 1- 5 | 23 | 8.7 | 14 | 6.5 | 7 | 3.4 |
| 6 – 10 | 5 | 1.9 | 6 | 2,8 | 10 | 4.9 |
| 11 – 15 | 0 | 0.0 | 0 | 0 | 0 | 0 |
| 16 - 25 | 4 | 1.5 | 0 | 0 | 2 | 1.0 |
| 1 -25 | 32 | 12.1 | 20 | 9.3 | 19 | 9.3 |

In late pregnancy 20 women (9.3 %) smoked. Most of them (6.5 %) smoked 1-5 cigarettes/day and some of them smoked maximum 10 cigarettes/day. Postpartum, the same proportion (9.3 %) of women smoked and among them 2 women smoked 20cigarettes/day. We mention a number of 11 women of the smoking women who nursed their babies. The urinary level of cotinine and thiocyanates reported

by creatinine highly correlated with the number of smoked cigarettes ($r=0.74$; $p=0.000$ and $r=0.10$; $p=0.023$ respectively). As consequence of stopping smoking, one can see a decrease of cotinine level in late pregnancy and an increase of this level postpartum at higher values than in early pregnancy. Thiocyanates varied differently (table 5).

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Table 5. Urinary cotinine and thiocyanates (mean+/- standard deviation)

| | Early pregnancy (n=232) | Late pregnancy (n=176) | Postpartum (n=111) |
|------------------------------------|---------------------------------|----------------------------------|---------------------------------|
| Cotinine (mmol/l) | 2.49 +/- 6.48 (0 – 41.85)* | 1.76 +/- 5.90 (0 – 42.88) | 3.24 +/- 9.95 (0 – 77.70) |
| Cotinine/Creatinine (mmol/g) | 2.66 +/- 6.21 (0 - 40) | 2.24 +/- 6.64 (0 – 47) | 2.91 +/- 7.04 (0 - 40) |
| Thiocyanates (mg/l) | 4.44 +/- 2.08 (0.82 – 14.16) | 4.00 +/- 1.95 (0.97 – 11.42) | 3.34 +/- 2.69 (0.22 – 13.16) |
| Thiocyanates/ Creatinine (mg/g) | 4.23 +/- 1.59 (0.50 – 11.0) | 5.03 +/- 4.40 (1.10 – 58.00) | 3.16 +/- 2.09 (0.60 – 10.0) |

*Variation limits

The smoking concerning repartition of the women in relationship with socio-economical status was not homogenous (table 6); this means that the smoking women were less educated, in a high proportion singles and unemployed.

In early pregnancy, smoking women had a higher energy intake (p=0.040) and consumed more lipids (p=0.030) than nonsmoking women (table 7).

Table 6. Association of smoking with unfavorable socio-economical status

| Associated factor | | Smoking women (n) | Nonsmoking women (n) | |
|-------------------|------------|----------------------|-------------------------|-------------------------------|
| Education | Elementary | 7 | 6 | $\chi^2 = 14.04$ p = 0.000 |
| | Middle | 11 | 101 | |
| | High | 7 | 121 | |
| Marital status | Sinles | 14 | 14 | $\chi^2 = 4.35$ p = 0.036 |
| | Married | 214 | 214 | |
| Working status | Unemployed | 28 | 28 | $\chi^2 = 6.36$ p = 0.011 |
| | Employed | 200 | 200 | |

Table 7. Association of energy intake and lipid consumption with smoking

| Associated factor | Women | n | Value of associated factor (mean +/- SD) | t | p |
|----------------------|------------|-----|--|------|-------|
| Energy intake (kcal) | Nonsmoking | 220 | 2128.9 +/- 796.9 | 2.03 | 0.040 |
| | Smoking | 27 | 2462.0 +/- 859.8 | | |
| Total lipids (g) | Nonsmoking | 220 | 84.4 +/- 39.2 | 2.14 | 0.030 |
| | Smoking | 27 | 101.6 +/- 41.8 | | |

As regards the consumption frequency of different foods, smoking was negatively associated with consumption of dairy products, fish, eggs, and positively associated with coffee consumption (table 8).

Table 8. Association of smoking with consumption frequency of some foods

| Stage | Associated factor | Consumption frequency by week | Smoking women (n) | Nonsmoking women (n) | |
|-----------------|-------------------|---|-------------------|----------------------|---------------------------------|
| Early pregnancy | Dairy products | <= once 2 -3 times >= 4 times | 8 5 15 | 23 63 135 | $\chi^2 = 7.85$ $p = 0.019$ |
| | Coffee | No consumption < 4 times >= 4 times | 7 4 17 | 136 36 40 | $\chi^2 = 24.71$ $p = 0.000$ |
| Late pregnancy | Fish | No consumption >= 2 -3 times | 5 15 | 15 172 | $\chi^2 = 5.97$ $p = 0.014$ |
| | Coffee | No consumption < 4 times >= 4 times | 4 4 12 | 98 49 40 | $\chi^2 = 14.84$ $p = 0.000$ |
| Postpartum | Eggs | <= once 2 -3 times >= 4 times | 6 11 2 | 20 88 74 | $\chi^2 = 10.09$ $p = 0.006$ |
| | Fish | No consumption >= 2 -3 times | 6 13 | 24 158 | $\chi^2 = 4.58$ $p = 0.032$ |
| | Coffee | No consumption < 4 times >= 4 times | 3 3 13 | 101 35 46 | $\chi^2 = 16.26$ $p = 0.000$ |

DISCUSSION

Our study on the relationship between smoking and food intake in a pregnant women group emphasized some unhealthy eating habits in smoking women comparing with nonsmoking women. We found a poorer quality of

the diet in smoking women because smoking had a significant effect on intake of many nutrients and this is in accordance with other authors' findings (13, 14).

The connection between smoking and dietary intake is extremely complex

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(15). Nicotine, the most characteristic of tobacco components, is a highly toxic alkaloid that is both a ganglionic stimulant and a depressant. Many of its complex effects are mediated by the release of catecholamines. Fowler et al. have demonstrated that tobacco smoke exposure is associated with a marked reduction in monoamine oxidase, an enzyme that influences mood function (16). It is possible that such effects result in deregulation of appetite or attitude towards foods (17). Other authors have suggested that modification of taste related to smoking may lead smokers to prefer certain foods (18). Thus, cigarettes smoking were accompanied by a decreased consumption of sweet-tasting high caloric food. This may help to explain the changes in body weight which accompany cigarette smoking. It seems that the change of body weight is determined by the nicotine effects on fat stores in the body as suggested studies in rats (7). Smoking influence upon food intake and body weight may be explained also by the increasing of acid secretion in the stomach, low production of compounds that protect the lining, and reduces blood flow in the stomach lining. Smoking is more likely to have an imbalance between the dietary intake of antioxidant nutrients and the metabolic demand for antioxidant protection (19). This imbalance makes smokers more susceptible to oxidative damage. Smokers are at increased risk of chronic diseases because their diets are different and because smoking creates an altered pattern of demand

for specific nutrients. The diet of smokers not only fails to meet the unusual requirements for specific nutrients to satisfy the altered pattern of demand, but it is likely to exacerbate the damage caused by smoking.

The apparently greater requirement for antioxidants among smokers means that poor intakes may have greater biological implications (10). Pregnant smokers have poorer intakes of most micronutrients than did nonsmokers despite their greater requirements.

Moreover, cigarette smoking may decrease absorption of micronutrients in the intestine and increase the utilization of nutrients. Kuhnert et al. suggested that cadmium from cigarette smoke accumulate and binds to zinc in the placenta, lowering the amount of zinc available to the fetus (20, 9).

Particular food choices might also correspond to a generally unhealthy lifestyle, a socio-economic status associated with smoking or a lack of nutrition knowledge (21).

CONCLUSIONS

- About a quarter of smoking women continued to smoke during pregnancy and after delivery.
- Smoking women had a less healthy nutrition comparing the nonsmoking women.
- In addition to advice to give up smoking, smoking mother should be advised to improve their diet.
- Our study has shown that smoking pregnant women constitutes a group of particular importance in terms of multifactor public health intervention.

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