



## Swedish women's food habits during pregnancy up to six months post-partum: A longitudinal study



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### ABSTRACT

**Objectives:** Diet influences the health of the foetus and the woman during pregnancy and later in life. It is therefore important to investigate pregnant women's food habits. The aim of this study was to describe women's food habits during pregnancy and up to six months post-partum.

**Study design:** A Food Frequency Questionnaire (VIP-FFQ) was distributed to 163 pregnant women on five occasions during and after pregnancy. Data were analysed using Friedman's ANOVA and a Bonferroni post-hoc test.

**Main outcome measures:** Food habits in relation to the National Food Agency's (NFA) food index.

**Results:** The pregnant women's diets were inadequate according to the NFA food index. A tendency towards an even poorer diet after delivery was identified, something which was related to an increased intake of discretionary food, e.g. sweets, cakes, cookies, crisps, ice cream, and decreased intake of fruit and vegetable. The alcohol consumption was low throughout.

**Conclusions:** The food habits during pregnancy were inadequate compared to recommendations and these habits became unhealthier after delivery. These suggest that dietary counselling needs to be more effective and continued into the lactating period. An increased focus should be given to healthy eating from the life course perspective, not just focus on effects on the foetus and pregnancy outcomes.

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### Introduction

A healthy diet during pregnancy, with safe food handling, consumption of a wide variety of food, and avoidance of alcohol and other harmful substances, can reduce risks for the expecting mother and the child during pregnancy and delivery. Moreover, a healthy diet is also correlated with future good health [1–3]. Eating a diet rich in vegetables, e.g. the Mediterranean diet, is found not only to reduce the incidence of preterm birth [4] but also shows a better degree of glucose tolerance and lowers the incidence of gestational diabetes among pregnant women [5]. A diet rich in vegetables, fruit and berries, whole grains, fish and low-fat dairy products is associated with lower odds of excessive gestational weight gain and low gestational weight of the child [6]. Higher adherence to the dietary recommendations for a healthy diet during pregnancy is also associated with weight reduction six months postpartum [7]. A balanced weight gain during pregnancy is important, since a large weight gain increases the risks for obstetric complications [8,9].

In both the previous and the recently revised Nordic Nutrition Recommendations (NNR) 2012 [10], diets rich in vegetables, legumes, fruit and berries, nuts and seeds, whole grains, fish and seafood, vegetable oils, and vegetable oil-based fat spreads, as well as low-fat dairy products are recommended to the general population. These recommendations are also valid for pregnant women with the addition of a few points. There is for instance an extra emphasis put on regularity in food intake during pregnancy, since prolonged periods of fasting are not beneficial for the woman or the foetus. Therefore, Swedish guidelines recommend three main meals per day (breakfast, lunch and dinner) plus 1–3 in-between meals or snacks with a good nutritional composition [11]. Further, Swedish pregnant women are advised to avoid food contaminated with *Listeria monocytogenes* or *Toxoplasma gondii*. Total abstention from alcohol during pregnancy is recommended, and special advice is given about low caffeine intake during pregnancy [11]. The Swedish dietary recommendations during lactation are virtually the same as the recommendations during pregnancy except for the avoidance of listeria and toxoplasma, and moderate alcohol consumption (equivalent to 1–2 small glasses, 15 cl of wine 1–2 times per week) is considered acceptable [12]. The majority of Swedish pregnant women take part in the maternal health care programme that is provided free of charge. In uncomplicated pregnancies, the programme entails 8–10

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visits and a postnatal visit at 8–10 weeks after pregnancy with a midwife in a primary care practice [13]. According to guidelines in the national pregnancy health programme, dietary information should be provided at the first visit, usually in pregnancy weeks 10–12, together with information about national guidelines concerning the avoidance of alcohol and smoking. Thereafter, healthy eating is only reflected upon if deemed necessary, and the postnatal visit does not include any lifestyle counselling [13].

Three distinct dietary patterns were identified in pregnant women in the Norwegian Mother and Child Cohort Study; prudent, Western and traditional [4]. The prudent pattern was characterized by a high intake of vegetables, fruit, poultry and fibre-rich bread, and was more common among those with higher education, non-smokers and women in higher age groups. The traditional pattern, which quite well fits in to the Swedish recommendations of healthy eating advice, was characterized by a high intake of boiled potatoes, fish products, low-fat milk and cooked vegetables. The Western pattern was characterized by a high intake of salty snacks, sweets, white bread, processed meat products and pasta. This pattern was more common among younger women with low education. Rasmussen et al. [14] have also reported that younger, low-educated pregnant women have less healthy food patterns.

There is a shortage of research on food habits among pregnant women in Sweden. Therefore, in order to identify areas for improvement in midwives' dietary counselling, the aim of this study was to describe women's food habits during pregnancy and up to six months postpartum.

## Materials and methods

### Participants and data collection

This paper is part of a larger study (PregNut), which investigates food intake and intake of specific nutrients among Swedish-speaking pregnant women [15]. Their dietary intake, height, and weight were measured by primary health care providers. Blood was sampled during pregnancy and postpartum. The participants were consecutively recruited between September 2006 and March 2009 by midwives at five selected health care centres, strategically and geographically distributed to represent a socio-economic cross-section. Exclusion criteria were major medical conditions, the inability to attend the ordinary antenatal welfare programme, and insufficient command of the Swedish language.

The participating women in the PregNut study ( $n = 226$ ) were requested to fill in a food frequency questionnaire (FFQ) about their food habits when visiting the health care (for more details, see below). Questionnaire data were collected on five occasions with three during pregnancy – in pregnancy weeks 10–12, in weeks 19–23 and in weeks 36–38 – and on two occasions after delivery, i.e. 10–12 weeks and 6 months postpartum.

In the present study, only the participants who had answered the questionnaire at the first visit and at least on three further occasions were included ( $n = 163$ ).

### Outcome measures

The FFQ used in the present study is also used in the Västerbotten Invention Program for Health Survey (VIP) [16] and has been validated for energy and nutrient intake. The VIP-FFQ included socio-demographic information and questions about the intake frequency of 66 different food items/groups. These were commonly reported on a 9-level scale, from “never” to “four or more times a day”, and some were reported per week or per month. When filling in the FFQ, the participants were instructed to report their food intake in relation to the previous two weeks. For the actual analyses, all frequencies were recalculated to a daily frequency.

The FFQ also included four pictures of plates with increasing portion sizes for staple foods, meat/fish/poultry and vegetables. The participants were asked to indicate the portion sizes most in line with their own food habits. These data, together with the reported frequencies, were used to calculate energy intake to enable assessment of the level of misreporting (for details see below).

A food index developed by the Swedish NFA was used to assess the healthiness of the participants' food habits [17]. The index – a priori-based method, based on the general Swedish dietary recommendations – assesses the healthiness of the diet focusing on intake of fruit and vegetables, fat (quality), whole grains, fish, and discretionary food (e.g. sweets, cakes, cookies, chips, ice-cream). The NFA food index contains seven components scored 0–2 for five components and 0–1 for two components, making a maximum score of 12. A score of 0–4 indicates a poor diet, 9–12 a healthy diet, and an acceptable diet in between. We also assessed the intake of alcohol, caffeine and dairy products (milk, yogurt and sour milk) to cover the pregnancy-specific dietary recommendations not included in the index. The Regional Ethics Board (04-171M) approved the study, and informed consent from each woman was obtained at each measurement.

### Statistical analyses

Data are presented as means  $\pm$  standard deviations (SD), medians with 25th and 75th percentiles (Q1–Q3) and percentages when applicable. When data were skewed, Friedman's ANOVA was performed. P-values below 0.05 were considered statistically significant. All analyses were performed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA). Internal missing values (8.2%) were replaced by means of last observation carried forward (LOCF), implying that a missing observation was replaced with the observation from the former occasion.

### Calculation of misreporting

To get an indication of trustworthiness of the reported food intake, the revised Goldberg cut-off equation [18] was used to assess the levels of misreporting of energy intake at each time point. Low, acceptable and high energy reporters were identified by comparing reported food intake levels (FIL), i.e. reported energy intake divided by calculated basal metabolic rate (BMR), with plausible physical activity level (PALs) for the age and sex, calculated as the ratio of standard energy expenditure levels divided with BMR.

BMR was calculated using the syntax suggested by Henry [19](table 15). As the mean age of the participants was  $30.5 \pm 4.2$  years, an average BMR value was calculated using Henry's syntaxes for 18–30 year olds and 30–60 year olds divided by two. In the present study, a group mean-PAL of 1.69 was deemed appropriate [18]. According to the Goldberg cut-off equation, low energy reporting was relatively common, varying between 30% and 46%, with the highest proportion at the end of the pregnancy, and the lowest ten weeks after delivery. High energy reporting was only seen in one participant at measurements 1, 2 and 4. For the two measurements after delivery, the validity of dietary intake could not be calculated for 34 and 47 participants respectively, as no information on weight was available for them. Most of them had been acceptable reporters at previous time points. The misreporting was at no time point deemed large enough to demand exclusion of any participants; thus, all 163 participants were included in the final analysis.

## Results

The mean age of the participants was  $30.5 \pm 4.2$  years (Table 1). Sixty-five percent of them had a university degree and one percent had a basic education level. On the first occasion in early pregnancy,

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