



Original article

The Preconception Dietary Risk score; a simple tool to assess an inadequate habitual diet for clinical practice[☆]



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SUMMARY

Background & aims: Worldwide unhealthy dietary behaviours in women and men in reproductive age are an increasing problem with adverse effects on reproduction. This emphasizes the need for a simple tool to assess the habitual diet in clinical practice. The aim of this study was to evaluate the use of the Preconception Dietary Risk score as a tool to determine the inadequacy of the habitual diet.

Methods: We investigated 139 patients (68 women, 71 men) planning pregnancy at the outpatient clinic. A summary Preconception Dietary Risk score was calculated from seven questions to assess the inadequacy of the diet using the six Dutch guidelines for the consumption of bread, oils/fats, vegetables, fruit, meat and fish. The Preconception Dietary Risk score was used to predict the nutrient intakes derived from the Food Frequency Questionnaire and validated with the biomarkers of one carbon metabolism in blood.

Results: The Preconception Dietary Risk score assessed an inadequate habitual diet in 55.4% of women and 54.2% in men and revealed a sensitivity of more than 80% for an inadequate intake of bread, vegetables, fruit, meat and fish. ANOVA revealed significantly positive linear trends of the Preconception Dietary Risk score for saturated fat intake, and significantly negative trends for the intake of protein, EPA, DHA, fibre, folate and vitamin B6, B12 and C intake. Furthermore, a significant inverse correlation was observed between the Preconception Dietary Risk score and serum vitamin B12 (Spearman's $\rho = -0.172$, $P = 0.046$).

Conclusions: The Preconception Dietary Risk score is a sensitive, quick and simple tool to assess an inadequate habitual diet in clinical practice.

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1. Introduction

Worldwide healthy dietary behaviours are deteriorating.^{1–3} Dutch men and women in reproductive age, showed an

insufficient consumption of more than 90% for fruit and vegetables, more than 70% for fish and 100% for fibre.⁴ In addition, excessive intakes of saturated fats, animal proteins and carbohydrates are observed.⁴ These qualitative poor diets result in relative deficiencies of essential vitamins and minerals, and as such contribute not only to the epidemic of obesity and ageing diseases, but also to reproductive failures.^{5,6}

The composition of the diet of women and men during the preconception period is considered increasingly important, because during this time frame of 14 weeks before conception female and male germ cells develop in order to be fertilized.⁷ During this period, reproductive tissues of especially women also have to be replenished with essential micronutrients to cover the nutritional needs of the embryo as well as the placenta during the first

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trimester of mainly histiotrophic nourishment. The amount of evidence addressing the detrimental influences of a qualitative poor diet on reproduction with long-term consequences for parental and offspring health is overwhelming.^{8–10} Moreover, maternal but also paternal obesity, a resulting phenotype of a poorly composed diet and a more sedentary lifestyle, is in a similar manner associated with increased risks of reproductive failures and adverse pregnancy outcome.^{11–13} Furthermore, it has been observed that poor maternal adherence to a healthy Mediterranean dietary pattern deteriorates chances of pregnancy and increases the risk of spina bifida and foetal growth restriction in offspring.^{8,14,15}

A change towards a healthier lifestyle can be achieved in a relatively short time and the preconception and pregnancy period is considered as 'the window of opportunity' to change poor dietary habits and to achieve lifestyle changes.¹⁶ Therefore, all couples planning pregnancy should be personally counselled on the inadequacy of the diet during a preconception visit.

Previous research has shown that a self-administered questionnaire prior to the preconception visit is a valid method to identify risk factors.¹⁷ To determine the inadequacy of the habitual diet, we created the Preconception Dietary Risk score (PDR), as summary score to assess the inadequacy intake of six food groups, derived from a self-administered questionnaire and based on the six dietary guidelines of the Netherlands Nutrition Centre.¹⁸

The current study aims to evaluate the PDR score as a clinical screening tool to assess the inadequacy of the habitual diet in couples planning pregnancy. We compared the PDR score with nutrient intakes from a validated semi-quantitative Food Frequency Questionnaire (FFQ)¹⁹ and biomarkers of one carbon metabolism, important in reproduction and significantly influenced by the diet.^{4,19}

2. Materials and methods

2.1. Study population

Between November 2010 and October 2011, couples visiting the preconception outpatient clinic "Achieving a Healthy Pregnancy"¹⁶ of the department of Obstetrics and Gynaecology of the Erasmus MC, University Medical Centre in Rotterdam, the Netherlands were invited to participate in the Rotterdam Predict study,²⁰ a preconception cohort study with follow up during pregnancy. Couples were eligible when they were living near Rotterdam and had an adequate understanding of the Dutch language in reading and writing. In the preparation of the preconception visit, all couples completed a Preconception Questionnaire (PQ) at home to obtain data on age, ethnicity, education, indication for referral, the use of medication, folic acid supplement, tobacco, drugs, beverages containing caffeine or alcohol, physical exercise, and diet inadequacy. The questions about habitual diet inadequacy were based on the Dutch food based dietary guidelines on average consumptions of bread, oils/fats, vegetables, fruit, meat and fish from which a summary PDR score was calculated (Table 1).¹⁸ Ethnicity and education level were classified according to the definition of Statistics Netherlands.²

During the study period a total of 860 patients (women and men) received preconception counselling of which 428 patients were eligible because of an adequate understanding of the Dutch language in speaking and reading and living in the Rotterdam area. A subgroup of 139 patients participating in the Predict study were available for analysis (68 women and 71 men) after exclusion of patients not responding the FFQ¹⁹ ($n = 173$; 40%), patients completing the FFQ¹⁹ >1 month after the PQ ($n = 89$; 21%) and when patients reported substantial changes in diet between the moment of completing the PQ and the FFQ¹⁹ ($n = 27$; 6%) (vegetarian, energy-restricted diet).

Table 1

The summary PDR score, calculated by the intake of six foods based on Dutch guidelines.⁴

PDR item	Preconception Questionnaire	Food Frequency Questionnaire
1	1) How many slices of bread do you eat daily? A: None, less than one, 1, 2–3, 4–5, 6–7, 7/> 2) What type of bread do you eat? A: White, brown, variable PDR score 1 ; White or variable 0–7 slices, or brown <4–5 slices.	1) How often did you eat bread in the previous month? A: None, 1 day/month, 2–3 days/month, 1 day/wk, 2–3 days/wk, 4–5 days/wk, 6–7 days/wk 2) When eating bread, how many slices of bread did you eat? A: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 3) What type of bread did you eat in the previous month? A: White, whole-wheat, brown, other
2	What type of cooking oils/fats do you use and how often do you use them weekly? A: Butter, margarine, liquid butter, vegetable oils, other. (Frequency; 0, 1, 2, 3, 4, 5, 6, 7) PDR score 1 ; Usage of butter, margarine.	4) What type of cooking fat did you usual use to cook meat, fish, vegetables, fried eggs, potatoes or meat replacers? (Answered per item separately) A: Butter, margarine, diet margarine, liquid margarine, olive oil, sunflower oil, other
3	How often do you eat 200 g of vegetables weekly (cooked or raw)? A: 0, 1, 2, 3, 4, 5, 6, 7 PDR score 1 ; <7 days a week.	5) How often did you eat vegetables (cooked/raw) in the previous month? A: None, 1 day/month, 2–3 days/month, 1 day/wk, 2–3 days/wk, 4–5 days/wk, 6–7 days/wk 6) How many servings (1 serving = 50 g) did you usually eat? A: 1–2, 3–4, 5–6, 7–8
4	How many pieces of fruit do you eat daily? A: none, 1 or less, 1–2, 2 or more PDR score 1 ; <2 pieces daily	7) How often did you eat fruits in the previous month? A: None, 1 day/month, 2–3 days/month, 1 day/wk, 2–3 days/wk, 4–5 days/wk, 6–7 days/wk 8) When eating fruit, how many pieces of fruit did you eat daily? A: 1, 2, 3, 4, 5, 6
5	How often do you eat meat weekly? A: 0, 1, 2, 3, 4, 5, 6, 7 PDR score 1 ; <3–4 times a week	9) How often did you eat meat in the previous month? A: None, 1 day/month, 2–3 days/month, 1 day/wk, 2–3 days/wk, 4–5 days/wk, 6–7 days/wk 10) When eating meat, how many servings did you eat on average? A: 0.5, 1, 1.5, 2/>
6	How often do you eat fish weekly? A: 0, 1, 2, 3, 4, 5, 6, 7 PDR score 1 ; <2 times a week	11) How often did you eat fish in the previous month? A: None, 1 day/month, 2–3 days/month, 1 day/wk, 2–3 days/wk, 4–5 days/wk, 6–7 days/wk 12) When eating fish, how many servings of fish did you eat on average? A: 0.5, 1, 1.5, 2/>

^a Based on the dietary guidelines of the Netherlands Nutrition Centre.¹⁸

Fig. 1 shows the flow diagram of the study population selection.

During the preconception visit, a trained counsellor screened and advised couples by using the PDR score from the PQ. Anthropometric measurements were performed during the visit, i.e. height, weight, waist- and hip circumference, systolic and diastolic blood pressure and body mass index (BMI) was calculated. Non-fasting blood samples were obtained by venipuncture for the determination of biomarkers of one carbon metabolism i.e. serum and red blood cell (RBC) folate, serum total vitamin B12 and plasma total homocysteine concentrations (tHcy). The participating patients received a FFQ¹⁹ to be completed at home and returned by mail.

All questionnaires and materials were anonymously processed. This study was conducted according to the guidelines laid down in

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