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Short report

Number of children and change in markers of metabolic health over 9-years in men and women. Data from the DESIR study

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Abstract

Aim. – Parity is associated with an increased risk of coronary heart disease and type 2 diabetes, possibly mediated by long-term modification of metabolic health. Studying associations between the number of children with health and disease in men in addition to women allows for differentiation between the social and lifestyle influences of child-rearing, and the biological influences of childbearing. We sought to determine whether the number of children is associated with the incidence of raised fasting glucose (fasting plasma glucose ≥ 6.1 mmol/L) and changes in glucose, insulin, insulin resistance and β-cell function over 9-years.

Methods. – Analysis of 1798 women and 1737 men from the DESIR study.

Results. – The number of children was associated with change in fasting glucose for women ($P_{trend} = 0.02$) and men ($P_{trend} = 0.03$), and increased incidence of raised fasting glucose by 30% (95% CI: 15, 47%) per child for men, but not women (3% [95% CI: −8, 15%]). There was a J-shaped association between number of children and change in insulin ($P = 0.01$) and insulin resistance ($P = 0.005$) for women, and a reduction in β-cell function in parous women ($P = 0.07$). Men with children had increases in insulin ($P = 0.02$), insulin resistance ($P = 0.02$), and β-cell function ($P = 0.07$).

Conclusions. – The number of children a person has is associated with changes in metabolic health indices long after childbirth for both men and women. The distinct gender differences in deterioration of metabolic health indices emphasize that childbearing and child-rearing are likely to have differential influences on metabolic health.

Keywords: Parity; Insulin resistance; Fasting glucose; β-cell function; Gender

Résumé

Relation entre le nombre d'enfants et l'évolution des marqueurs métaboliques sur neuf ans : analyse selon le sexe dans l'étude DESIR.

Objectif. – Le nombre d'enfants a été associé chez les femmes à une augmentation du risque cardiovasculaire et de diabète de type 2. La comparaison chez l'homme et chez la femme de la relation entre le nombre d'enfants et le risque métabolique permet de distinguer les déterminants socioéconomiques liés au style de vie des conséquences physiopathologiques des grossesses répétées. Nous avons ainsi étudié dans chaque sexe l'association entre le nombre d'enfants et l'évolution de la glycémie, de l'insulinosensibilité et la fonction bêta sur neuf ans au sein de la cohorte DESIR.

Méthodes. – Nous avons analysé 1798 femmes et 1737 hommes de la cohorte DESIR.

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Résultats. – Le nombre d'enfants était associé avec l'augmentation de la glycémie, à la fois chez les femmes ($P_{tendance} = 0{,}02$) et les hommes ($P_{tendance} = 0{,}03$). L'incidence de l'hyperglycémie à jeun (glycémie plasmatique à jeun ≥ 6,1 mmol/L) était significativement augmentée de 30 % (IC 95 % : 15, 47 %) par enfant chez les hommes mais non chez les femmes (3 % [IC 95 % : −8, 15 %]). Il existait chez les femmes une relation en J entre le nombre d'enfants et les variations de l'insulinémie ($P = 0{,}01$) et de l'index d'insulinorésistance HOMA au cours du temps ($P = 0{,}005$). Chez les hommes avec enfants, il existait une augmentation de l'insulinémie ($P = 0{,}02$), de l'index d'insulinorésistance ($P = 0{,}02$) et du HOMA bêta ($P = 0{,}07$).

Conclusions. – Le nombre d'enfants est significativement associé à une augmentation de la glycémie et de l'insulinémie au cours du temps, à la fois chez les femmes et les hommes. Les grossesses répétées et le fait d'élever plusieurs enfants semblent avoir chacun un impact différent sur les modifications des paramètres du métabolisme glucidique.

Mots clés : Parité ; Homme ; Femme ; Insulinorésistance ; Glycémie ; Insulinémie ; Sexe ; HOMA

1. Introduction

Parity is associated with an increased long-term incidence of coronary heart disease, hemorrhagic stroke and ischemic stroke [1–3]. This may be partially mediated by an increased progression of atherosclerosis during the perigestational period, leading to an increased extent and severity of atherosclerosis later in life [4,5]. However, a similar association between number of children and coronary artery disease and stroke also exists for men [2,6], despite there being no direct association between number of children and severity of atherosclerosis for men [4,5]. Accordingly, the links between number of children and cardiovascular disease appears to be acting via gender specific pathways. One such group of pathways may involve long-term alterations in metabolic health, including incidence of diabetes, impaired glucose tolerance, impaired fasting glucose, insulin resistance and β-cell function. While prior studies have focused largely on women [7–11], there is limited evidence concerning the association of number of children with markers of metabolic health in men. Studying men in addition to women allows for differentiation of the social and lifestyle influences of child-rearing, from the biological influences of childbearing [4,12]. We have previously demonstrated that the number of children is associated with fasting glucose, 2-hour glucose and the prevalence of diabetes in women but not men [5], despite there being no gender differences in the association of number of children born during a 6-year period and concurrent changes in glucose, insulin or insulin resistance [4]. Whether changes in metabolic profile non-concurrent to the time of childbirth may contribute to the increased incidence of diabetes in parous women remains unknown.

We studied the relationship between the number of children and changes in markers of metabolic health, including the incidence of raised fasting glucose and changes in glucose, insulin, insulin resistance and β-cell function, over 9-years in 1737 men and 1798 women from the Data from an Epidemiological Study on the Insulin Resistance syndrome (DESIR) study.

2. Methods

The study population was 1737 men and 1798 women aged 30–65 years, without diabetes at baseline, who participated in the 9-year DESIR follow-up study [13]. Participants were recruited from volunteers offered periodic health examinations free of charge, in 10 health centers in western France. All subjects provided written informed consent and the protocol was approved by an ethics committee.

The number of children, smoking habits, physical activity, education, family and employment status were assessed by self-administered questionnaire [13].

Metabolic factors were determined at 0, 3, 6 and 9-years using standardized techniques [13]. The homeostasis model assessment (HOMA2) was used to estimate insulin resistance and β-cell function [14]. The incidence of raised fasting glucose (glucose ≥ 6.1 mmol/L) and diabetes (glucose ≥ 7.0 mmol/L or treatment) were based on all follow-up visits. The incidence of raised fasting glucose was assessed in those who were normoglycaemic (glucose < 6.1 mmol/L) at baseline. Change in continuous variables during follow-up was calculated as the difference between the 9-year visit and baseline.

Multivariable regression models were used to study the associations of the number of children (linear and non-linear, the latter determined using a centered quadratic variable), and children (yes/no), with metabolic indices. Only the strongest gender-specific association (linear, non-linear or dichotomous) for each endpoint, as determined using change in R-squared, is presented. All analyses were adjusted for age and socioeconomic factors (education, family and employment status), and then a further model was adjusted for lifestyle factors (physical activity, smoking) and BMI (baseline and 9-year change). Participants with outlying residuals for associations with glucose ($n = 7$) and insulin ($n = 6$) were excluded from relevant models. Results are presented as odds ratio (95% CI) and unstandardized β-coefficients (SE).

Statistical analyses used SPSS software (version 17.0; SPSS, Chicago, IL). Statistical significance was inferred at $P < 0.05$.

3. Results

Participant characteristics at baseline, stratified by the number of children, are shown in Table 1 for women and Table 2 for men. In brief, age was associated with the number of children in both men and women, and BMI and smoking status were associated with the number of children in women but not in men. In cross-sectional analysis at baseline, there were no significant associations between the number of children and insulin or