Preliminary Report

Marital status and family size of type 1 diabetic patients in a French cohort

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Summary

Objective: To compare the marital status, the number of offspring and the cumulative incidence of type 1 diabetes in offspring of type 1 diabetic men and women.

Methods: From the database of patients attending our department, we reviewed the files of all the 352 subjects aged ≥ 40 years with type 1 diabetes and compared male and female patients for whom age, age at diagnosis of diabetes, marital status, socio-economic status, number and age of offspring, diagnosed type 1 diabetes in the offspring could be obtained from patient’s record and/or direct interview (86 males and 78 females).

Results: In this population, 73% of women and 81% of men were married or living a marital life (NS), and 35% of women versus 8% of men had no offspring (P < 0.0001). The proportion of parents with 2 offspring or more was 43% in females and 61% in males (p = 0.03) and was not related to the socio-economic status. The number of offspring with diagnosed type 1 diabetes was small (8/229) and did not show significant association with gender of the parent, with a cumulative incidence of 3.2 and 3.7% in offspring of type 1 diabetic mothers and fathers respectively.

Conclusion: The number of children born before 1960 was fewer children than men. In this cohort, there was no difference in the cumulative incidence of type 1 diabetes in offspring of type 1 diabetic men and women despite reduced family size in women.

Key-words: Type 1 Diabetes · Gender · Offspring · Incidence · Marital Status.


Résumé

Statut marital et taille de la descendance dans une cohorte française de patients diabétiques de type 1

Objectif : Comparer le statut marital, le nombre de descendants et l’incidence cumulée du diabète de type 1 chez les descendants d’hommes et femmes ayant un diabète de type 1 (DT1).

Méthode : Nous avons colligé tous les 352 patients diabétiques de type 1 suivis dans notre service, âgés d’au moins 40 ans et comparé les hommes et les femmes pour lesquels les informations concernant l’âge au moment du diagnostic, le statut marital, le statut socio-économique, et les descendants (nombre, âge, diagnostic du diabète de type 1) pouvaient être obtenues par le dossier médical, en consultation ou par entretien téléphonique (86 hommes, 78 femmes).

Résultats : Dans la population étudiée, 73 % des femmes et 81 % des hommes étaient mariés ou vivaient en couple (NS), 35 % des femmes et 8 % des hommes n’avaient aucun descendant (p < 0.0001). Les parents de 2 descendants ou plus représentaient 43 % des femmes et 61 % des hommes (p = 0.03), sans association avec le statut socio-économique. Au total 8/229 descendants avaient un DT1, soit une incidence cumulée de 3,2 et 3,7 % chez les descendants de femmes et d’hommes respectivement (NS).

Conclusion : Au sein de cette population de patients diabétiques nés avant 1960, les femmes ont eu moins d’enfants que les hommes. Il n’existait pas de différence significative de l’incidence cumulée du DT1 chez les descendants en dépit du nombre réduit de descendants chez les femmes.

Mots-clés : Diabète de type 1 · Sexe · Descendants · Incidence · Statut marital.

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Several studies including large scale studies have shown that the incidence of type 1 diabetes was higher in the offspring of type 1 diabetic fathers compared to offspring of type 1 diabetic mothers [1, 2]. Sex of parent with type 1 diabetes, year of birth and birth order of the offspring were independent factors associated with the risk of type 1 diabetes in the offspring. In families with more than one offspring, the first-born child tended to have a lower risk compared to the later-born children [2]. Thus, it is possible that the lower cumulative incidence of type 1 diabetes in the offspring of type 1 diabetic female is attributable to the lower number of children. Indeed, diabetes seems to have an influence on the decision of remaining childless in a study of 50 20-35yr old type 1 diabetic patients [3], and young adults with type 1 diabetes aged 16 - 25 yr were reported to be less likely to have children than non diabetic people of similar age range [4]. Recently, in a larger sample of patients in Japan, a lower rate of marriage and a smaller number of children per married women was observed in patients with diabetes compared with the Japanese general population [5], but men - women comparison was not reported. It is of interest to investigate whether the often reported lower cumulative incidence of type 1 diabetes in offspring of type 1 diabetic women compared to men is biased by the family size. The present study therefore aimed to assess and compare the marital status and the number of offspring, and the cumulative incidence of type 1 diabetes in offspring of type 1 diabetic men and women living in Paris and its suburbs, and analyse possible relation between these factors.

Methods

In 2001, we selected from the database of patients attending our department, all the subjects aged 40 years and over who were entered in the database as having type 1 diabetes mellitus. We reviewed the files of all such patients with view to have confirmation of the diagnosis of type 1 diabetes and verify the availability of information about marital status, number and age of offspring. In addition, incomplete files were considered if the patient was still attending regularly follow-up consultation or could be contacted by phone. From 352 files retrieved from the database, 86 males and 78 females with confirmed type 1 diabetes fulfilling these criteria were identified.

The following items were recorded for each of the selected patients: age, sex, age at diagnosis of diabetes, marital status, socio-professional category (classified in low, middle and high), number and age of offspring, diagnosed type 1 diabetes in the offspring. Two main sources of data were used and cross-checked: hospital patient’s record and direct interview with the patient during routine consultation or by phone. When discrepancies existed between the sources, data from direct interview were considered.

Data were expressed as frequencies, means and standard deviation. Comparison between type 1 diabetic males and females were made using chi square test with continuity correction when necessary for discrete variables, and paired t-test for continuous variables, with significance level at p < 0.05.

Results

From the 352 type 1 diabetic patients born before 1960 that we reviewed, 86 males and 78 females with confirmed type 1 diabetes mellitus fulfilled the entry criteria. The total number of offspring of these patients was 229. Results are summarised in Table I.

Age at the moment of the study and age at diagnosis of diabetes was similar in male and female patients. The rate of marriage or marital life was non significantly lower in females compared to males, however, 35% of females versus only 8% of males with type 1 diabetes did not have any offspring (P < 0.0001). The proportion of patients with ≥ 2 offspring was 43% in females and 61% in males (p = 0.03).

Mean age of the parents at the birth of their offspring was 27-30 in females and 30-34 in males (p < 0.0001). No association between socio-professional category and number of offspring was found.

Among the patients who had at least one offspring, if diabetes was diagnosed after the birth of the first offspring, 67% of the men and 48% of the women had at least a second offspring (NS). If diabetes was diagnosed before the birth of the first offspring, still 67% of men and only 34% of women had at least a second offspring (p = 0.003).

The number of offspring with diagnosed type 1 diabetes was small and did not show significant association with gender of the parent. The M: F sex ratio of type 1 diabetic offspring of type 1 diabetic fathers was 3: 2, and 2: 1 in offspring of type 1 diabetic mothers. Five of the 8 type 1 diabetic offspring were first born children (2/3 from diabetic mothers, and 3/5 from diabetic fathers).

Discussion

In this study population, type 1 diabetes was associated with trends towards lower marriage rate, reduced frequency of parenthood and reduced size of family in affected females compared to males aged 40 years and over. No significant difference in the cumulative incidence of type 1 diabetes was observed between the offspring of type 1 diabetic men and women.

The limited sample size does not allow strong conclusions in terms of cumulative incidence of diabetes in the offspring. Two hundred and twenty nine offspring where identified from the 164 parents studied, and the precise frequency of stillbirth is lacking for the whole sample. However, focusing only on patients aged 40 years and over allowed us to study only females who had completed their
family size or nearly done so. In addition, with the mean age of offspring ranging from 18 to 23 years, we had the opportunity to focus on a group of subjects of whom most had gone through the age of peak incidence of type 1 diabetes. The specificity of this study is to question within a type 1 diabetic population, men - women difference with regard to marital status and family size and its possible influence on offspring.

The few previous studies that focused on the social implications of type 1 diabetes mainly compared type 1 diabetic patients to the general population. Lloyd et al. [4] reported no difference between 16-25 yr old type 1 diabetic patients and non diabetic age-matched controls with regard to commitment to marriage. However in Japanese type 1 patients, Aono et al. [5] found in both men and women a lower marriage rate compared to the general background population in the 20-39 yr age range. The mean number of children was reported only for women and was 1.17 in 30-35 yr patients compared to 2.14 in the background population of the same age range. Comparison with men was not reported [5]. The marriage rate in the ≥ 40yr French population we studied was much higher than that of 35-39 yr Japanese type 1 patients who reported 52% in females and 50% in males [5], but is lower than in women of the French general population of the same generation in whom less than 9% never got married [6]. Consistent with our data, Aono et al. found the greatest proportion of women with type 1 diabetes having none, one or at most two offspring [5]. None had three or more, contrasting with the background population. Unfortunately no data were reported for men. In the present study we found that despite similar marriage rate, less than 10% of men were childless compared to 35% of women and the frequency of large-size family was higher in men compared to women, with no significant association with the socio-professional category.

Interestingly, the number of offspring of type 1 diabetic women differed according to whether the first offspring was born before or after the diagnosis of diabetes. The experience of a pregnancy while the patient was already diagnosed with diabetes seemed to refrain women from having further pregnancies. This was not observed in men.

In 1995, in a large cohort of type 1 diabetic patients, Tuomilehto et al. [2] evidenced from multivariate analyses that apart from the gender of the parent, birth order of offspring was an independent factor associated with type 1 diabetes in the offspring. The first born children tended to be at

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**Table I**

Comparison between type 1 diabetic males and females aged ≥ 40 years.

<table>
<thead>
<tr>
<th></th>
<th>Type 1 diabetic females</th>
<th>Type 1 diabetic males</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>78</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Age (yr)*</td>
<td>51 (9)</td>
<td>52 (8)</td>
<td>NS</td>
</tr>
<tr>
<td>Age at diagnosis of diabetes (yr)*</td>
<td>23 (10)</td>
<td>24 (10)</td>
<td>NS</td>
</tr>
<tr>
<td>% married or living a marital life</td>
<td>73</td>
<td>81</td>
<td>NS</td>
</tr>
<tr>
<td>% having children</td>
<td>65 (50/77)</td>
<td>93 (66/71)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Socio-professional category (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Low</td>
<td>4.9</td>
<td>3.7</td>
<td>NS</td>
</tr>
<tr>
<td>— Middle</td>
<td>80.3</td>
<td>61.7</td>
<td>NS</td>
</tr>
<tr>
<td>— High</td>
<td>14.8</td>
<td>34.6</td>
<td>NS</td>
</tr>
<tr>
<td>% of patients having</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— No offspring</td>
<td>35.1</td>
<td>8.4</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>— 1 offspring</td>
<td>22.1</td>
<td>31.0</td>
<td>NS</td>
</tr>
<tr>
<td>— 2 offspring or more</td>
<td>42.9</td>
<td>60.6</td>
<td>0.03</td>
</tr>
<tr>
<td>Total number of offspring (n)</td>
<td>95</td>
<td>134</td>
<td></td>
</tr>
<tr>
<td>Age of offspring (yr)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Youngest</td>
<td>20 (9)</td>
<td>18 (9)</td>
<td>NS</td>
</tr>
<tr>
<td>— Oldest</td>
<td>23 (9)</td>
<td>23 (9)</td>
<td>NS</td>
</tr>
<tr>
<td>Age at birth of offspring (yr)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— First</td>
<td>27 (4)</td>
<td>30 (5)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>— Last</td>
<td>30 (4)</td>
<td>34 (7)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Cumulative incidence of type 1 diabetes in offspring (%)</td>
<td>3.2%</td>
<td>3.7%</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>(3/95)</td>
<td>(5/134)</td>
<td></td>
</tr>
</tbody>
</table>

* results expressed as mean (standard deviation).
lower risk compared to the last born children [2]. Thus, the fact that in both the Japanese study and ours, women with type 1 diabetes tended to have very few offspring may account at least in part for the previously reported reduced incidence of type 1 diabetes in offspring. However, in our study, most offspring diagnosed with type 1 diabetes (5/8) were first-born children. In addition, there is still a controversy about the relation between birth order and type 1 diabetes in the offspring [7]. The relation seems complex with a possible interaction between birth order and maternal age that may apply only to children born second or later [7].

It is not plausible that selective loss of diabetes-susceptible foetuses accounted for the lower incidence of type 1 diabetes in the offspring of type 1 diabetic women as shown by Warram et al. at the Joslin Diabetes Center in Boston. A 4% perinatal mortality was reported since 1975 in their unit [8]. Moreover, they found a higher risk of developing type 1 diabetes in offspring from young mothers compared to older parents [8]. It is therefore of interest to consider the mean age at first and last birth that was 3 to 4 years lower in women compared to men with type 1 diabetes. In fact, the cumulative incidence of type 1 diabetes was not significantly higher in the offspring of males compared to females with type 1 diabetes mellitus as previously reported. However, the reduced number of patients and offspring does not allow any conclusion in this context. For ethical reasons the possibility that children from diabetic fathers could have different fathers was not ascertained and should be beard in mind when drawing conclusions.

In conclusion, for unknown reasons, possibly fear, or enormous medical constraints during pregnancy, and/or medical advise at a certain time in the past, women with type 1 diabetes have had no or fewer children than men. If birth order independently influences the risk of type 1 diabetes in the offspring, the reduced family size may have had an impact on the previously reported lower incidence of type 1 diabetes in the offspring of type 1 diabetic women compared to men. We therefore suggest that when comparing offspring of type 1 diabetic men and women in large cohorts with reference to the cumulative incidence of type 1 diabetes, adjustment to the size of the family or birth order of the offspring should be investigated.

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References