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ORIGINAL ARTICLE

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Reproductive attitudes of couples having a child with cystic fibrosis in Brittany (France)

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Abstract Cystic fibrosis (CF) has an incidence of one in 2,636 livebirths and a carrier rate of one in 26 inhabitants in Brittany. One objective of a major enquiry among parents having a CF child as well as CF adolescents and adults was to evaluate the reproductive behavior of 124 couples attending a CF care center. Knowledge of recurrence risk resulted in deciding against further progeny or in reducing the number of children (average number of children: 1.96; ideal mean number of children: 3.7). Thirty-five percent adopted or changed their method of contraception after the birth of their affected child, but the change was due to the birth of the CF child in only 14.3% of the couples. Prenatal diagnosis (PD) was favored by 95.1%, and 41.2% had used it; 68.6% were in favor of pregnancy interruption for CF and 76.2% would interrupt the pregnancy should PD reveal that their fetus had CF. All 123 respondents thought that genetic counseling was useful, but only 87.1% knew of its availability. Our results are quite different from those previously published. Although results could be population-specific, one cannot exclude the fact that they reflect a change of attitudes among parents, the other studies being much older.

Keywords Cystic fibrosis · Reproductive attitudes · Contraception · Birth rank · Prenatal diagnosis · Genetic counseling

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Introduction

Cystic fibrosis (CF) is the most common autosomal recessive disorder of childhood in Caucasian populations and affects one in every 2,500–3,500 livebirths with a carrier rate of one in 25–30 individuals (Boat et al. 1989). It has an estimated incidence of one in 2,636 live births with a carrier rate of one in 26 individuals in Brittany (Scotet et al. 2000).

Several studies have shown that the birth of a CF child had a major impact upon subsequent family planning (Boué et al. 1991; De Braekeleer et al. 1994, 2000b; Evers-Kiebooms et al. 1988, 1990; Evers-Kiebooms and Van den Berghe 1979; Jedlicka-Köhler et al. 1994; Kaback et al. 1984b; Rona et al. 1994; Steele et al. 1986; Wertz et al. 1991, Wertz et al. 1992). Some emphasized the role of the rank of the affected child on the parents' reproductive attitudes, a few discussed how the birth of a CF child could influence contraceptive methods, while others analyzed the use and the impact of prenatal diagnosis (PD) and genetic counseling.

The lack of recent published data on these important topics prompted us to investigate the impact of the birth of a CF child on the reproductive attitudes of their parents attending the CF care centers in Brittany and Loire-Atlantique (an administrative department of historical Brittany). More precisely, we wanted to know the effect of the birth of a CF child on subsequent pregnancies and use of contraceptive methods. We were also interested in assessing the knowledge, intent to use, and use of genetic counseling and PD.

Materials and methods

In the past four years, we conducted a major survey, distributing 506 questionnaires to parents with a CF child as well as CF adolescents and adults who were followed in a CF care center in Brittany and Loire-Atlantique. Overall, 207 completed questionnaires (40.9%) were returned (De Braekeleer et al. 2003).

Each questionnaire contained up to 23 sections and 398 multiple-choice questions. The questionnaire for parents having a CF child younger than 18 years old still living with them included questions relating to the knowledge of the clinical aspects and the transmission of CF, compliance to treatment, social and familial impact of the disease, reproductive attitudes, PD and genetic counseling, etc. (De Braekeleer et al. 2000b). At the time of the survey, 293 couples had at least one CF child living with them; 124 (42.3%) completed the questionnaire (De Braekeleer et al. 2003).

Results and discussion

Number of children born to CF-carrier parents

Of the 122 couples who completed this section of the questionnaire, 28 (23.0%) had a sole child, 60 (49.2%) had two children, 31 (25.4%) had three, and three (2.5%) had four. Among these 122 couples, 120 had one CF child (98.4%) and two had two (1.6%).

Parents with at least one CF child had, on average, 2.07 children (standard deviation: 0.82). However, the probability for a couple of which both carry the CF gene of having an affected child depends on the number of children that couple has. If a couple has a sole child, the child's probability of being affected is 25% (1/4); therefore, 75% of the couples in which both partners are carriers are missed. If the couple has two children, the probability that at least one is affected is 44% ($1-(0.75)^2$); therefore, 56% of the couples with two children are not identified. As a consequence, there is an ascertainment bias towards the larger sibships, a bias that can be overcome by considering the number of couple carriers who have no affected child and by weighting the influence of the other couples by their number of children (De Braekeleer et al. 2000a; Ten Kate 1977).

If n is the number of children in the sibship and if A is the number of families with n children included in the study, then $B_n = 4 \times A_n \times (0.75)^n$, number of families of size n not included in the study; $A_n + B_n$, number of families of size n included or not in the study; $n(A_n + B_n)$, total number of children in families of size n included or not in the study.

The mean number of children of couple carriers is, after bias correction, equal to:

$$\frac{\sum_n n(A_n + B_n)}{\sum_n (A_n + B_n)}$$

Table 1 presents the corrections made to calculate the number of children among CF carrier couples. After correction for the ascertainment bias, the average number of children by couple was 1.96. During the same period, couples in Brittany had three children on average (Gillet 2002)

Effect of the birth rank of the CF child

Table 2 shows the distribution of the 122 sibships by birth rank of the first CF child and the total number of children in the sibship. Sixty-five couples had their firstborn affected with CF; of those, 28 (43.1%) had no more children, whereas 37 (56.9%) had at least a second child. The CF child was second born of 41 couples; seven of those couples (17.1%) had at least a third child.

Four studies have reported that the probability of initiating a pregnancy was between 39 and 69% when the CF child was their firstborn and between 12 and 22% when he(she) was second born (De Braekeleer et al. 2000b; Evers-Kiebooms et al. 1990; Kaback et al. 1984b; Phelan 1983; Steele et al. 1986). Our results, and those of the literature, may be explained by the desire to have a healthy child. Other explanations include misunderstanding the recurrence risk or the perception that it is not high enough to prevent the parents from having another child.

Influence of the birth of a CF child on pregnancy planning

Knowledge of the risk of having another CF child is very important in order to evaluate the impact on family planning. Parental awareness of the 25% risk was excellent; 93.3% (114/122) knew the correct risk figure (De Braekeleer et al. 2003). Forty-three of the 116 couples (37.1%) did not want subsequent pregnancies,

Table 1 Correction of the ascertainment bias due to the size of sibships with at least one cysctic fibrosis (CF) child

Family size	Correction coefficient	Number of families included in the study	Number of families not included in the study	Total number (after bias correction)	
n		A_n	B_n	Of families	Of children
1	0.75	28	84	112	112
2	0.563	60	135.12	195.12	390.2
3	0.422	31	52.33	83.33	250
4	0.316	3	3.79	6.79	27.17
Ensemble		122	275.24	397.24	779.4

Table 2 Distribution of the families by cystic fibrosis (CF) birth order and number of children

CF birth order	Number of children in sibship				
	1	2	3	4	Total
1st	28	26	10	1	65
2nd	–	34	6	1	41
3rd	–	–	15	1	16
4th	–	–	–	0	0
Total	28	60	31	3	122

whereas 19 (16.4%) decided to have less children than planned. Seven (6.0%) decided to have more children than planned, and the birth of the CF child had no influence on subsequent planning for 47 couples (40.5%). The birth of the CF child had a major impact on further pregnancy planning. It correlates well with the mean number of children by couple (2.07 children). This result is less than the mean ideal number of children desired by parents with a CF child. Indeed, the mean number of children the couples would have desired was 3.7. Although only 16.4% decided to have less children than planned because of CF, this result may reflect the fact that the real number of children a couple has is lower than their desired number, as observed in the general population in several studies (Thomson 1997; Toulemon and Léridon 1999; Léridon 2001).

Contraception after the birth of a CF child

As many parents decided to stop having children, it was interesting to determine whether the respondents changed their contraceptive methods. We collected data about contraception before and after the birth of the CF child. Eighty-nine percent (109/122) of the couples used contraception before the birth of the CF child, most of them medical methods (intrauterine contraceptive device; pill), which is similar to what is observed in the general population. Whether the couples used a contraceptive method before the birth of the CF child or not, 35% (42/121) adopted or changed their method after the birth of their affected child. Sterilization (tubal ligation or vasectomy) was chosen by three of the 40 couples (7.5%), two couples having not answered the question. The change in contraceptive behavior was due to the birth of the CF child for 14.3% (6/42) of the couples. For the remaining couples, the change was decided upon because the desired family size was reached. However, no data is available on the change of contraceptive method after having reached the desired number of children for the general population.

Few studies on contraception after the birth of a CF child have been published (Boué et al. 1991; De Braekeleer et al. 2000b; Evers-Kiebooms et al. 1988; Evers-Kiebooms et al. 1990; Kaback et al. 1984a; Super 1987; Wertz et al. 1992). Our results show that the birth of a CF child did not greatly influenced the contraceptive behavior of the parents. Our results are very different from those obtained in a similar study conducted in the high-risk population of Saguenay-Lac Saint-Jean (Quebec, Canada) (De Braekeleer et al. 2000b). Indeed, 70% of the parents adopted or changed methods after the birth of their affected child, opting for a more reliable method including sterilization (tubal ligation or vasectomy) for 84.4% of them. Furthermore, the change in contraceptive behavior was due to the birth of the CF child for 76.7% of the couples. More particularly, 30 of the 38 couples (78.9%) who had surgical sterilization did so because of the presence of CF in their family. The rate of sterilization among couples with a CF child was 23% in Belgium (Evers-Kiebooms et al. 1990) and 51% in New England (Wertz et al. 1992). In a study reported by Kaback et al. (1984a,b) on 211 couples, one or both members of 62% of the couples had undergone surgical sterilization (Kaback et al. 1984a). Super (1987) reported that one or the other member had been sterilized in more than 50% of the families surveyed (Super 1987). The reasons explaining the differences are difficult to assess. The choice of birth control method is the personal option of each couple. It may also be influenced by the time period at which the enquiries are conducted, the acceptance or refusal of pregnancy interruption, and/or the beliefs of health care providers.

Prenatal diagnosis after the birth of a CF child

PD has been available, first using RFLP linked to the CF locus since 1986 then by mutation analysis since 1992. All CF-affected children went through genetic testing; the CFTR mutations were identified on more than 98% of CF chromosomes (Férec et al. 1992). During the period 1992–2001, 122 PDs were performed among parents with a CF child (Scotet et al. 2003). They led to the identification of 33 CF affected fetuses, of whom 31 were aborted. One hundred sixteen respondents (95.1%) were in favor of PD, 49 couples (41.2%) having used it. The decision not to use PD was the absence of further pregnancies at a time when the PD was available for 62.1% of the couples. We also asked the couples of their intents to make use of PD; 17.1% (21/123) intended to use PD, 70.7% (87/123) did not, and 12.2% (15/123) were unsure. Although a decline in the proportion of couples intending to use PD was observed between the age groups (30.8, 22.1 and 9.5% for the 21–30 years, 31–40 years, 41–50 years old, respectively), the difference was not statistically significant ($p = 0.29$). The decision not to intend to use PD was motivated by the desire of not having more children for 93.0% (80/86) of couples; only two couples (2.3%) answered that they would not use PD should the woman be pregnant.

Attitudes toward PD of cystic fibrosis were investigated by several workers (Borgo et al. 1992; De Braekeleer et al. 2000b; Evers-Kiebooms et al. 1988; Jedlicka-Köhler et al. 1994; Wertz et al. 1992). Several studies showed that the intent to use PD was usually

not followed by a request for PD (Borgo et al. 1992; Jedlicka-Köhler et al. 1994). However, it may provide an important option for some couples, particularly those without a healthy child. The use or intention to make use of PD is influenced by factors such as religion, family income, education, family size, the presence or absence of healthy children born before the affected child, and the willingness to abort for CF (Borgo et al. 1992; Evers-Kiebooms et al. 1990; Kaback et al. 1984a; Wertz et al. 1991). These factors were also reported by others for different hereditary disorders and congenital abnormalities (Kraus and Brettler 1988; Kyle et al. 1988; Meryash and Abuelo 1988). We asked couples whether they were in favor of pregnancy interruption for cystic fibrosis; 68.6% (81/118) were in favor, 11.9% (14/118) were not, and the remaining 19.5% (23/118) were undecided. Their attitudes did not change when asked if they would interrupt the pregnancy should PD reveal that their fetus had CF. In this particular situation, 76.2% (93/122) reported that they would have an abortion, 7.4% (9/122) that they would not, and 16.4% (20/122) were undecided.

Attitudes toward abortion among parents of children with CF showed a wide spectrum in the available studies. The majority of the surveyed parents supported abortion, ranging from 52 to 73% (Al-Jader et al. 1990; Evers-Kiebooms et al. 1988; Evers-Kiebooms et al. 1990). However, in New England, only 20% of the parents would interrupt a pregnancy for CF (Wertz et al. 1991). Such discrepancies between the studies is not surprising, because correlations have been found between abortion attitudes and religion, education, interpretation of risk, etc. Another factor to be considered is the time period at which the enquiries were conducted. Indeed, in the early 1990s, a study conducted in Saguenay-Lac Saint-Jean found that only 17% of the couples would have interrupted the pregnancy should the fetus be affected (De Braekeleer et al. 1994). At the end of the 1990s, there were 41.9% who intended to request an abortion (De Braekeleer et al. 2000b).

Genetic counseling for CF

Genetic counseling is a valuable way of providing at-risk couples with an option of making informed reproduction decisions. All 123 respondents thought that genetic counseling was useful, but only 87.1% knew of its availability in Brittany and Loire-Atlantique. Ninety-two of the 124 couples (74.2%) consulted a genetic counselor; 36.7% (33/90) did so as a step toward PD—41 couples (45.6%) consulted to determine which mutations they carried or whether their healthy children were carriers and 11 (12.2%) for information on the risk of having another affected child. Excluding 68 couples who did not wish to have further children, as many as 20 couples out of 26 intended to use the service of genetic counseling in the near future.

Conclusions

This study was undertaken to evaluate the reproductive behavior of families attending the CF care centers in Brittany and Loire-Atlantique. Our results are quite different from those previously published. Although results could be population-specific, one cannot exclude the possibility that they reflected a change of attitudes, the other studies being much older. The group under study was small; however, actions with regard to family planning were important. Knowledge of the recurrence risk resulted in deciding against further progeny or reducing the number of children planned. The effect was found in both the reproductive plans reported by the couples and in the number of children they had. PD was widely used by the couples, and only two couples answered that they would not use PD when pregnant. The majority of parents with a CF child would abort a CF fetus; they viewed pregnancy interruption for CF after PD as an acceptable reproductive option.

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