Parental Separation and Pediatric Cancer: A Danish Cohort Study

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WHAT'S KNOWN ON THIS SUBJECT: Cancer in a child may affect the quality of the parents' relationship, but few studies have examined a potential effect on parental divorce, and no studies have accounted for the proportion of couples that live outside formal marriages.

WHAT THIS STUDY ADDS: In this nationwide registry-based study with up to 20 years of follow-up, we included both married and cohabiting couples, reflecting modern family structures. We found that experiencing cancer in a child is not a risk factor for the parents separating.

abstract

OBJECTIVE: The purpose of this study was to determine the risk for separation (ending cohabitation) of the parents of a child with a diagnosis of cancer.

METHODS: In a nationwide cohort, we compared the risk for ending cohabitation of the parents of 2450 children (aged 0–20 years) given a diagnosis of cancer with the risk of parents of 44 853 randomly selected, gender- and age-matched cancer-free children. We adjusted for socioeconomic position and demographic factors. Rate ratios and 95% confidence intervals for separation were estimated in a Cox proportional hazards model.

RESULTS: The parents of children with cancer did not have a higher risk for separation than the general population (rate ratio: 1.00 [95% confidence interval: 0.91–1.10]). Separate analyses according to type of cancer and survival of the child similarly yielded null results.

CONCLUSIONS: Experiencing cancer in a child does not seem to be a risk factor for separation. Our study will allow clinicians to reassure parents and to support them in facing the trauma of cancer in their child. *Pediatrics* 2012;129:e1187–e1191

Childhood cancer can affect not only the child but all members of the family. Parents of children with cancer reportedly experience increased emotional distress due to multiple stressors and burdens, including disruption of social and family roles, changes in daily activities, and fear of losing the child.[1,2] A cancer diagnosis in a child may thus affect the family's general functioning and the quality of the parents' relationship, as seen in higher levels of family conflicts and marital distress.[3,4] Consequently, it would be of great importance to both parents and health professionals to clarify if parents are at an increased risk of separation and, if so, if supportive interventions should be initiated.

Despite both public and clinical interest, only 5 studies have addressed the association between cancer in a child and the risk for parental divorce, none of which reported a significant association.[4–8] Three studies only examined the risk for divorce after the loss of a child to cancer.[6–8] Two of these studies were small ($n_{children}$ 20–40),[6,7] and only 1 study included a control group.[8]

In a small study from the United States, the self-reported divorce rate from 1969 to 1974 among parents of 191 children who were treated for cancer was compared with the divorce rate in the general population of families with children.[4] A more recent study was registry based, of high methodologic quality, and included data from 1974 to 2001 on 977 928 couples in Norway, of whom 4590 had a child with cancer.[5] However, the study included only officially married couples, even though 15% of couples with children in Norway in 2001 lived together outside a formal marriage.[9] In Denmark in 1996, 60% of first-born children were born into families consisting of cohabiting parents with no formal marriage.[10] When studying how cancer in a child affects the parents' relationship, it is thus relevant to include cohabiting parents as well as parents who are formally married. The purpose of this nationwide registry-based study was therefore to investigate whether cohabiting parents of children with cancer in Denmark are at increased risk for separating (ending cohabitation).

METHODS

We used a cohort–cohort design to examine the association between cancer in a child and parents ending cohabitation, which was defined as the parents no longer sharing the same address, except when due to the death of a spouse.

Cohorts

Two cohorts were identified: an exposed cohort consisting of cohabiting couples with a child diagnosed with cancer and an unexposed cohort of randomly selected cohabiting couples with children. First, parent–child links were identified in the Danish Fertility Database (established in 1989–1992 with annual information on men and women of fertile age), limited to parents both of whom were alive, who were either married or cohabiting, and both of whom were recorded as parents or had both adopted a child.[11] Information on cohabitation (including marital status), vital status, and emigration was obtained by linkage to the Central Population Register, which has ensured accurate linkage of information among national registries since 1968.[12] We identified the exposed cohort by obtaining information on all children aged 0 to 20 years in 1980 to 1997 ($n = 3514$) who were registered as having cancer in the Danish Cancer Registry, which since 1943 has registered all cases of cancer in Denmark.[13] For the unexposed cohort, we randomly sampled 132 944 cohabiting parents of 66 472 children in the Central Population Register. For each child with cancer, ~18 children free of cancer at the time of matching were frequency-matched on gender and date of birth. Excluding children whose parents were no longer cohabiting at time of matching, the 2 cohorts comprised 105 812 parents living together at the time of diagnosis or inclusion. After exclusion of 2706 couples for whom there were inconsistencies in the data files and 2897 for whom values for core variables were missing, 4900 exposed parents of 2450 children and 89 706 unexposed parents of 44 853 children remained for analyses.

Socioeconomic Indicators

Information on demographic and socioeconomic characteristics was obtained by data linkage to the population-based Integrated Database for Labor Market Research (compiled by Statistics Denmark), which contains yearly data since 1980.[14] Information was obtained for each year of the study period on highest attained educational level, job type, employment status, and income.

Follow-up

Unexposed parents were followed up from the same calendar year as the year of cancer diagnosis in the child of matched exposed parents. All parents were followed up from the date of the child's cancer diagnosis (exposed) or entry (unexposed) until change in cohabitation status, death of a cohabiting partner, emigration, or December 31, 2000, whichever came first. "Experiencing cancer in a child" was included as a time-dependent variable, with values reflecting the current status of the child as "unexposed" (cancer-free) or "exposed" (has cancer).

Statistical Analysis

Rate ratios (RRs) for change in cohabitation status and 95% confidence intervals (CIs) were estimated on the assumption that the events were generated in a Cox proportional hazards model. To take into account the fact that information on outcome was available only once a year, discrete-time Cox

regression models were fitted with the follow-up time separated into 1-year age groups by using the GENMOD procedure in SAS version 9.1.3 (SAS Institute, Inc, Cary, NC) with the complementary log–log function as the link function. Analyses were adjusted for time since diagnosis/entry (≤2, 3–5, 6–10, and >10 years), child's age at diagnosis/entry, birth order, father's and mother's age at diagnosis/entry, father's and mother's highest attained educational level (basic school, high school, vocational or short/medium higher education [2–4 years, roughly equivalent to a bachelor degree], long higher education [>4 years, roughly equivalent to a master's degree or higher], or unknown), degree of urbanization (capital area, provincial city, or rural area), father's and mother's occupation 1 year before diagnosis/entry (salaried employee, skilled worker, professional, self-employed, unskilled, unemployed, outside the labor market, or unknown), father's and mother's annual degree of unemployment (none, ≤50% unemployment, or >50% unemployment), and disposable household income extracted yearly after taxation and interest per person, adjusted for number of people in the household by the following formula from the Danish Ministry of Finance: (deflated household income [according to the 2001 value of the Danish crown])/(number of persons in household$^{0.6}$). Analyses, including interaction terms of the modifying effects of all covariates, were conducted. Because the disease pattern may differ according to type of cancer in the child, we also examined the association according to grouped types of cancer (leukemia and lymphoma, central nervous system, and other). Finally, we examined the association with the child's survival (death versus survival).

RESULTS

Diagnoses of leukemia or lymphoma were recorded for 918 children, cancer

TABLE 1 Characteristics of 44 853 Unexposed (Cancer-Free Child) and 2450 Exposed (Child With Cancer) Couples, 1980–1997

Characteristic	Unexposed	Exposed	P
Child's age at diagnosis/entry, y			
15–20	13 660 (31)	785 (32)	
10–14	7998 (18)	451 (18)	
5–9	8383 (19)	438 (18)	
≤4	14 812 (33)	776 (32)	.22
Time since diagnosis/entry, y			
>10	21 306 (48)	1160 (47)	
6–10	13 844 (31)	70 (31)	
3–5	7539 (17)	415 (17)	
≤2	2164 (5)	105 (4)	.98
Father's age at diagnosis/entry, y			
>45	12 694 (28)	721 (29)	
36–45	19 749 (44)	1103 (45)	
25–35	11 853 (26)	607 (25)	
<25	557 (1)	19 (1)	.04
Mother's age at diagnosis/entry, y			
>45	7632 (17)	466 (19)	
36–45	19 682 (44)	1087 (44)	
25–35	15 938 (36)	822 (34)	
<25	1601 (4)	75 (3)	.02
Father's educational level			
Long higher education	9613 (21)	503 (21)	
Vocational or short/medium higher education	19 322 (43)	1065 (44)	
High school	1209 (3)	69 (3)	
Basic school	12 511 (28)	698 (29)	
Unknown	2198 (5)	115 (5)	.84
Mother's educational level			
Long higher education	9418 (21)	552 (23)	
Vocational or short/medium higher education	14 711 (33)	800 (33)	
High school	469 (3)	71 (3)	
Basic school	16 763 (37)	912 (37)	
Unknown	2492 (6)	96 (4)	.05
Father's occupation at year before diagnosis/entry			
Salaried employee/skilled	12 449 (28)	685 (28)	
Professional	12 040 (27)	665 (27)	
Self-employed	5951 (13)	296 (12)	
Unskilled	7810 (17)	416 (17)	
Unemployed	1 912 (4)	112 (5)	
Outside the labor market	1 587 (4)	99 (4)	
Unknown	3 104 (7)	177 (7)	.76
Mother's occupation at year before diagnosis/entry			
Salaried employee/skilled	12 952 (29)	681 (28)	
Professional	7 591 (17)	441 (18)	
Self-employed	3 040 (7)	160 (7)	
Unskilled	9 337 (21)	529 (22)	
Unemployed	3 503 (8)	166 (7)	
Outside the labor market	5 318 (12)	299 (12)	
Unknown[1]	3 112 (7)	192 (7)	.24
Annual household income (DKK)			
> 235 000	9 307 (21)	403 (17)	
190 000–235 000	10 523 (24)	460 (19)	
150 000–190 000	13 172 (29)	678 (28)	
< 150 000	11 851 (26)	909 (27)	< .0001
Father's annual degree of unemployment			
None	37 025 (83)	2012 (82)	
≤ 50%	6 097 (14)	330 (13)	
> 50%	1 731 (4)	108 (4)	.39
Mother's annual degree of unemployment			
None	33 627 (75)	1908 (78)	
≤ 50%	7 846 (17)	424 (17)	
> 50%	3 380 (8)	118 (5)	< .0001

TABLE 1 Continued

Characteristic	Unexposed	Exposed	P
Degree of urbanization			
Capital area	12 283 (27)	681 (28)	
Provincial city	15 485 (35)	859 (35)	
Rural area	17 085 (38)	910 (37)	.64

Data are presented as *n* (%). All analyses are unadjusted. *P*-values indicate significance level for difference between unexposed and exposed. DKK, Danish crowns.

TABLE 2 Adjusted RRs and 95% CIs for Change in Cohabitation Status Among 44 853 Unexposed (Cancer-Free Child), 2450 Exposed (Child With Cancer), and All 47 303 Parents, 1980–1997

Characteristic	Unexposed RR (95% CI)	Exposed RR (95% CI)	Total RR (95% CI)
Cancer in the child			*P* = .9944
No			1.00
Yes			1.00 (0.91–1.10)
Child's age at diagnosis/entry, y	*P* < .0001	*P* = .29	*P* < .0001
15–20	1.00	1.00	1.00
10–14	1.15 (1.05–1.25)	1.35 (0.97–1.88)	1.16 (1.07–1.26)
5–9	1.26 (1.18–1.40)	1.20 (0.82–1.77)	1.26 (1.15–1.37)
≤4	1.40 (1.27–1.55)	1.34 (0.89–2.03)	1.40 (1.27–1.54)
Time since diagnosis/entry , y	*P* < .0001	*P* = .00	*P* < .0001
>10	1.00	1.00	1.00
6–10	1.47 (1.37–1.58)	1.27 (0.96–1.68)	1.46 (1.36–1.56)
3–5	1.90 (1.78–2.03)	1.51 (1.15–1.99)	1.88 (1.76–2.00)
≤2	1.47 (1.37–1.57)	0.90 (0.66–1.22)	1.43 (1.34–1.53)
Father's age at diagnosis/entry , y	*P* < .0001	*P* = .50	*P* < .0001
>45	1.00	1.00	1.00
36–45	1.33 (1.22–1.46)	1.28 (0.88–1.85)	1.33 (1.22–1.45)
25–35	1.48 (1.33–1.65)	1.42 (0.88–2.30)	1.48 (1.33–1.64)
<25	1.86 (1.56–2.21)	1.62 (0.63–4.18)	1.84 (1.55–2.18)
Mother's age at diagnosis/entry, y	*P* < .0001	*P* = .05	*P* < .0001
>45	1.00	1.00	1.00
36–45	1.36 (1.22–1.51)	1.40 (0.90–2.20)	1.36 (1.22–1.51)
25–35	1.74 (1.53–1.99)	1.42 (0.82–2.49)	1.72 (1.52–1.96)
<25	2.49 (2.11–2.94)	2.45 (1.22–4.92)	2.49 (2.11–2.94)
Father's educational level	*P* < .0001	*P* = .62	*P* < .0001
Long higher education	1.00	1.00	1.00
Vocational or short/medium higher education	0.86 (0.79–0.92)	1.05 (0.76–1.4)	0.86 (0.80–0.93)
High school	1.02 (0.89–1.16)	1.12 (0.62–2.01)	1.02 (0.90–1.17)
Basic school	0.98 (0.91–1.07)	0.99 (0.70–1.43)	0.98 (0.91–1.07)
Unknown	0.91 (0.81–1.03)	0.70 (0.39–1.25)	0.90 (0.80–1.02)
Mother's educational level	*P* < .0001	*P* = .44	*P* < .0001
Long higher education	1.00	1.00	1.00
Vocational or short/medium higher education	1.00 (0.92–1.09)	0.99 (0.70–1.41)	1.00 (0.93–1.09)
High school	1.11 (0.98–0.26)	1.65 (0.96–2.83)	1.13 (1.00–1.23)
Basic school	1.24 (1.14–1.35)	1.02 (0.71–1.45)	1.23 (1.13–1.34)
Unknown	0.91 (9.89–1.03)	0.89 (0.50–1.56)	0.91 (0.80–1.03)
Annual household income (DKK)	*P* < .0001	*P* = .00	*P* <.0001
≥235 000	1.00	1.00	1.00
190 000–235 000	0.95 (0.88–1.02)	0.80 (0.57–1.12)	0.94 (0.88–1.01)
150 000–190 000	0.90 (0.84–0.97)	0.97 (0.69–1.36)	0.90 (0.83–0.97)
<150 000	1.03 (0.95–1.13)	1.44 (1.02–2.05)	1.05 (0.97–1.14)

All analyses are mutually adjusted and adjusted for degree of urbanization, father's occupation at year before diagnosis/entry, mother's occupation at year before diagnosis/entry, father's annual degree of unemployment, mother's annual degree of unemployment, and birth order. DKK, Danish crowns.

of the central nervous system for 613, and other cancer diagnoses for 919. We observed only small differences between the unexposed and exposed cohorts with regard to family structure, parental age, number of children in the family, and other socioeconomic conditions (Table 1). In adjusted analyses with a mean follow-up of 10.4 years, young parental age, time since diagnosis/entry, unemployment, low household income, and living in the capital were similarly associated with ending cohabitation in both the exposed and the unexposed cohorts (Table 2). Having a child with cancer was not associated with ending cohabitation (RR: 1.00 [95% CI: 0.91–1.10]), and no significant associations were found between cancer in the child and ending cohabitation according to the child's survival or type of cancer (data not shown). Parents of children who survived had an RR of 0.85 (95% CI: 0.68–1.05) for ending cohabitation when compared with those who did not. Parents of children with leukemia and lymphoma had an RR of 0.87 (95% CI: 0.69–1.09), and parents of children with cancers of the central nervous system had an RR of 0.94 (95% CI: 0.73–1.22) compared with the parents of children with other cancers. No interactions were observed with covariates.

DISCUSSION

In this nationwide registry-based study of childhood cancer in Denmark with up to 20 years of follow-up, we found no significant association between cancer in a child and ending cohabitation of the parents. Our overall findings are in line with those of previous studies.[4–8] One of the studies, however, observed an increased risk for divorce among couples in which the wife had higher education,[5] which we did not observe. That study also reported an increased risk for divorce for the parents of children with Wilms' tumor. This might have

been a chance finding, as no effect was seen for other types of cancer with a similar burden of treatment and late effects (eg, retinoblastoma),[15] and the authors had no a priori hypothesis for this finding. A recent study from Sweden including a control group found no significant risk for dissolution of the parents' partnership after the loss of a child to cancer.[8] We also did not find that the child's survival influenced the risk estimates.

The advantages of this study include the fact that it was a nationwide, population-based, large sample. We used data from high-quality administrative registries compiled independently of the research hypothesis, thus limiting recall, information, and misclassification biases. We adjusted for important confounding factors. Furthermore, this is the first study to include cohabitating couples as well as married couples, thus reflecting Western societies more accurately. Limitations of the study include lack of inclusion of same-gender couples and potential residual confounding from unknown factors. In addition, it would be relevant in future studies to combine registry- and questionnaire-based data and thereby explore potential interactions with relationship satisfaction and emotional distress to determine if couples with poor relationship satisfaction or high emotional distress are at greater risk of separating.

CONCLUSIONS

We concluded that the experience of cancer in a child is not a risk factor for the parents separating, irrespective of the cancer type and survival of the child. If we had found that parents were at increased risk of separating after cancer in a child, it would be relevant to develop supportive initiatives aiming at preventing this occurrence. Our study is thus important for clinicians, who can inform parents of this reassuring finding to support them in coping with having a child with cancer.

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