Null Results in Brief

No Association between Parental or Subject Occupation and Brain Tumor Risk

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Introduction

Evidence to date reveals an inconsistent association between parental and subject occupation and brain tumors (1-4). Paternal exposures in hydrocarbon-associated occupations, the petroleum industries, and paint exposures have been associated with brain cancer (5). Maternal exposures have received less attention, but some studies have yielded suggestive results linking occupational exposures to pesticides and solvents to childhood brain tumors (6, 7).

We previously reported an association between maternal employment in electronic parts manufacturing and textile industries and brain tumor from a population-based case-control study from 74 cases and 170 controls (7). In this report, we present the results from the larger, completed case-control study to assess the association between parental and subject occupation and brain tumor risk.

Materials and Methods

Study Design. Details regarding the design of our study (202 cases and 501 controls) have been previously described (7-9). Briefly, this is a population-based case-control study conducted in the metropolitan area of Kaohsiung, an industrialized city in southern Taiwan with a large petroleum industry. Subjects were recruited between November 1997 and December 2005. Incident cases were identified and recruited through (*a*) a rapid case ascertainment system set up in three large referral hospitals in Kaohsiung and (*b*) screening the Cancer Registry File from the Taiwan Department of Health. All cases were reviewed by a pathologist in Kaohsiung Medical University Hospital. Eligible cases included all pathologically confirmed incident primary brain cases (benign and malignant: International Classification of Diseases-9 codes 191-192, 194.3-194.4, and 225), ages 0 to 29 years, and currently residing in the study area. Eighty-four percent of brain tumor cases initially reviewed were enrolled in the study. Controls were cancer-free residents of the study area, selected randomly from the population registry data based on the personal identification number system of the Taiwanese government. Each case was matched with three controls on age ($\pm$1 year) and sex. Of those initially contacted, 61% of prospective controls agreed to participate in the study. In-person interviews were conducted with the parents and/or subjects to collect information regarding the descriptive characteristics, medical history, as well as environmental, occupational, and behavioral factors. The histology and location of the brain tumors in our cases are presented in Table 1. Demographic information on the study population is displayed in Table 2.

Job Title Classification. Details of the job title classification system have been previously described (7). Each job was assigned two four-digit codes, one for occupation and one for industry, by project staff in Taiwan familiar with the Taiwanese occupational and industrial coding system. Codes followed the Taiwanese government's standardized classification system for occupations and industries, which is adapted from the systems used by the International Labor Organization (10). The classification system groups occupations and industries by a four-digit code, the first digit designating the broadest group and additional digits representing progressively more specific categories. Odds ratios were calculated for each occupation or industry group, first using one-digit codes, and then subsequently using two-, three-, and four-digit codes to investigate more specific classifications. We list the major (one-digit) occupation and industry categories of our study population in Table 3.

In our analysis, all persons in the subgroup who held jobs, but did not have the occupation or industry title in question, were used as the referent groups. Paternal, maternal, and subject data were analyzed separately. Odds ratios were adjusted using conditional logistic regression for subject smoking (ever smoked or not), parental smoking (either parent ever smoked or not), and

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exposure to medical radiation (ever exposed or not). These covariates were chosen to form a parsimonious analysis and to provide comparability with our previously published analysis.

Results

No association was seen between parental or subjects' occupation or industry classification and brain tumor. Age-adjusted analyses did not change our results. Subgroup analysis of glioma, the predominant histologic type, did not reveal significant associations between brain tumor and either occupation or industry classification. Because of the location of our study (in a city with a large petrochemical processing industry), we also examined (as a group) those parental and subject occupations and industries that were likely to involve exposures to petrochemicals. For these jobs considered as a group, we found no significant association with brain tumors.

Discussion

We did not detect any association between parental or subjects' occupational history and the risk of brain tumors in our population-based case-control study which used questionnaires to determine occupational and industrial classifications. The question of whether parents' exposure to carcinogens in the workplace could increase the risk of brain cancer in the children is yet unresolved. Recent reviews of the studies concerning the relation of parents' occupations and brain tumors have suggested that there are elevated risks of brain tumors in children for fathers who work in industries involving paper and pulp, pesticide solvents, painting, printing, and graphic arts, and for mothers with exposure to fertilizers and pesticides during pregnancy (2, 4, 5). Our study, set in an industrial city with a large petrochemical and petroleum industry, was not able to show an association.

Our study has several major strengths including (*a*) the choice of controls from a population registry, (*b*) high participation rate of cases and controls, and (*c*) tumor pathology confirmed by a pathologist.

The limitations of our study include recall bias—differential recall on exposure among cases and controls (11). Our ability to obtain occupational histories, however, did not vary by disease status, and it is possible that parents are more likely to accurately remember jobs than exposures of possibly shorter duration such as dietary intake or alcohol use.

Several factors may have contributed to the null association found in this study. Brain tumor is a broad term describing diverse histologic types and each of them could have different etiologic factors contributing to development. Our sample size was not large enough to assess all subtypes separately, but we were able to examine the largest subtype, glioma, independently.

Table 1. Histology and location of 202 brain tumor cases in subjects 0 to 29 y in Kaohsiung, Taiwan (1997-2005)

Characteristic	No. of cases (%)
Histology of tumor (%)	
Glioma	75 (37)
Pilocytic astrocytoma	10
Astrocytoma, nonpilocytic	48
Oligodendroglioma	9
Ependymoma	8
Medulloblastoma	20 (10)
Adenoma	52 (26)
Craniopharyngioma	10 (5)
Nerve sheath tumor	7 (3)
Meningioma	9 (4)
Germ cell tumor or teratoma	15 (8)
Other	8 (4)
Missing histology	6 (3)
Location of tumor	
Cerebrum	72 (36)
Posterior fossa	31 (15)
Sella turcica	71 (35)
Meninges	24 (12)
Cranial nerve	4 (2)

Table 2. Characteristics of cases and controls

Characteristic	Cases (n = 202)	Controls (n = 501)
Sex (%)		
Male	105 (52)	260 (52)
Female	97 (48)	241 (48)
Age (%)		
Under 5 y	32 (16)	80 (16)
5 to 9	25 (12)	59 (12)
10 to 14	22 (11)	62 (12)
15 to 19	34 (17)	88 (18)
20 and over	89 (44)	212 (42)
History of smoking (%)		
Ever	29 (14)	48 (10)
Never	172 (86)	452 (90)
Smoker in household (%)		
Yes	126 (62)	292 (58)
No	76 (38)	209 (42)
X-ray (%)		
Yes	44 (22)	103 (21)
No	158 (78)	398 (79)
Petroleum/petrochemical plant within 1 km of home (%)		
Yes	19 (9)	51 (10)
No	183 (91)	450 (90)
Parental occupational history available	127 (63)	309 (62)

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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Table 3. Selected industrial and occupational categories of study population

Person	Industry or occupation	Cases, controls with job
Subject	Agriculture, forestry, fishing and animal husbandry	17, 69
	Electricity, gas and water	20, 42
	Trade and eating-drinking places	15, 40
	Social, personal and related community services	28, 51
	Professional	12, 24
	Technicians and associate professionals	17, 44
	Clerks	14, 33
	Craft and related trades workers	20, 23
Mother	Electricity, gas and water	48, 139
	Trade and eating-drinking places	24, 60
	Social, personal and related community services	40, 63
	Professionals	11, 29
	Technicians and associate professionals	20, 54
	Clerks	18, 53
	Service workers and shop and market sales workers	32, 61
	Craft and related trades workers	22, 49
	Plant and machine operators and assemblers	18, 44
Father	Agriculture, forestry, fishing and animal husbandry	74, 200
	Electricity, gas and water	21, 55
	Construction	10, 14
	Trade and eating-drinking places	12, 28
	Finance, insurance, and real estate	11, 8
	Servicemen	55, 139
	Technicians and associate professionals	12, 25
	Service workers and shop and market sales workers	14, 26
	Craft and related trades workers	22, 66
	Plant and machine operators and assemblers	11, 24

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