Cigarette, Alcohol, and Coffee Consumption and Congenital Defects

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A B S T R A C T

We analyzed data from a survey of occupational and other factors and pregnancy outcome to assess the effects of cigarette, alcohol, and coffee consumption. There was no evidence of an association between any congenital defect and smoking. Results for alcohol and coffee consumption were largely negative, but there was a weak association with musculoskeletal defects in babies born to women who drank one or more alcoholic drinks a day. (*Am J Public Health.* 1992;82:91–93)

Introduction

A report that smoking in pregnancy was associated with congenital heart defects[1] was not confirmed,[2–4] even in two large series of births.[5] Heavy alcohol consumption has been reported to cause retarded physical and mental development and certain facial and neurological abnormalities (fetal alcohol syndrome). Moderate alcohol consumption has also been reported to affect fetal growth and morphogenesis.[6] Some concern has been expressed that heavy coffee consumption may be teratogenic,[7] although a case-control study in Finland was negative.[8] We investigated the relationships between cigarette, alcohol, and coffee consumption and congenital defects, using data from a survey of occupational factors in pregnancy conducted in Montreal from 1982 to 1984 (see the first paper in this series). In this survey no association was found between congenital defects and chemical exposures estimated from job title,[9] but in a case-referent study an association with aromatic solvents was found.[10] The excess defects were mainly renal and urinary. The association of cigarette, alcohol, and coffee consumption with congenital defects has now been analyzed for all current and previous pregnancies of the 56 000 women interviewed—104 000 pregnancies in all.

Methods

The study design and methods are briefly described in the first of these reports, and have been described in detail elsewhere.[11] All current and previous pregnancies of more than 20 weeks' duration, whether or not the woman was employed during the pregnancy, were included in the present analysis. Therapeutic abortions for fetal defect were included irrespective of gestation length. Information on cigarette and alcohol consumption, and on potential confounding factors was available for 89 317 of these pregnancies. As questions on coffee consumption in previous pregnancies were introduced after the survey began, only 80 319 remained for study of this factor.

Congenital defects were ascertained (blind) in current pregnancies from pediatric records.[8] For previous pregnancies, the mother was asked whether any abnormality had been noted in the child. If a defect was suspected, further inquiries were made. The defects were classified into 90 groups. Minor abnormalities such as hydrocele, glandular hypospadias, undescended testes, skin tags, nevi, and hernias were omitted, as were known inherited defects, those that were poorly described (less than 1%), and those that became apparent only at a later stage of development, such as mental retardation, epilepsy, cerebral palsy, and deafness. Interauricular and interventricular septal defects were retained if accompanied by another heart abnormality. Cases with multiple defects were classified under the one that appeared to be most serious. Eight types of congenital defect (shown in Tables 1 and 2) were entered into the present analyses.

Possible confounding by maternal age, educational level, and ethnic (color and language) group was controlled by including these factors together with cigarette, alcohol, and coffee consumption in logistic regression analyses, which were performed separately for current and previous pregnancies. Regression coefficients for cigarette, alcohol, and coffee consumption from the two series were combined as a weighted mean to obtain a single odds ratio, as they did not significantly differ for any factor at a 5% probability level.

Results

There was no consistent evidence of an association between cigarette consumption and any defect group, after

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TABLE 1—Congenital Defects by Type According to Cigarette Consumption in the First Trimester

Defect	Nonsmoker[a] n	Cigarettes per Day: 1 to 9 n	1 to 9 OR (95% CI)	10 to 19 n	10 to 19 OR (95% CI)	20+ n	20+ OR (95% CI)	Total n	Total Rate[b]
Chromosomal	123	12	1.02 (0.7–1.5)	13	0.94 (0.7–1.3)	21	0.84 (0.6–1.2)	169	1.9
Neural tube	106	21	1.84 (1.1–3.0)	23	1.06 (0.7–1.7)	40	1.35 (0.9–2.0)	190	2.1
Cleft of lip or palate	59	8	1.17 (0.6–2.5)	11	1.04 (0.5–2.1)	18	1.09 (0.6–1.9)	96	1.1
Cardiovascular	200	20	1.03 (0.6–1.6)	41	1.17 (0.8–1.7)	57	1.17 (0.9–1.6)	318	3.6
Digestive or respiratory	69	6	0.75 (0.3–1.7)	16	1.13 (0.7–2.0)	18	0.94 (0.5–1.7)	109	1.2
Renal or urinary	124	20	1.55 (1.0–2.5)	32	1.42 (0.9–2.1)	33	1.17 (0.8–1.8)	209	2.3
Clubfoot	396	47	1.06 (0.8–1.4)	76	1.00 (0.8–1.3)	95	0.98 (0.8–1.3)	614	6.9
Musculoskeletal	149	17	1.07 (0.6–1.8)	33	1.29 (0.9–1.9)	24	0.73 (0.5–1.2)	223	2.5
Total	1 226	151	1.14 (1.0–1.4)	245	1.08 (0.9–1.2)	306	1.02 (0.9–1.2)	1 928	21.6
No. pregnancies	59 456	6 308		10 304		13 249		89 317	

Note. n = number of defects. OR = odds ratio, accounting for confounding by education, ethnicity, maternal age, and alcohol and coffee consumption. CI = confidence interval.
[a]OR = 1.00.
[b]Rate per 1000 pregnancies.

TABLE 2—Congenital Defects by Type According to Alcohol Consumption in the First Trimester

Defect	None[a] n	Drinks per Week: 1 to 2 n	1 to 2 OR (95% CI)	3 to 6 n	3 to 6 OR (95% CI)	7+ n	7+ OR (95% CI)	Total n	Total Rate[b]
Chromosomal	110	40	1.19 (0.9–1.5)	16	1.11 (0.8–1.5)	3	0.91 (0.5–1.6)	169	1.9
Neural tube	139	39	1.19 (0.8–1.7)	8	0.59 (0.3–1.2)	8	0.63 (0.2–1.7)	190	2.1
Cleft of lip or palate	62	21	1.42 (0.9–2.4)	11	1.68 (0.9–3.3)	2	1.06 (0.3–4.2)	96	1.1
Cardiovascular	225	55	0.91 (0.7–1.2)	24	0.96 (0.6–1.5)	14	1.24 (0.7–2.2)	318	3.6
Digestive or respiratory	70	23	1.27 (0.8–2.1)	12	1.56 (0.8–2.9)	4	2.00 (0.7–5.6)	109	1.2
Renal or urinary	152	36	0.86 (0.6–1.2)	19	1.02 (0.6–1.7)	2	0.59 (0.1–2.4)	209	2.3
Clubfoot	412	130	1.19 (1.0–1.5)	53	1.03 (0.8–1.4)	19	0.99 (0.6–1.6)	614	6.9
Musculoskeletal	143	44	1.13 (0.8–1.6)	23	1.33 (0.8–2.1)	13	1.85 (1.0–3.3)	223	2.5
Total	1 313	388	1.11 (1.0–1.3)	166	1.06 (0.9–1.3)	61	0.95 (0.7–1.2)	1 928	21.6
No. pregnancies	62 539	16 441		7357		3000		89 317	

Note. n = number of defects. OR = odds ratio, accounting for confounding by education, ethnicity, maternal age, and cigarette and coffee consumption. CI = confidence interval.
[a]OR = 1.00.
[b]Rate per 1000 pregnancies.

accounting for possible confounding (Table 1). Odds ratios (relative to nonsmokers) for mothers who smoked one to nine cigarettes per day were 1.84 for neural tube, 1.53 for renal-urinary, and 1.14 for all defects. These values were on the borderline of statistical significance (at about $P = .05$); however, odds ratios were lower in heavier smokers.

There was some evidence of an increased risk of musculoskeletal defects in women who took alcohol, with risk increasing with the amount drunk (Table 2). The odds ratio of 1.82 in women who took seven or more drinks per week was significant at $P = .05$. Among the 13 defects in this group were 6 cases of congenital dislocation of the hip, whereas 2.3 were expected based on the proportion of musculoskeletal defects that were of this type overall. The specific risk for congenital dislocation of the hip (6/2.3 = 2.61) was thus somewhat higher than for musculoskeletal defects overall, but because of small numbers it is not statistically significant ($P > .05$). The other 7 musculoskeletal defects were craniosynostosis, scaphocephaly, cranial abnormality, hemivertebrae, limb reduction deformity (2), and fibular abnormality. Facial deformities were not observed.

Of the odds ratios for defects in babies born to coffee drinkers (Table 3), only that for heart defects among the children of women who drank three or more cups a day (1.52) was significantly elevated ($P = .02$). No specific type of heart defect was overrepresented in these 58 cases compared with defects in babies born to women who did not drink coffee.

TABLE 3—Congenital Defects by Type According to Coffee Consumption in the First Trimester

Defect	Cups per Day: None[a] n	1 to 2 n	1 to 2 OR (95% CI)	3+ n	3+ OR (95% CI)	Total n	Total Rate[b]
Chromosomal	61	69	1.01 (0.8–1.2)	20	0.97 (0.7–1.3)	150	1.9
Neural tube	63	71	1.12 (0.8–1.6)	28	1.09 (0.7–1.8)	162	2.0
Cleft of lip or palate	29	43	1.42 (0.9–2.3)	15	1.39 (0.7–2.7)	87	1.1
Cardiovascular	101	112	1.08 (0.8–1.4)	58	1.52 (1.1–2.2)	271	3.4
Digestive or respiratory	35	44	1.17 (0.7–1.8)	18	1.34 (0.7–2.4)	97	1.2
Renal or urinary	83	83	0.96 (0.7–1.3)	25	0.81 (0.5–1.3)	191	2.4
Clubfoot	228	248	1.01 (0.8–1.2)	76	0.91 (0.7–1.2)	552	6.9
Musculoskeletal	82	78	0.89 (0.6–1.2)	36	1.30 (0.9–2.0)	197	2.4
Total	682	748	1.04 (0.9–1.2)	276	1.09 (0.9–1.3)	1 706	21.2
No. pregnancies	34 282	34 345		11 691		80 319	

Note. n = number of defects. OR = odds ratio, accounting for confounding by education, ethnicity, maternal age, and cigarette and alcohol consumption. CI = confidence interval.
[a]OR = 1.00.
[b]Rate per 1000 pregnancies.

Discussion

Given that over 70 odds ratios were tested, the three that were significantly ($P < .05$) raised could have occurred by chance. The one association with smoking, namely an increase of neural tube defects in babies born to women who smoked 1 to 9 cigarettes per day, would have been more convincing if an excess had been seen in the heavier-smoking groups. Even quite heavy cigarette smoking was common in this survey—in 30% of the pregnancies the mother smoked during the first trimester of pregnancy, and in 15% the mother smoked 20 or more cigarettes per day. Thus our study had the power to detect important risks due to smoking, if such risks were present. The risks we can exclude are specified by the upper confidence limits of the odds ratios, which are quite low for smoking.

Alcohol consumption, on the other hand, although perhaps underreported, was generally low. Only 3% of the women surveyed reported taking one or more drinks per day (seven per week), and 0.3% reported taking three or more drinks per day. The power of our study to detect increased risk at these levels was thus very limited, as is evident from the wide confidence limits for the odds ratios shown in Table 2. No case of suspected fetal alcohol syndrome was noted, although we were not specifically looking for the syndrome. The association of alcohol with musculoskeletal defects has not been reported elsewhere, and was of low statistical significance.

Coffee consumption was associated only with heart defects, and the evidence was not strong. In Finland, where coffee consumption is high (29% of those surveyed reported taking three or more cups of coffee a day, compared with 12% in Montreal), no association was found between coffee consumption and clefts of the lip and palate or defects of the central nervous, cardiovascular, or musculoskeletal systems. □

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