

Early Abortion and Breast Cancer Risk among Women under Age 40

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In New York State, incidence of cancer and fetal death are reportable health events mandated by state law. These data enabled a population-based record linkage study of the effect of early pregnancy termination on breast cancer risk to be conducted. In upstate New York 1451 cases under age 40 were reported to the Cancer Registry during 1976-1980. Cases were matched with 1451 population controls by year of birth and by residence using zip codes. All names including those changed by marriage were matched with the reports of fetal deaths occurring between 1971 and 1980.

Matched pairs analyses revealed an excess of early pregnancy terminations among cases in all categories. Odds ratios (OR) were significantly elevated among those with an induced abortion (OR = 1.9) and a spontaneous abortion (OR = 1.5). Elevated risks were also noted for consecutive abortion events without intervening livebirths.

Reproductive factors have been associated with breast cancer risk since their first recognition in the 17th century when breast cancer was noted to be more prevalent among nuns. Epidemiological investigations have repeatedly confirmed that parous women are at lower risk than those who remain nulliparous.¹ The influence of induced abortion, as well as all interrupted pregnancies, on breast cancer risk has become a source of concern. Spontaneous abortion has been assessed in numerous investigations with conflicting findings.²⁻⁶ However, few studies of adequate sample size have been undertaken to evaluate the independent effect of induced abortion.

This report examines specific issues related to the relationship of early pregnancy loss and breast cancer risk in an effort to increase awareness of their importance for future epidemiological investigations of breast cancer. A record-linkage case-control methodology is used and all breast cancer cases diagnosed between 1976 and 1980 among women under age 40 in New York State excluding New York City are included in the study. The separate

and combined effect of spontaneous and induced abortion on the breast cancer risk among young women is addressed.

METHODS AND MATERIALS

In 1940 the New York State Public Health Law mandated the reporting of cancer cases to the state. On 1 July 1970, abortion up to 24 weeks' gestation became legal. Concurrently, the Public Health law requiring a report of a fetal death after 20 weeks' gestation was expanded to include all induced and spontaneous abortions, regardless of gestation length. Using these files, a population-based record linkage study was initiated in 1982 and covered the period 1971 to 1980. The 1451 breast cancer cases were identified who met the following inclusion criteria: they were younger than age 40 at diagnosis, a resident of New York State excluding New York City, and they were diagnosed with breast cancer between 1976 and 1980. Using the New York State Department of Motor Vehicles' records of drivers newly licensed or renewing licenses in 1980, one control per case was matched at random by year of birth and by residence using the same first three digits of their zip code.

Surname changes during this study period (1971-1980) due to marriage among cases and controls were identified. Surnames were linked through computer matching programs with certificates of marriage reported to the State Vital Records office. Again using computerized programs, all surnames for the 2902 cases and controls were linked with the fetal death certificates reported from 1971 through 1980. Linking information

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included the mother's age, address, and first, maiden and married names. Linking was completed through the year of diagnosis. Fetal deaths recorded subsequent to the date of breast cancer diagnosis were not included in the analysis.

The computerized linking system yielded a list of potential matches if the last name and first initial matched exactly and if the mother's date of birth matched within one year. Data were abstracted manually from the fetal death certificate for all possible matches. The abstracts were reviewed to verify the possible matches. The criteria employed for a positive match were same first name and same last name or agreement of middle initial with maiden name and one of the following combinations: (1) exact age at time of fetal death and exact address; (2) exact age, same city and same middle initial; (3) exact age and same city or same county; and (4) exact address and same middle initial.

Data pertaining to prior pregnancies on the fetal death certificate include the total number of pregnancies, livebirths, stillbirths, induced and spontaneous abortions. In addition, the dates of first and last livebirth and the date of the last termination of pregnancy are reported. Pregnancy history is available only for cases and controls with a positive fetal death history. Resources were not available to search for livebirth records.

Fetal deaths are reported in New York State for all fetal losses through the time of delivery (eg stillbirths). Therefore several subjects had gestation lengths indicative of full-term pregnancy. Only a few subjects had gestation

lengths over 20 weeks. To be consistent with other reports and to distinguish interrupted pregnancy from full-term pregnancy, this report has been restricted to interrupted pregnancies lasting 20 weeks or less, as reported on the fetal death certificate by the physician. (An analysis was also conducted of all fetal deaths and did not differ from the results reported below. Data are available upon request.)

A matched-pairs analysis was performed. Statistically significant differences were determined by examining 95% confidence intervals and by an exact test of the binomial distribution.⁷ Odds ratios were calculated according to the Mantel-Haenszel method for matched pairs.⁸ Since the numbers of early abortion events were small in some categories, adjusted estimates in the odds ratio using the conditional binomial distribution were also calculated.⁹ These values were not reported since they were very similar to and did not change the interpretation of the unadjusted odds ratio.

RESULTS

Demographic Characteristics of the Cases

Over half of the women were diagnosed with breast cancer between 35 and 39 years of age (Table 1). A majority of the cases were white, however the proportion of black women increased when only cases with a history of abortion were examined. Eighty per cent of all cases were married, however marital status was not reported on the fetal death certificate.

Induced and Spontaneous Abortion Histories

Abortions under 20 weeks were found for 100 cases and 63 controls. An excess of early abortions was found among the cases in each category examined. Table 2 summarizes the findings of the breast cancer discordant case-control pairs. An odds ratio of 1.7 reflected an

TABLE 1 Demographic characteristics of the breast cancer cases

	Total sample		Cases with pregnancy termination	
	No	%	No	%
Age at diagnosis (yrs)				
less than 30	160	11	14	14
30-34	450	31	31	31
35-39	841	58	55	55
Race				
White	1320	91	88	88
Black	116	8	11	11
Other	15	1	1	1
Education*				
Less than high school	—	—	12	12
High school	—	—	56	56
More than high school	—	—	32	32
Marital status†				
Married	1161	80	—	—
No longer married	53	10	—	—
Never married	137	9	—	—

* Data not reported to Cancer Registry.

† Data not reported on Fetal Death certificates.

TABLE 2 Discordant breast cancer case-control pairs under age 40 by early abortion history*

	First early abortion reported for:		Total
	First pregnancy	Other pregnancy	
Case only	21	72	93
Control only	13	43	56
Both case-control	3	4	7
Neither	144	132	1295
Total pairs	1451	1451	1451
Odds ratio	1.6	1.7	1.7
95% confidence interval	0.8, 3.5	1.1, 2.4	1.2, 2.3

* Breast cancer cases diagnosed among upstate New York residents, 1976-1980; fetal deaths recorded upstate New York, 1971-1980.

elevated risk among all women. The odds ratios also indicate elevated risks for women whose first pregnancy terminated by 20 weeks, as well as for women who had a term pregnancy prior to an abortion. Seven pairs had concordant abortion histories.

In Table 3, separate analyses are presented for induced and spontaneous terminations. A significant elevation of risk was associated with a history of induced abortion (OR = 1.9, 95% confidence interval (CI) = 1.2, 3.0), but not spontaneous abortion (OR = 1.5, 95% CI = 0.7, 3.7).

An odds ratio of 4.0 (95% CI = 1.5, 13.6) was associated with a history of repeated interrupted pregnancies with no intervening livebirths. Ten cases and no controls had a history of two consecutive induced abortions. Two (or more) spontaneous abortions were reported for six cases and no controls. Four cases and five controls had a history of both spontaneous and induced abortions.

Pregnancy History

Assessment of pregnancy histories recorded on the fetal death certificates revealed no significant differences between mean ages at first pregnancy for women with a livebirth and those with an interrupted pregnancy. Both cases and controls had a mean age of 23 years at their first livebirth. The age at first pregnancy interruption was 26 years old for cases and 25 years old for controls. No difference in the mean values of the total number of pregnancies was observed (the mean gravidity was 3.1 for each group). The average gestation length was 9.6 weeks for cases and 11.5 weeks for controls.

DISCUSSION

This study investigated the relationship between early abortion and risk for breast cancer among women under

40 years old. A 70% excess of interrupted pregnancies was noted among the cases. The excess was evident regardless of a prior pregnancy history. A statistically significant odds ratio of 1.9 was noted for cases with a history of only induced events and an odds ratio of 1.5 for cases with a history of only spontaneous abortions. The category of highest risk was a case with a history of two consecutive abortions.

Twenty-two other case-control studies^{1-5,10-26} as well as two breast cancer reviews,^{6,27} have reported on the effect of abortion on breast cancer risk. Six of the 22 found no association.^{12,13,15,21,22,26} Paffenbarger *et al* reported a general protective effect among women of all ages,³ and Vessey *et al* noted a protective effect among nulliparous women only.¹⁶ Kvale *et al* found a lower risk of breast cancer among women having at least one abortion; however, no trend was seen with increasing numbers of abortions.²⁵

Seven other studies noted an elevated risk with abortion among cases of all ages^{2,11,14,17,19,23,24}. Three of the studies only noted an elevated risk among older¹⁹ or postmenopausal women.^{1,20} The other two studies found an elevated risk among nulliparous women only.^{3,4}

Several important differences exist between our data set and the others. Twenty of the 22 studies included breast cancer cases either of all ages or all ages over 35. The age distribution of the case is, therefore very different from our cases, who were all under age 40 at the time of diagnosis. The study of Pike and colleagues was restricted to cases under age 32 at diagnosis, an age group similar to ours.⁴ They found a relative risk of 2.4 among nulliparous women. Brinton *et al* also noted a significant association of induced and spontaneous abortion among nulliparous women,³ although only 13% of their case group was under age 45 at the time of diagnosis. Neither study noted any increase associated with abortions occurring after a full-term pregnancy.

An important methodological strength of the study is the implication of the legitimacy of abortion in New York State. Since 1 July 1970, a woman could have an induced abortion on request without psychological review. This aura of legitimacy should contribute to a higher number of induced abortions in our data set than those from other states or countries where the procedure was or still is more restrictive. In addition, interview refusals, recall bias, death prior to the interview, and the social stigma of abortion²⁷ do not affect the data in this record-linkage study.

The appropriate choice of a control population is important in evaluating relatively small odds ratios. Among females, aged 25-44, in New York State, excluding New York City, 80% have a license to drive.

TABLE 3 Discordant breast cancer case-control pairs* under age 40 for fetal deaths under 20 weeks' gestation by type of fetal death

Group	Type of fetal death			Total
	Induced only	Spontaneous only	Mixed†	
Last fetal death under 20 weeks' gestation:				
Case only	65	17	11	93
Control only	34	11	11	56
Odds ratio	1.9	1.5	1.0	1.7
95% confidence interval	1.2, 3.0	0.7, 3.7	0.4, 2.5	1.2, 2.3

* Breast cancer cases diagnosed among upstate New York residents, 1976-1980; fetal deaths recorded upstate New York, 1971-1980.

† Either case or control had both types of fetal death.

