Tea, coffee, and caffeinated beverage consumption and risk of epithelial ovarian cancers

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ABSTRACT

Background: The risk for epithelial ovarian cancer associated with the consumption of caffeinated beverages (tea, coffee, and soft drinks) and green tea is inconclusive. However, few studies have investigated the type of caffeinated beverage or the type of tea.

Objective: We assessed consumption of tea (black/caffeinated tea and green tea separately), coffee, and caffeinated soft drinks, as well as level of consumption, and the risk for epithelial ovarian cancer and its histotypes.

Study design: This study was conducted within a population-based case-control study in Alberta and British Columbia, Canada from 2001 to 2012. After restricting to cases of epithelial invasive cancers and controls aged 40–79 years who completed an interview that included coffee, soft drink, and tea consumption (ascertained starting in 2005 in British Columbia and 2008 in Alberta), there were a total of 524 cases and 1587 controls. Those that did not meet the threshold for beverage consumption (at least once per month for 6 months or more) were classified as non-drinkers. Adult lifetime cumulative consumption (cup-years = cups/day * years) was calculated. Unconditional logistic regression was used to estimate adjusted odds ratios (aOR) and 95% confidence intervals (CI) to describe the association between the relevant drink consumption and risk.

Results: No excess risk was seen for coffee or caffeinated soft drinks. Similarly, any tea consumption was not associated with risk, but when stratified by the type of tea, there was an increase in risk in black tea only drinkers (aOR = 1.56; 95% CI: 1.07–2.28 for >40 cup-years), but no excess risk for the exclusive green tea drinkers. Similar findings were observed for post-menopausal women. The association for black tea only consumption was mainly seen in the endometrioid histotype (aOR = 3.19; 95% CI: 1.32–7.69).

Conclusion: Black tea consumption may be associated with an increased risk epithelial ovarian carcinoma. The excess risk is seen only in the endometrioid histotype but not in serous or clear cell. Further studies are required to confirm these findings and identify the constituents in black tea that may increase the risk.

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1. Introduction

Ovarian cancer is the second most deadly gynaecological cancer in the world, and the most deadly in North America [1], highlighting the need for primary prevention through modifiable risk factors potentially including the consumption of tea, coffee, and caffeinated soft drinks. Black tea consumption has been suggested to be associated with increased level of estrogen circulation in postmenopausal women [2], while green tea [2–4] and coffee [5] consumption have been suggested to be associated with decreased estrogen circulation in pre- and postmenopausal women. Estrogenic activities associated with tea consumption through flavonoids have been indicated in other studies [6,7], including a positive trend with black tea [8,9]. Given that increased estrogen has been long suspected to increase the risk for ovarian cancer [10,11], black tea consumption may increase risk, while green tea and coffee consumption may decrease risk. Additionally, risk could be decreased because tea and coffee contain flavonoids and black tea, coffee, and many soft drinks contain caffeine, and both flavonoids and caffeine have anti-carcinogenic properties [12–14].

Epidemiological studies investigating the putative association between tea consumption and the risk for epithelial ovarian cancer have produced mixed results. Findings from case-control studies of positive [15], no [16–19], and negative [20] associations and from cohort studies of no [21–24] and negative [25,26] associations, among studies with tea consumption assessed for a short period of time (less than five years) have been reported. A few other studies have assessed cumulative tea consumption including a prospective cohort study [27] and two case-control studies [28,29] and all have reported negative associations for the highest drinking group, but the associations were not separately assessed by type of tea [27,28]. In the few studies that assessed the type of tea consumed, all reported a stronger reduction in risk with green tea versus black tea consumption [16–18,29], suggesting that the type of tea may be important for further examinations. For coffee consumption, no excess risk was observed in several studies, including recent prospective cohort studies [21–24,26,30].

It is important to consider contemporary epithelial ovarian cancers as a collective of distinct diseases or histotypes. These histotypes differ with respect to cell of origin, genetic risk factors, molecular events during oncogenesis, patterns of spread and responses to treatment, suggesting distinct etiologies [31]. The few studies that evaluated histotypes reported no significant differences in risk across histotypes with recent [15,18] or cumulative [24,27] tea consumption, as well as recent [15,19,20] or cumulative [24] coffee consumption. However, none of these studies examined the role of black tea and green tea separately by histotype. Given the lack of information regarding the impact of various beverages intake over the adult lifetime on risks of ovarian cancer histotypes, we assessed the consumption of black tea, green tea, coffee and other caffeinated beverages separately on the risk for epithelial ovarian cancers overall and by histotype among women in Alberta (AB) and British Columbia (BC), Canada.

2. Materials and methods

2.1. Study participants

The Ovarian Cancer in Alberta and British Columbia (OVAL-BC) Study is a population-based case-control study that accrued participants from 2002 to 2012. The study population and methods have been described previously [32]. In brief, eligible cases and controls were: residents of the given province, age 20–79 years (40–79 years in AB) at the reference date (the date of incident ovarian cancer diagnosis for cases and an assigned reference date for controls), alive at the time of study contact, English speaking, and able to complete an interview or self-administered questionnaire. Additionally, all cases and controls had to have at least one partial ovary before the reference date and no history of cancer except non-melanoma skin cancer. Cases diagnosed with any incident ovarian tumors (only invasive, epithelial ovarian cancer in AB) that met the eligibility criteria were identified through the provincial cancer registries. Of the 2522 eligible cases identified, 1505 (59.7%) completed the study interview/questionnaire. Controls were randomly selected from the provincial health roster for all years of the study in AB and between 2002 and early 2005 in BC. From early 2005 to 2012, controls in BC were randomly recruited from a province-wide mammography screening program because new legislation in BC restricted access to the provincial health roster. Controls were frequency matched to cases on age (±5 years) separately by province. Of the 4870 eligible controls identified, 2564 (52.6%) completed the study interview/questionnaire. This study was approved by UBC-BCCA Research Ethics Board (H07-02271).

2.2. Data collection

Respondents completed a self-administered questionnaire (2002 to early 2005 in BC) or a telephone interview (for all years in AB and for early 2005–2012 in BC) in which they reported their personal health history, reproductive and menstrual history, exogenous hormone use history, family history of cancer, physical activity patterns, lifetime alcohol consumption history, smoking habits, demographic characteristics and adult height and weight at each decade from age 20 to 60 years. Information on risk factors was ascertained through the diagnosis date (cases)/reference date (controls).

Consumption of caffeinated coffee, caffeinated soft drinks, caffeinated tea (excluding decaffeinated tea, green tea, or herbal tea), or any type of green tea was ascertained in telephone interviews only starting in 2008 in AB and 2005 in BC. The respondents were queried about consumption of each type of beverage if they met a threshold: consumption of at least once a month for ≥6 months in their lifetime. Those that did not meet the threshold were classified as non-drinkers. Among those who responded affirmatively, details were obtained about intake patterns throughout adulthood. For each beverage, women were queried about the start and end age and the average frequency of consumption (cups per day). One cup was defined as 8 oz/240 mL for all drinks. Since caffeinated tea is most specific to caffeinated black tea by the exclusion of decaffeinated tea, green tea, or herbal tea in the query, we will refer to it as black tea hereafter.

2.3. Statistical analysis

The analysis was restricted to: epithelial invasive cancer cases; with cases and controls aged 40–79 years; and women who completed a telephone interview that included coffee, soft drink, and tea consumption, resulting in 524 cases and 1587 controls, with nearly all having at least one intact ovary (99% of cases and 98% of controls 98%). For each type of beverage, we calculated a lifetime cumulative consumption based on number of years of consumption and average daily intake (cup-years = years of consumption * cups per day). For example, black tea consumption of average 3 cups per day for duration of 10 years would have a score of 30 cup-years. For any tea consumption, cup-years were calculated based on the total daily intake of both types of tea and the maximum duration of any tea drinking. Cup-years and cups per day were then divided each into 3 categories, approximately based on tertiles of the controls' consumption distribution.