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Bladder cancer and *mate* consumption in Argentina: A case-control study

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Abstract

Mate is a 'tea', made from *Ilex paraguariensis*, widely consumed in South America, as *mate con bombilla* and *mate cocido*. *Mate* consumption has been associated with esophageal, oral, lung, and bladder cancers. This bladder cancer case-control study involved 114 Argentinean case-control pairs. *Mate* consumption was recorded for time of interview, and 20 and 40 years previously. *Mate con bombilla* consumed 20 years ago was associated with bladder cancer in ever-smokers (odds ratio = 3.77, 95% confidence interval: 1.17–12.1), but not in never-smokers. *Mate cocido* was not associated with bladder cancer. These results are consistent with a previous study in Uruguay.

Keywords: Argentina; Bladder cancer; Case-control study; Epidemiology; *Mate*; Tobacco smoking

1. Introduction

Mate is a type of tea, widely consumed in several South American countries, particularly Argentina, Paraguay, Uruguay, and the southern states of Brazil. It is made from dried leaves of the plant *Ilex paraguariensis*. In some countries, *mate* is consumed at hot temperatures, as *mate con bombilla* or *mate cocido*. However, in Paraguay, *mate* is sometimes consumed with water at ambient or refrigerated temperature [1,2]. *Mate con bombilla* is prepared as a hot *mate* infusion and usually drunk from a container through a metal straw with a filtering head (*bombilla*); *mate cocido* is made by boiling the *mate* herb in water and passing the resulting liquid through a strainer, after which it is consumed from a cup [1]. *Mate cocido* in tea bag form is now common.

There have been a number of investigations of whether *mate* is carcinogenic. Most of these studies have focused on oral, esophageal, and laryngeal cancers, and these have produced evidence of associations with *mate* consumption [1,3–9]. It is unclear whether these associations are a consequence of the high temperature at which *mate* is often consumed, or whether they are related to carcinogenic components in the *mate* infusion, or both [1,10,11].

The present case-control study was carried out in Argentina. Its main purpose was to investigate whether there was an association between bladder cancer and arsenic in water supplies. However, data collected included details of *mate* consumption past and present. We investigated whether these data showed any evidence that *mate* was associated with bladder cancer.

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2. Methods

Study methods have been described in detail elsewhere [12]. Briefly, during the period 1996–2000, incident cases of transitional cell cancer of the bladder, aged 20–80, living in the counties of Union and Marcos Juarez, Córdoba province, Argentina, were identified by pathologists and urologists. Only living cases were included, and were confirmed histologically.

Controls (matched on county of residence, sex, and year of birth) were identified from voter registration lists. These lists are very complete. All cases in the study were identified as present on the voter lists. All cases and controls were administered a standardized questionnaire during a face-to-face interview. The questionnaire included questions on consumption of beverages, and smoking, occupational and medical histories. Separate questions concerned consumption of *mate con bombilla* and *mate cocido*. Subjects were asked to estimate how many drinks of both beverages they would have consumed on a daily or weekly basis, and the size of the containers they used. They were asked to estimate this consumption at time of interview, and 20 and 40 years earlier. No information was collected on the temperature at which the *mate* was consumed. Smokers were asked whether they had consumed black (sun-cured) or blond (light, flue-cured) cigarette tobacco.

Simple stratified analyses were followed by conditional logistic regression analysis, after dividing cases and controls into exposure index categories, without regard to case or control status. All analyses were adjusted for variables shown to be associated with bladder cancer: smoking and whether they had had more than an elementary school education [12]. For most analyses, adjustment for smoking was according to whether subjects were current, former or never-smokers.

Stratification on smoking status was used to investigate possible interactions between smoking and *mate* consumption. To take into account possible latencies of effect, parallel analyses were carried out for the three time periods for which data on *mate* consumption were collected—time of interview, 20 years before interview, and 40 years before interview. Because smoking status was not a matching variable, we broke the original match and used unconditional logistic regression, to maximize study power. All models were adjusted for sex, age, county of residence, and level of education. *Mate con bombilla* and *mate cocido* consumption were examined within the same models defined by time-frame and smoking status. Models for ever smokers were adjusted for level of smoking (maximum daily number of cigarettes ever smoked: 0, 1–10, 11–20, >20). A cigar or a pipe was treated as a cigarette equivalent. None of the models included adjustment for arsenic exposure, as this did not confound the associations.

3. Results

Participation rates for cases and controls were 93 and 75%, respectively. Thirteen cases and 13 controls were no longer living when they were sought for recruitment. Table 1 shows a summary of demographic and exposure data for the cases and controls. Cases and controls are similar in terms of age and educational

Table 1
Demographic and descriptive characteristics of cases and controls

Characteristic	Cases	Controls
Total subjects	114	114
Sex		
Male	94 (82%)	94 (82%)
Female	20 (18%)	20 (18%)
Mean age at interview (SD)	68.9 years (10.7)	68.3 years (10.7)
Mean years of education (median, range)	4.46 years (4, 0–21)	4.49 years (4, 0–17)
Smoking status[a]		
Ever smoked	85 (75%)	63 (55%)
Black tobacco	32 (28%)	17 (15%)
Blond tobacco	65 (57%)	53 (46%)
Never smoked	29 (25%)	51 (45%)
Mate con bombilla consumption[b]		
Ever	109 (96%)	103 (90%)
Never	5 (4%)	11 (10%)
Mean daily intake at interview (ever users)	0.66 L	0.67 L
Mate cocido consumption (ever)[c]		
Yes	80 (70%)	82 (72%)
No	34 (30%)	32 (28%)
Mean daily intake at interview (ever users)	0.23 L	0.25 L

[a] Unadjusted odds ratio for ever smoking = 2.37, 95% CI: 1.31–4.33.
[b] Unadjusted odds ratio for ever consumption of *mate con bombilla* = 2.33, 95% CI: 0.72–7.99.
[c] Unadjusted odds ratio for ever consumption of *mate cocido* = 0.92, 95% CI: 0.50–1.69.