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Nutrient patterns and risk of lung cancer: A factor analysis in Uruguayan men

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Summary In the time period 1996—2004, a case—control study on environmental factor risks and lung cancer was conducted in Montevideo, Uruguay. The study included 846 cases and 846 controls and was restricted to men. Forty nutrients and bioactive substances were submitted to exploratory (principal components) factor analysis. We retained three factors which were labeled as *high-meat*, *antioxidants* and *carbohydrates*. After that, score patterns (obtained from the retained factors) were correlated with sociodemographic variables, tobacco use, alcohol drinking and food groups. Finally, scored patterns were used as explanatory variables through multiple logistic regression analysis. The so-called antioxidants pattern was inversely associated with lung cancer risk (OR 0.69, 0.51—0.96) whereas the high-meat pattern was associated with a strong increase in risk (OR 2.90, 95% CI 1.91—4.40). The carbohydrates pattern was not associated with risk of lung cancer. Although nutrients could be important determinants in the etiology of lung cancer, stop smoking continue to be the major preventive measure for this disease.

1. Introduction

Lung cancer is the most frequent malignancy among Uruguayan men, with an age-adjusted incidence rate of 76.5 per 100,000 men of Montevideo [1]. In fact, in comparisons between American registries, the rate of Uruguay is only

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second, following the rate observed among black men in United States [1].

Undoubtly the main etiologic factor of lung cancer in Uruguay is tobacco smoking [2]. Uruguayan men display a high prevalence rate of smoking and this population is also characterized by an elevated use of black tobacco cigarettes and by the use of hand-rolled cigarettes [3,4]. Both types of cigarettes have been particularly considered as risky. Also occupation and dietary factors have been considered as risk factors for this malignancy [5–7].

Traditionally, research on the role of diet and lung cancer risk have been conducted, both in prospective and case–control studies, by individual analysis of foods and/or nutrients [6,7]. Our previous studies reported that total meat, red meat, high-fat foods, vegetables, fruits, plant foods, total fat, saturated fat and cholesterol were significantly associated with risk of lung cancer [8–13]. Rather recently, factor analysis, which is a statistical method for simplifying and reducing complete sets of data into a rather small number of factors, has begun to be employed in the field of dietary epidemiology of lung cancer [14]. Initially used in the field of psychology [15,16], this method has been employed in the field of social sciences, economy and other sciences [17–19].

The role of dietary patterns in the etiology of lung cancer was studied in two previous reports [14,20]. The first study [20] used cluster analysis and reported that a ''healthy'' pattern had a protective effect against lung cancer. However, after controlling for smoking this inverse association was no longer significant. The second study used factor analysis and reported a protective effect for a so-called ''salad'' pattern whereas the ''pork, processed meat and potatoes'' pattern was directly associated with lung cancer risk [14].

The use of nutrients instead of foods was performed by Palli et al. [21] in a study conducted in Florence, Italy. Martínez et al. [22] have some concerns about the use of nutrients in factor analysis. Nevertheless, it is our opinion that the employment of nutrients could enlarge the knowledge about lung cancer and other malignancies. In fact, nutrients obviously derived from foods, thus providing complementary information on the etiology of lung cancer. Furthermore, in our study we also included bioactive substances, such flavonoids, phytosterols and reduced gluthathione among other constituents.

Although nutrients are not extremely useful for public health planning, we considered that a research on these constituents and risk of carcinoma of the lung using exploratory factor analysis, could be worthwhile in order to replicate case–control and prospective studies in the field [23,24], reducing large datasets in a small number of factors. This is the main objective of the present research. In other words, we hope to achieve a reduced and more comprehensive view of the role of diet in the etiology of lung cancer.

2. Material and methods

In the time period 1996–2004, a case–control study on environmental risk factors and lung cancer was conducted in Montevideo, Uruguay.

2.1. Selection of cases

All newly diagnosed and microscopically confirmed cases of lung cancer of the lung were considered eligible for the present study. Therefore, 861 male patients were identified in the four major hospitals in Montevideo, Uruguay. Fifteen patients refused the interview. These patients were excluded from the study, leaving a final number of 846 participants (response rate 98.2%). They were distributed by cell type according to Travis et al. [25] as follows: squamous cell carcinoma (308 patients, 36.4%), small cell carcinoma (105, 12.4%), adenocarcinoma (212, 25.1%), large cell carcinoma (37, 4.4%) and other types (including adenosquamous carcinoma, giant cell carcinoma, spindle cell carcinoma, solid carcinoma and unclassified carcinoma) (184, 21.7%). Most unclassified carcinomas were diagnosed only by cytology.

2.2. Selection of controls

In the same time period and in the same hospitals, all male patients hospitalized for conditions not related with tobacco smoking, alcohol drinking and without recent changes in their diets were considered as eligible for the study. One thousand and six hundred patients were identified through the log book of admissions. Thirty eight patients refused the interview, leaving a final number of 1562 potential controls (response rate 97.6%). Among them 846 controls were frequency matched to cases on age (in 10-years intervals), residence (Montevideo, other countries) and hospital (Cancer Institute, Pasteur, Clinicas, Maciel) and retained in the current analysis. Controls presented the following diseases: eye disorders (178 patients, 21.0%), abdominal henia (170, 20.1%), fractures (130, 15.4%), injuries (77, 9.1%), diseases of the skin (67, 7.9%), acute appendicitis (66, 7.8%), varicose veins (42, 5.0%), hydatid cyst (40, 4.7%), urinary stones (25, 3.0%), blood disorders (21, 2.5%), prostate hypertrophy (18, 2.1%) and osteoarticular diseases (12, 1.4%).

2.3. Questionnaire

Cases and controls were interviewed shortly after admittance in the hospitals. All the interviews were performed face-to-face by two trained social workers, who were blinded about the role of diet in lung cancer. No proxy interviews were accepted. The questionnaire administered to the participants included the following sections: (1) sociodemographics, (2) a complete-occupational history based in job titles and its durations, (3) family history of lung cancer or other cancers in first-degree relatives, (4) self-reported height and weight 5 years before the date of the interview, (5) a complete history on tobacco smoking, including age at start, age of quit, average number of cigarettes smoked per day, type of tobacco used (based in brands), type of cigarette, filter use, degree of inhalation (no inhalation, mouth and chest), (6) a complete history of alcohol drinking including age at start, age of quit, number of glasses drunked per week or day, type of alcoholic beverage, (7) a *mate* drinking section including age at start, age at quit, liters or fractions of liter ingested per day (or week), temperature of the beverage and (8) a food-frequency questionnaire (FFQ)