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British Journal of Oral and Maxillofacial Surgery xxx (2016) xxx–xxx

BRITISH
Journal of
Oral and
Maxillofacial
Surgerywww.bjoms.com

Influence of oral hygiene and its interaction with standard of education on the risk of oral cancer in women who neither smoked nor drank alcohol: a hospital-based, case-control study

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Accepted 15 November 2016

Abstract

We know of only limited data about the role of oral hygiene and the risk of oral cancer with different standards of education. The aim of this study was to assess the association between oral hygiene and risk of oral cancer, with stratification by standard of education, in Chinese women. We organised a case-control study with 250 women with oral cancer and 996 age-matched controls in Fujian, China. Data were collected by personal interview using a structured questionnaire. We used unconditional logistic regression with stratification by educational standard to estimate the odds ratios (OR) and 95% CI. Tooth-brushing twice a day or more was inversely related to the risk of oral cancer in women with high school education or above (OR 0.50; 95% CI 0.25 to 0.98), but not in those who were illiterate or had primary-middle school education. Wearing dentures showed an increased risk only in less well-educated women: the OR were 2.23 (95% CI 1.14 to 4.34) for the illiterate and 1.68 (95% CI 1.08 to 2.62) for the primary-middle school group. The loss of more than five teeth and oral ulceration were associated with increased risks of oral cancer in all three groups. There was also a multiplicative interaction between oral hygiene and standard of education for risk of oral cancer ($p=0.001$). Our results suggest that oral hygiene seems to have a critical role in the risk of oral cancer in Chinese women, but this effect may be modified by their educational standard.

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Keywords: Oral cancer; Oral hygiene; Educational level; Females; Case-control study

Introduction

Oral cancer is a growing health problem in many developing countries. In China it has been estimated that the age-standardised incidences in 2010 were 2.77/100,000 for

men and 1.36/100,000 for women.¹ Although the incidence in 2011 had increased in both sexes (2.94/100,000 for men and 1.51/100,000 for women), the male:female ratio was slightly less.² A recent paper reported that the percentage of women with oral cancer increased gradually from 32.2% in the 1960s to 35.3% in 2013 in South China.³ It is essential therefore to explore the risk factors for oral cancer in women, and take appropriate precautions. Many epidemiological studies have indicated that the disease may have different aetiological factors in the two sexes, and tobacco smoking and drinking alcohol are the major risk factors for oral cancer in men.⁴

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<http://dx.doi.org/10.1016/j.bjoms.2016.11.316>

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However, less than 10% of female patients in China smoked or drank alcohol, indicating that other factors may play important parts in the aetiology of oral cancer in women.⁵

Oral hygiene is possibly associated with the risk of oral cancer in women, but the results are inconsistent. A previous study from Beijing showed that missing teeth and oral mucosal lesions increased the risk of oral cancer in women, but they did not find that the frequency of brushing teeth, or wearing dentures, were associated with it.⁶ Balaram et al⁷ reported an increased risk of oral cancer in women who brushed their teeth less than once a day, and a meta-analysis showed that wearing dentures was a risk factor for oral cancer.⁸ Chang et al⁹ found regular visits to the dentist had a beneficial effect on the prevention of oral cancer, but Garrote et al¹⁰ found no such association. It is therefore critical to find out the reason for these contradictory results.

We hypothesised that the effect of oral hygiene might be modified by the standard of education. Vano et al¹¹ stated that oral health was correlated with education, and a high educational standard was associated with better oral hygiene. Peeran et al¹² also reported that a low standard of education was associated with inadequate oral hygiene. However, to date, we know of few studies on the association between oral hygiene and the risk of oral cancer depending on the standard of education.

The aim of this study, therefore, was to evaluate the association between oral hygiene and the risk of oral cancer in women with stratification by educational standard in the southeast of China.

Material and methods

Subjects

We organised a hospital-based, case-control study between September 2010 and September 2015 in Fujian province, China. A total of 250 eligible women with oral cancer were recruited from the inpatients in the Department of Oral and Maxillofacial Surgery of the First Affiliated Hospital of Fujian Medical University. As described previously,¹³ inclusion criteria were as follows: all cases were newly-diagnosed patients with histologically-confirmed primary oral cancer; they were all Chinese Han people who resided in Fujian Province; none smoked tobacco or drank alcohol; and they were all aged 20–80 years. Exclusion criteria included recurrent oral cancer, metastasising disease, and a history of chemotherapy or radiotherapy.

During the same period, 996 eligible controls were selected using random numbers from among 2719 inpatients or outpatients who neither smoked tobacco nor drank alcohol and were matched with cases by age (within 5 years). All the controls had other acute and non-neoplastic conditions including no diagnosis (healthy population); skin and subcutaneous tissue disorders; ear and eye disorders; trauma; gastrointestinal disorders; or upper-respiratory tract diseases.

Subjects were excluded from the control group if they had any history of malignant disease. This study was approved by the Institutional Review Board of Fujian Medical University (Fuzhou, China). All participants provided written informed consent before the interview.

Collection of data

Before the survey, we trained three conscientious medical graduate students as interviewers. The training included an introduction to the purpose, contents, and methods of the study, teaching interviewing skills, and simulating an investigation. They then did face-to-face interviews with a structured questionnaire for about 30 minutes. The questionnaire included demographic characteristics, whether the subjects smoked tobacco or were exposed to passive smoking, whether they drank alcohol or were exposed to fumes from cooking oil, the weekly frequency of their consumption of vegetables and fruit; what their oral hygiene was like, and their family history of cancer and other diseases.

Detailed information on oral hygiene was recorded: tooth brushing/day, the number of missing teeth, regular dental visits (times/year), wearing of dentures (no/yes), duration of wearing dentures (years), and whether they had oral ulcers (no/yes). The numbers of missing teeth were recorded after oral inspection by the interviewing dentists.

Smokers were defined as subjects who had smoked at least 100 cigarettes during their lifetime. Passive smokers were defined as those who were exposed to environmental tobacco smoke over 15 minutes/day. Drinking alcohol was defined as consuming an alcoholic drink at least once/week continuously for at least 6 months. Exposure to fumes from cooking oil was defined as cooking food by deep frying or stir frying more than twice/week that caused irritation of the eyes or throat.

Statistical analysis

The distribution of demographic characteristics and lifestyle habits were compared using the chi square test. We used an unconditional logistic regression model with stratification by educational standard to estimate the odds ratios (OR) and 95% CI for the risk of oral cancer in relation to variables of oral hygiene. A test for trend was done by entering categorical variables as continuous variables in the regression model, and *p* values were obtained using the Wald chi square test. To evaluate the association between oral hygiene and the risk of oral cancer comprehensively, we created a composite variable named “oral hygiene score”. As in previous study,⁹ the oral hygiene score was calculated as follows:

Oral hygiene score = tooth brushing + regular dental visits + the number of missing teeth + wearing dentures + oral ulceration. Tooth brushing: \geq twice/day = 0; or <twice/day = 1. Regular dental visits: \geq once/year = 0; <once/year = 1; or never = 2. Number of missing teeth: no = 0;

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