A library-based ecological study to investigate the contribution of ethnicity to the incidence of oral cancer within health authorities in England and Wales

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Abstract

Our aim was to investigate the incidence of oral cancer in three ethnic groups, Indian, Pakistani, and Bangladeshi residents of the UK, to try to establish a link between ethnic background and the incidence of oral cancer. We used data from the 1991 and 2001 censuses to calculate approximate percentages of the number of Indian, Pakistani, and Bangladeshi residents in each Health Authority (HA) region and correlated these with rates of oral cancer from the Office of National Statistics (ONS) cancer atlas for the same period. Data about lung cancer and oesophageal cancer were used as proxies for the confounding variables of smoking and alcohol, respectively, in a multiple regression analysis. There was a strong significant correlation between figures for lung cancer and variations in oral cancer rates among HAs ($p < 0.001$). Ethnicity contributed weakly and insignificantly to variations in rates of oral cancer among HAs. In summary, we found only a weak correlation between ethnicity and oral cancer in the UK population, unlike previously published studies, while simultaneously showing a stronger relation with the proxy for smoking trends. There are various drawbacks inherent in library-based ecological studies in general, and in this study in particular, that may have been responsible for this.
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Introduction

Oral cancer is the eleventh most common form of cancer in the world,[1] about 405,000 new cases being diagnosed in a year. The United Kingdom contributes about 3%, whereas the Indian subcontinent contributes about 30% of oral cancers in men and 13% in women.[2] Identified risk factors include smoking, smokeless tobacco, alcohol, betel nut, diet and nutrition, exposure to ultraviolet light, and age. The age-standardised rate incidence of oral cancer is twice as high for south Asia than for the United Kingdom because of the widespread use of smokeless tobacco.[3]

Nine per cent of England's population is made up of ethnic minorities. London has the most with 45%, followed by the West Midlands with 13%. South Asians account for 44.9% of the ethnic minority population, the Indians being the largest group with 22%.[4]

Smoking and the use of smokeless tobacco are prevalent among south Asians, although the community is not

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homogeneous but consists of different groups, predominantly Indians, Pakistanis, and Bangladeshis, each with their own culture, habits and attitudes.[4,5] Recent data have shown that the Bangladeshi community had the highest smoking rate (40%), and highest prevalence of tobacco chewing (9% of men and 16% of women).[6]

The relative risk of oral cancer among south Asian men in south east England seems to be borne out after controlling for socioeconomic deprivation,[7] and south Asians seem to have a higher incidence of oral cancer than their non-south-Asian counterparts in the ethnic minority population in the United Kingdom.[8] This risk seems to have followed them as, in a recent international review of population-based cancer registries, the highest incidence of oral cancer worldwide was seen in South Karachi (Pakistan), followed by India.[9] A comparative study by Rastogi et al.[10] suggested that the incidence of oral cancer in south Asians is highest in the country of origin, but seems to drop with migration to the UK or United States, the suggested reason being the better access to tobacco products in the Indian subcontinent.

The aim of our study was to find out if there was a correlation between ethnicity and oral cancer in the decade 1991–2001 based on the south Asian population, taking into account various risk factors. The proxies used for smoking and alcohol habits were lung and oesophageal cancer, respectively.

Methods

This library-based ecological study was conducted at the University of Birmingham School of Medicine in 2008 from resources available in the Barnes Medical Library and the Main Library. We searched the census archives of 1991 and 2001 for data relating to ethnicity within the Health Authorities (HAs) in England and Wales. From each of the archives, the percentage of residents of all ethnic groups combined was multiplied by the fraction of these residents listed as Indian, Pakistani, and Bangladeshi to obtain a percentage of residents in each area who belonged to one of these three ethnic groups. Two figures were thereby obtained, one for 1991 and one for 2001, and the median between these figures was used as an estimate of the percentage of Indian, Pakistani, and Bangladeshi residents within each area for the midpoint of the decade at 1995/1996.

Boundaries of HAs altered between the two census dates and so the 2001 data were matched to the original health boundaries by combining a number of newer areas to make one previous HA using the Ward:Health Matrix, Health Geography, and the Gazeteer of Authority changes from the Government National Statistics websites. Any areas for which this matching was not possible between the two census dates were omitted for the purposes of this study.

Age standardised incidence (ASI) rates of oral cancer for both men and women separately were retrieved from the Office of National Statistics (ONS) Cancer Atlas for the same time frame. The ASI was chosen as a summary measure of the incidence that the study populations would have had if they had a standard age structure, thereby allowing an unbiased study of oral cancer (a strongly age-dependent disease) with regard to differences in age between the study populations.

ASIs for lung cancer from the ONS Cancer Atlas were used as a proxy for smoking. There was no easily available data on rates of cirrhosis for this time frame and so ASIs of oesophageal cancer were used as a proxy for alcohol consumption in the calculations.

The Statistical Package for the Social Sciences version 16.0 (©SPSS Inc., Chicago) was used for the statistical analysis of our data. The ASI rates of oral cancer were converted to their natural logarithms (log ASI), to achieve a normal distribution of data, which were otherwise skewed to the right. Histograms were then constructed to verify the presence of a normal curve by looking at the appearance of the graphs and probability plots (P–P plots) to see how closely the data matched a perfect normal distribution.

Pearson correlation coefficients were calculated for the log ASI oral cancer rates against the percentage of Indian, Pakistani, and Bangladeshi residents in the HAs. This is a measure of the extent to which the points in a scattergram conform to a straight line, indicating in this instance a corresponding increase in the rate of oral cancer for a given increase in the proportion of residents in the HAs from one of the ethnic groups. Linear regression models were worked out to check for any relation between the independent variables that would otherwise mask their individual effects on the incidence of oral cancer. A multiple linear regression was then calculated using the log ASIs for oral cancer as the dependent variables with the percentages of Indian, Pakistani, and Bangladeshi residents, ASIs for lung cancer, and ASIs for oesophageal cancer, being used as independent variables, tested separately and together. The statistical method of linear regression was chosen as it looks at the effects of several independent variables (ethnicity, smoking, and alcohol) on a single dependent variable (oral cancer) and defines the extent of that relation for each individual independent variable, while accounting for the influence of the other independent variables.

Results

Data were retrieved for 100 HAs across England and Wales. After the omission of those HAs for which changes in geographical boundaries between 1991 and 2001 were uncertain, the final number of HAs included in the study was 94.

P–P plots and histograms showed a normal distribution for log ASIs of oral cancer for both sexes. Scatterplots for log ASI of oral cancer rates against the percentage of residents who were Indian, Pakistani, or Bangladeshi for 1995–1996 showed no obvious linear relation (Figs. 1 and 2).

Pearson correlation coefficients of oral cancer against ethnicity showed weak correlations of 0.13 in men and 0.19