



## The risk of lung cancer in HBR area in India—a case control study

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**Abstract.** Karunagappally in Kerala, India is known for the radiation-emitting sands, more than 100,000 people are exposed to higher levels of natural radiation. The risk of lung cancer with exposure to natural radiation is investigated in this study. An increasing nonsignificant trend of risk with radiation levels was obtained. © 2004 Published by Elsevier B.V.

**Keywords:** Lung cancer; Environmental radiation; Odds Ratio (OR)

### 1. Introduction

Lung cancer is the leading cancer among males in almost all developed as well as developing countries. The coastal areas of Kollam district of Kerala, India provides a unique opportunity to conduct studies to investigate the effect of chronic exposure to low-level ionizing radiation on human beings. In this paper, a preliminary analysis was attempted to investigate the risk of lung cancer among males in relation to exposure to the external radiation present in Karunagappally Taluk (administrative unit), a coastal area in Kollam district of Kerala, India.

### 2. Material and methods

A complete enumeration on sociodemographic and life style factors of the people residing in the study area along with radiation level measurements were undertaken by the population-based cancer registry functioning in this area from 1990. In the survey, 54,544 males were above 34 years of age, and this constitutes the study population. Cases were incident males with lung cancer reported by the registry during 1991–2001 in the study

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Table 1  
Distribution and Odds Ratio (OR) and corresponding 95% Confidence interval (CI) for cancer of lung by selected characteristics

Characteristics	Cases (%)	Controls (%)	OR	95% CI	
Age (year)	30–39	3 (1.5)	1		
	40–49	17 (8.3)	3.3	0.9–11.5	
	50–59	58 (28.3)	16.3	4.9–54.1	
	60–69	79 (38.5)	29.1	8.7–97.0	
	≥70	48 (23.4)	62 (10.1)	27.1	7.9–92.7
Religion	Hindu	135 (65.9)	442 (71.9)	1	
	Muslim	55 (26.8)	108 (17.6)	2.0	1.3–3.1
	Christian	15 (7.3)	65 (10.6)	0.8	0.4–1.5
Smoking	Nonsmokers	15 (7.3)	157 (25.5)	1	
	Ever smokers	190 (92.7)	458 (74.5)	3.2	1.7–5.8
Outside radiation (mGy/Yr)	<1 mGy	25 (12.2)	89 (14.5)	1	
	1≥mGy<2	49 (23.9)	205 (33.3)	0.9	0.5–1.6
	2≥mGy<5	90 (43.9)	222 (36.1)	1.5	0.9–2.7
	5≥mGy<10	27 (13.2)	63 (10.2)	1.6	0.8–3.3
	≤10 mGy	14 (6.8)	36 (5.8)	2.3	0.9–5.7

Similar results were obtained for microscopically confirmed primary cases also.

population, and there were only 205 such cases. Three controls per case were randomly selected using systematic sampling technique from the study population who were free of any cancer. Among 205 male cases, 105 (51%) were microscopically confirmed primary lung cancer cases. The analysis was done on these 205 and 105 cases separately. Odds Ratio and 95% confidence interval (CI) were computed using unconditional multiple logistic regression models which include age, education, religion, smoking habit and outside house radiation measured in milliGray per year (mGy/Yr) using the GMBO software in Epicure.

### 3. Results

Table 1 gives the distribution, Odds Ratio (OR) and 95% confidence interval (CI) for all lung cancer cases by age, religion, smoking habit and outside house radiation measured in milliGray per year (mGy/Yr). The OR for all age groups (except ≥70) shows an increasing trend with age ( $p$  value<0.001). An increasing nonsignificant trend of lung cancer risk with different radiation levels was obtained ( $p$  value for trend=0.154).

### 4. Conclusion

The investigated population has been living in the natural background radiation areas of Karunagappally Taluk for many decades, and the lack of any significant increase in the incidence of lung cancer either indicates (a) the existence of no association with the radiation levels present in this area or (b) very low levels of elevated or reduced risk, which were not detectable by means of simple analysis applied and due to the small number of cases under study or (c) other factors, like diet, which may confound or compete with the effects of radiation exposure. Further in-depth studies are thus necessary to investigate [1] the interaction of risk factors acting together with radiation [2] risk in relation to cumulative dose and [3] the risk among Muslims.

### References

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