



# Cancer Risk among Physicians is Different from that among Non-Physicians: An Observational Pilot Study

Hyun Young Kim\*

Department of Internal Medicine, Seoul National University Bundang Hospital, Korea

\*Corresponding author: Hyun Young Kim, MD, Department of Internal Medicine, Seoul National University Bundang Hospital, Seongnam-si, Gyeonggi-do, Korea, E-mail: [cecilup@naver.com](mailto:cecilup@naver.com)

### Abstract

**Introduction:** Some controversy has existed concerning the cancer incidence rate among physicians and non-physicians. We investigated the cancer incidence rate among physicians compared to that in non-physicians.

**Methods:** We conducted a retrospective, case-control study on cancer risk among physicians and non-physicians at a health screening center. A total of 1,110 Korean subjects aged 30 to 65 years were assessed for cancer risk. A physician group (primary clinic, N = 147, tertiary hospital, N = 123) and non-physician group (N = 840) were included.

**Results:** In univariate analysis, age, gender, and being a primary clinic physician were factors significantly associated with cancer events. In multivariate analysis, being a primary clinic physician showed a statistically significant relationship with cancer incidence (control; age- and gender-adjusted relative risk [RR], 2.905; 95% confidence interval [CI], 1.337-6.314;  $p = 0.007$ ).

**Conclusions:** Primary clinic physicians are at higher risk of cancer than tertiary hospital physicians and non-physicians. Regular health examinations for primary clinic physicians may help to maintain their health status.

### Keywords

Cancer, Physician, Risk

### Introduction

Cancer is a leading cause of death in Korea [1] and has been a major Korean public health concern since 1983. The overall cancer incidence in Korea increased from 1975 to 1989, with non-significant changes during the period 1989 to 1998, and a significant decline in incidence from 1998 to 2008 [2,3].

The Korean workforce currently includes over 100,000 physicians. Physicians comprise a diverse group of healthcare personnel working under multiple occupational and environmental hazards and various teratogenic or carcinogenic factors contributing to impaired physical and mental health. These factors include physical, chemical, biological, and psychological hazards (chronic fatigue, depression, and burnout) and alcohol/tobacco exposure [4,5].

Some controversy has existed concerning the cancer incidence rate among physicians and non-physicians. Some studies reported increased mortality rates for specific tumor types in various health care professions: breast cancer among women physicians, and

melanoma among men and women physicians, dentist may have an elevated risk for brain, skin and some reproductive cancers [4,6,7]. Other studies have reported a lower cancer death rate among physicians as compared to the general population [7,8]. In this study, we investigated cancer incidence rate in physicians comparing in non-physicians, using data from a single tertiary hospital records.

### Methods

#### Study population

We performed a retrospective, cross-sectional study. The study population consisted of physicians and non-physicians who underwent screening health evaluation in a single tertiary hospital (Seoul National University Bundang Hospital) between January and December 2015. The study group consisted of a total of 1,110 asymptomatic subjects aged 30 to 65 years who participated in a screening health evaluation program and were at average risk of cancer. Subjects who underwent abdominal US, thyroid US, Esophagogastroduodenoscopy, colonoscopy, breast mammography, breast US, low-dose chest CT, transvaginal US, brain MRI on the same day for a comprehensive health evaluation in Seoul National University Bundang hospital healthcare center. All subjects filled out a questionnaire regarding family history of cancer, physical activity, alcohol drinking, smoking, and hormone use. We classified subjects into a control (non-physicians) and a physician group (primary care clinic vs. tertiary hospital). There were 3 controls per case, for a total of 840 evaluated.

This study was approved by the Institutional Review Board of Seoul National University Bundang Hospital (#B-1603/338-105).

#### Statistical analysis

Continuous variables were expressed as the mean  $\pm$  standard deviation (SD) using a *t*-test. Categorical variables were determined by the chi-square test. Multivariate analysis was performed using logistic regression. All statistical analyses were performed using SPSS software (version 22.0, SPSS Inc., Chicago, IL, USA). Two-sided *P* values of  $< 0.05$  were considered statistically significant.

#### Results

We reviewed 1,110 subjects comprised of 270 physicians and 840 non-physicians subjects; 667 (60.1%) were men and 443 (39.9%) were women. Table 1 shows the demographic data of the study

subjects. In the entire study group, 11 primary clinic physicians (7.5%), 2 tertiary hospital physicians (1.6%), and 24 non-physicians (2.9%) were diagnosed with cancer. The mean ages ( $\pm$  SD) were  $45.1 \pm 9.2$  years in the primary clinic physicians group,  $37.1 \pm 7.5$  years in the tertiary hospital physicians group, and  $45.6 \pm 11.6$  years in the non-physicians group. The mean ages ( $\pm$  SD) of those with cancer were  $47.8 \pm 9.9$  years in the primary clinic physician group,  $47.5 \pm 6.4$  years in the tertiary hospital physician group, and  $47.5 \pm 10.7$  years in the non-physician group.

As shown in table 2, a significant relationship was found between being a primary clinic physician and the risk of cancer in multivariate analysis (control; age- and gender-adjusted relative risk [RR], 2.905; 95% confidence interval [CI], 1.337-6.314;  $p = 0.007$ ).

Table 3 lists various types of cancer in the physicians group (primary and tertiary) and non-physicians group. Primary physician has 1 brain tumor, 1 thyroid cancer, 3 stomach cancer, 1 gallbladder cancer, 3 prostate cancer, 1 renal cell carcinoma. Tertiary physician has 1 rectal neuroendocrine tumor, 1 prostate cancer, 1 ovary cancer. Cancer numbers are too small to analyze for meaningful analysis.

**Table 1:** Baseline characteristics of physicians vs. control group.

Characteristics	Physicians		Non-physicians	P value
	Primary	Tertiary		
Subjects, n (%)	147 (13.2%)	123 (11.1%)	840 (75.7%)	
Age (mean $\pm$ SD)	$45.1 \pm 9.2$	$37.1 \pm 7.5$	$45.6 \pm 11.6$	0.000*
Sex (Male/Female)	124/23	78/45	465/375	0.000*
Cancer events (%)	11 (7.5%)	2 (1.6%)	24 (2.9%)	0.008*

vs. indicates versus; SD indicated standard deviation; \* $P < 0.05$ , considered statistically significant.

**Table 2:** Multivariate-Adjusted odds ratios and 95% confidence intervals of cancer.

Parameter	B	OR (95% CI)	P value
Sex			
Male (n = 667)		1	
Female (n = 443)	-0.002	0.998 (0.488-2.042)	0.995
Age group			
< 20 (n = 64)		1	
20-39 (n = 276)	0.383	1.466 (0.175-12.280)	0.724
40-49 (n = 401)	0.526	1.692 (0.215-13.347)	0.618
50-59 (n = 251)	0.922	2.514 (0.315-20.041)	0.384
$\geq 60$ (n = 118)	0.941	2.564 (0.290-22.670)	0.397
Physicians vs. Non-physicians			
Non-physicians (n = 840)		1	
Primary physicians (n = 147)	1.067	2.905 (1.337-6.314)	0.007*
Tertiary physicians (n = 123)	-0.348	0.706 (0.155-3.220)	0.653

\* $P < 0.05$  vs. control (Non-physicians), considered statistically significant; Values of B are standardized regression coefficients; OR indicates odds ratio; CI indicates confidence interval.

**Table 3:** Cancer types among primary vs. tertiary physicians vs. non-physicians group.

Cancer	Primary physicians	Tertiary physicians	Non-physicians	Total
	11/147	3/123	24/840	38/1110
Brain tumor	1	0	0	1
Thyroid cancer	1	0	7	8
Breast cancer	0	0	4	4
Lung cancer	0	0	3	3
Stomach cancer	3	0	1	4
Duodenum, neuroendocrine tumor and Renal cell carcinoma	0	0	1	1
cholangiocarcinoma	0	0	1	1
Gallbladder cancer	1	0	0	1
Rectum, neuroendocrine tumor	0	1	0	1
Prostate cancer	3	1	4	8
Ovary cancer	1	1	1	3
Renal cell carcinoma	1	0	1	2
Breast cancer & colon cancer	0	0	1	1

Numbers too small to analyze for meaningful statistical analysis.

## Discussion

This retrospective analysis shows that primary clinic physicians have a significantly higher overall risk of cancer than tertiary hospital physicians and the reference non-physicians. This association remained significant even after adjusting for other risk factors, including age and gender. To our knowledge, this is the first study to demonstrate an association between being a primary clinic physician and cancer risk.

Some epidemiological reports have suggested that physicians have either an average or low risk of cancer, e.g. in Israel and Taiwan [6,7,9]. One editorial offered several explanations for the lower cancer death rate among physicians as compared to the general population [10]. This may reflect the combined effects of relatively high socioeconomic status and knowledge of the consequences of health-related behaviors such as smoking, alcohol drinking, and drug abuse.

Our study results seemed to contradict previous reports that cancer risk is similar between tertiary hospital physicians and the non-physicians. Physicians have a higher prevalence of work-related stress and mental health problems than the general population [11-14]. A study in the USA suggested that motivational interventions may improve physician lifestyles and that positive personal health behaviors should be encouraged among physicians [15]. The study reported that over 53% had severe to moderate stress, 35% reported "no" or "occasional" exercise, 34% slept 6 or fewer hours daily, and 21% worked more than 60 hours per week. In Korea, the environment and health behavior of primary physicians is not optimal, even though physicians should know best how to live healthfully. Korean physicians in primary clinic, particularly those who routinely work on Saturday, when there are fewer severely ill patients, often perform minor surgery. Due to competition to provide low-cost healthcare services, the working hours of primary physicians are relatively long, with Saturday, Sunday, and weekday night hours. Thus, time for exercise is lacking, and there are few opportunities to schedule personal health evaluations. We suspect that enhanced and regular diagnostic evaluations account for the discrepancy in cancer risk between primary clinic and tertiary hospital physicians. Our hospital provides a physician-tailored free-of-charge annual health evaluation program to all physicians, and many have evaluations on a regular basis.

The KMA (Korean Medical Association) Health Policy Institute published a primary medical management survey [16,17] showing that the average weekly hours worked by primary physicians were 56.5, which is 5.5 hours longer than in 2005. Compared to non-physicians working 40 hours in a 5-day week, primary physicians usually work on average an additional 16.5 hours in a 6-day week. Working in the South Korean healthcare system [18], with universal coverage for all citizens and lower medical fees, threatens physician survival, as more physicians further divide an already decreased share of the market.

The strengths of the present study include the following: 1) physicians were evaluated by type of practice (primary clinic vs. tertiary hospital); 2) when cancer was diagnosed, treatment was started immediately, and continued follow-up was performed, suggesting the data were of high quality; and 3) all the physicians continue to provide medical services. A main limitation of this study is its cross-sectional, retrospective design. A second limitation is the small sample size.

## Conclusion

In conclusion, our findings show a significant association between being a primary clinic physician and cancer risk. Regular health examinations for primary clinic physicians may help to maintain their health status.

## Declarations

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## Competing interests

The authors declare that they have no competing interests.

## Author' contributions

HYK designed the study and drafted the manuscript. Author read and approved the final version of this manuscript.

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