RESEARCH COMMUNICATION

Cancer Deaths in a Cohort of Japanese Barbers in Aichi Prefecture

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Abstract

Barbers have frequent occasion to come in contact with hair and beauty products that contain many chemical substances, which could have harmful effects on health. Subjects were barbers belonging to the Barbers' Union of Aichi Prefecture who responded to a questionnaire in 1976. Deaths from all sites of cancers in the subjects were observed over 27 years. Mortalities of several cancers in the subjects were compared with individuals in the Japanese population, calculating standardized mortality ratios (SMRs) using the general Japanese population as a standard. Subjects included 8,360 people (4,674 men). There were a total of 551 deaths (469 men) during the follow-up period, and 277 deaths (211 men) from all cancers. The male and female SMRs (95%CI) were 0.62 (0.58-0.66) and 0.25 (0.16-0.34) for all deaths, 0.46 (0.39-0.53) and 0.41 (0.35-0.53) for all cancers combined, 0.49 (0.35-0.63) and 0.40 (0.12-0.68) for stomach, 0.40 (0.24-0.56) and 0.30 (0.10-0.70) for lung, 0.56 (0.39-0.73) and 0.26 (0.02-0.76) for liver, 0.38 (0.16-0.60) and 0.30 (0.07-0.67) for colon, and 0.48 (0.08-0.88) and 0.22 (0.04-0.79) for blood cancers, respectively, with significantly fewer deaths than in the general population. The female SMRs were 0.90 (0.74-1.06) for breast and 0.55 (0.06-1.04) for ovarian cancer, lacking significance. Thus, no excess mortality of any cancer sites was observed compared with the general population in both Japan overall and in Aichi Prefecture.

Key Words: Barbers - cancer - mortality rate - cohort study

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Introduction

Barbers and hairdressers are often exposed to hairdressing products that contain many chemical substances. Many epidemiological studies have been conducted so far based on the possibility that these chemical products may have somewhat harmful effects on health (Kono et al., 1983; Shibata et al., 1989; Schumacher et al 1989; Kato et al., 1990; Skov et al., 1990; 1994; Silverman et al 199l; Pukkala et al., 1992; Boffetta et al., 1994; Miligi et al., 1999; Teschke et al 1997; Sugiura et al 2000; Czene et al 2003; Ji et al 2005). Positive associations with non-Hodgkin's lymphoma (Boffetta et al 1994) and urinary bladder (Schumacher et al 1989) cancer, but not other sites, have been reported.

In Japan, there have been few such studies on the health of barbers and/or hairdressers (Kono et al 1983; Shibata et al 1989; Kato et al 1990; Sugiura et al 2000). We have conducted earlier studies on hematopoietic diseases in the cohort of the current study, but found that the mortality was lower than in the general Japanese population (Shibata et al 1989; Sugiura et al 2000). In the current study we presented the mortality experience of a cohort of barbers in Aichi Prefecture over 27 years and examined for any excess in mortality from specific cancer sites, including stomach, lung, liver, colon, blood, urinary bladder, breast and ovary, compared with the general population in Japan.

Materials and Methods

Study Population

Subjects were members of the Barbers' Union of Aichi Prefecture who responded to a self-administered questionnaire sent and sent back by mail in October 1976. The questionnaire included items on living habits, medical history, and use of hair dye. Those who could not be accurately identified by name, address, or other information were not included in the study. The subjects were followed for all causes of deaths from October 1976 to December 2002 as a cohort. During the follow-up period, information on deaths from cancers was obtained using deaths' certificates from Barbers' Union of Aichi Prefecture received. The subjects who seceded from the Barbers' Union of Aichi Prefecture or moved out of Aichi Prefecture during the follow-up period were treated as censored cases (473 men, 363 women). We believe the information on vital status for all barbers of the Barber's Union to be reliable, because there were no material cases

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whose death information demonstrated differences from that registered at Aichi Cancer Registry.

This study was approved by the ethics committee of Aichi Medical University School of Medicine, and permission to use cancer registration records was received from the Aichi Cancer Registry at the Aichi Cancer Center.

Types of Cancer Analyzed

The mortality rates were calculated with all sites of, stomach, lung, liver, colon, blood, urinary bladder, breast, and ovarian cancers, based on the ICD-10 classifications. As the standard population, the whole Japanese population was used, and the data were from the Ministry of Health, Labor, and Welfare.

The number of expected deaths (E) in the cohort was calculated stratified by gender and age (5-year age-classes) using the standard population and its mortality rates of cancers. The numbers of people in the cohort of each gender and age-classes were calculated separately and multiplied by the mortality of the standard population each year, and totaled for the 27-year period. Then, Standard mortality ratios (SMRs), the ratio of observed (O) to expected (E) number of deaths, were calculated for all cancers combined, site-specific cancers. Statistical significance of the SMRs was examined using chi-square tests.

Results

Background Factors of Subjects

Table 1 shows the 1976 baseline gender and age distribution of the 8,360 people (4,674 men, 3,686 women) in this study. Table 2 shows demographic characteristics and lifestyle factor of subjects at baseline.

Table 1. Baseline Sex and Age Distribution

Age group (year)	Male (%)	Female (%)	Total (%)
≤19	51 (1.1)	50 (1.4)	101 (1.2)
20-29	963 (20.6)	994 (27.0)	1,957 (23.4)
30-39	1,923 (41.1)	1,548 (42.0)	3,471 (41.5)
40-49	884 (18.9)	600 (16.3)	1,484 (17.8)
50-59	441 (9.4)	371 (10.1)	812 (9.7)
60-69	377 (8.1)	114 (3.1)	491 (5.9)
70-79	31 (0.7)	9 (0.2)	40 (0.5)
≥80	4 (0.1)	0 (0.0)	4 (0.0)
Total	4,674 (100)	3,686 (100)	8,360 (100)

Table 2. Demographic Characteristics of the Study Cohort at Baseline

Characteristics		Male	Female
Barber start age		17.0± 4.3	18.6±5.6
Working years		21.2±11.4	17.0±8.8
Occupational hair dye use	yes	88.9	75.5
(%)	no	11.1	24.5
Personal hair dye use (%)	yes	37.4	58.5
	no	62.6	41.5
Smoking habit (%)	yes	84.4	15.4
	no	15.6	84.6
Drinking habit (%)	yes	78.8	45.9
	no	21.2	54.1

Cancer Mortality Rate in Subjects and General Cohort

Table 3 presents observed number of deaths, expected number of deaths, and SMRs during the follow-up period from 1976 to 2002. A total of 551 deaths due to all causes were observed in this cohort (469 men, 82 women), with 277 (211 men, 66 women) deaths from all cancers. Among both men and women, the observed numbers of cancer deaths were lower than the expected number of cancer deaths based on the referent Japanese population. Among

Table 3. Observed and Expected Numbers of Deaths from All Causes and Cancers, with SMRs by Sex in a Cohort of Barbers, 1976-2002

	Men					Women				
Cause of death	Observed	Expected	SMR	95%CI	P value	Observed	Expected	SMR	95%CI	P value
All deaths	469	752.96	0.62	0.58-0.66	p<0.01	82	329.16	0.25	0.16-0.34	p<0.01
All cancer deaths	211	461.90	0.46	0.39-0.53	p<0.01	66	159.36	0.41	0.35-0.53	p<0.01
Stomach	51	103.23	0.49	0.35-0.63	p<0.01	12	29.85	0.40	0.12-0.68	p<0.01
Lung	37	91.81	0.40	0.24-0.56	p<0.01	5	16.85	0.30	0.10-0.70	p<0.01
Liver	32	57.65	0.56	0.39-0.73	p<0.01	3	11.38	0.26	0.02-0.76	p<0.05
Colon	18	47.67	0.38	0.16-0.60	p<0.01	6	19.99	0.30	0.07-0.67	p<0.01
Blood	11	22.70	0.48	0.08-0.88	p<0.05	2	9.07	0.22	0.04-0.79	p<0.05
Bladder	5	7.84	0.64	0.22-1.06	n.s.	0	1.33	0.00		n.s.
Breast						14	15.59	0.90	0.74-1.06	n.s.
Ovary						4	7.29	0.55	0.06-1.04	n.s.

SMR: standardized mortality ratio; CI: confidence interval

Table 4. Observed and Expected Numbers of Deaths by Time period, with SMRs by Sex in a Cohort of Barbers, 1976-2002

	Men					Women				
Time period	Observed	Expected	SMR	95%CI	P value	Observed	Expected	SMR	95%CI	P value
1976-84	31	73.52	0.42	0.25-0.59	p<0.01	8	26.83	0.30	0.02-0.62	p<0.01
1985-93	73	139.95	0.52	0.41-0.63	p<0.01	24	47.25	0.51	0.31-0.71	p<0.01
1994-2002	107	248.43	0.43	0.34-0.52	p<0.01	34	85.28	0.40	0.24-0.56	p<0.01
All periods	211	461.90	0.46	0.39-0.53	p<0.01	66	159.36	0.41	0.29-0.53	p<0.01

SMR: standardized mortality ratio; CI: confidence interval

men, all SMRs were lower than unity for the major sites of cancer, such as stomach, lung, liver, colon and blood. No excess in bladder cancer mortality was noted in this cohort. Among women, all SMRs were again lower than unity for the stomach, lung, liver and colon. The SMR for breast cancer was near unity. No excess in ovary cancer mortality was noted in this cohort. SMR for bladder cancer could not be calculated because no deaths were observed.

Table 4 shows observed number of cancer deaths, expected number of cancer deaths, and SMRs, stratified by 3 follow-up periods. In all three 9-year periods with 9 years follow-up, the number of deaths was significantly lower than in the general cohort for both men and women.

Discussion

In the present study, mortality from all cancers, and from specific sites such as stomach, lung, liver, colon and blood cancer deaths in this cohort were significantly lower than in the general population for both men and women. Moreover, mortality from urinary bladder cancer in men, and from breast and ovarian cancers in women showed no remarkable elevation. These results do not support the IARC report that hairdressing is a profession that may be related to increased cancer risk (IARC, 1993).

We speculate that low cancer mortality in Aichi Prefecture, where this cohort study was conducted, could may be the main reason for the lower cancer mortality observed in this cohort. Kikuchi et al calculated that SMRs for 1994 to 2002 in Aichi prefecture were lower than 1.0 for male all cancers combined (0.94), male stomach (0.97), and male (0.88) and female (0.90) liver cancers, and higher than 1.0 for female stomach cancer (1.07). SMRs for male and female lung and breast cancer were around 1.0 and less than ones for Aichi Prefecture (unpublished data). There also seems to be a remarkable difference in cancer mortality between the barbers and the general population in Aichi Prefecture. Smoking increases risks of both lung (Wakai et al., 2006) and stomach cancers (Kikuchi et al., 2002). In spite of high rates of smokers in the subjects of the current study, mortality of stomach and lung cancers were low compared with general population.

The reason why the mortality of the barbers was low compared with general population in Aichi Prefecture and in Japan is unknown. One possible explanation is that some cases were not registered on vital status for all barbers, but this seems unlikely because no cases of deaths from cancer in this barbers' cohort were recorded only in Aichi Cancer Registry. The healthy worker effect, which is inherent in occupational cohort studies, may also be responsible for a relatively lower mortality, but the effect seems limited. The subjects of this study were barbers belonging to the Barber's Union in Aichi Prefecture who responded the questionnaire at baseline. They were actually working as barbers and consequently relatively healthy compared with the general population. Another reason may be that most subjects were self-employed persons working indoors and they were free from occupational stress. Stress weakens immune response including activity of natural T-cells (Arranz et al., 2007), which increases risk of cancer (Imai et al., 2000).

Although many epidemiological studies on hair dye and various types of cancer have been conducted to date, no causal relationship has been established (Hennekens et al., 1979; Thun et al 1994; Grodstein et al 1994; La Vecchia et al 1995; Altekruse et al 1999; Gago-Dominguez et al 2001; Negri et al 2001; Zhang et al., 2004). Our results are not consistent with a study by Kono et al (1983), who investigated causes of death from cancer and other diseases in a cohort of female beauticians in comparison with all citizens of Fukuoka Prefecture from 1953 to 1977. They reported that only death from stomach cancer was significantly higher, and that there were no special trends for other cancers.

Epidemiologic studies have suggested a positive association between hematopoietic diseases and occupational exposure of hairdressers (Boffetta et al., 1994; Skov et al., 1994; Miligi et al.,1999), but the results are controversial. Shibata et al (1989) surveyed hematopoietic diseases in the 11 years from 1976 to 1987 in the subjects of the current study, and reported that up to 1987 mortality from leukemia and malignant lymphoma were lower than in the general population. Our previous study followed-up the same subjects until October 1995 and compared the mortality rates of hematopoietic diseases including blood cancer with the general population. We found that all deaths and all cancer deaths were significantly less frequent than in the general cohort, and leukemia and malignant lymphoma were somewhat less frequent.

An increased risk of breast cancer in hairdressers has also been reported in Aichi (Kato et al., 1990). In a Japanese cohort study, Lin (Lin et al., 2005) reported an elevated risk of breast cancer in women who drank alcohol regularly compared with those who did not. In the current study, breast cancer showed a relatively higher SMR than other cancers, although it was still not higher than in the whole Japanese population or in Aichi prefecture. As shown in Table 2, the high rate of alcohol drinkers among female subjects might also explain the relatively high mortality compared with other sites of cancers.

Previous studies have suggested that risk of cancer mortality may differ according to the length of follow-up period. In Finland, Pukkala et al (1992) studied the development of cancer in male and female hairdressers from 1970 to 1987, by dividing the follow-up period into 3 periods. They found that the risk of cancer was elevated in the first period only, but not in the subsequent periods, and stated that the change in risk may have been associated with changes in working conditions in hair salons. Furthermore, Boffetta et al (1994) investigated the incidence rate of ovarian cancer and non-Hodgkin's lymphoma in female hairdressers in Denmark, Sweden, Norway, and Finland. They reported that the increase in risk differed by country, and indicated that the risk of work-related cancer in female hairdressers differed according to time and geographical factors. In the current study, we examined the changes in mortality rate from all cancer deaths over three 9-year periods, but found no appreciable differences in SMRs in each period.

Our study has limitations. Approximately 10% of the study subjects were lost to follow-up during the follow-

up period, which might bias the results if those who were lost differed significantly from those who remained in the cohort. Ten percent during the 27 years means only 0.37 percent per year. Furthermore, no cases of deaths from cancer in this barbers' cohort were recorded on Aichi Cancer Registry but not in the information from the Barber's Union, which means that the association between drop out and death of cancer was limited. The strengths of our study included a long period of follow-up and complete employment record.

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