



## Consumption of fruits, vegetables, and seaweeds (sea vegetables) and pancreatic cancer risk: The Ohsaki Cohort Study

Michiko Shigihara<sup>a,b,\*</sup>, Taku Obara<sup>a</sup>, Masato Nagai<sup>b</sup>, Yumi Sugawara<sup>b</sup>, Takashi Watanabe<sup>b</sup>, Masako Kakizaki<sup>b</sup>, Yoshikazu Nishino<sup>c</sup>, Shinichi Kuriyama<sup>a</sup>, Ichiro Tsuji<sup>b</sup>

<sup>a</sup>Division of Molecular Epidemiology, Environment and Genome Research Center, Tohoku University Graduate School of Medicine, Sendai, Japan

<sup>b</sup>Division of Epidemiology, Department of Public Health and Forensic Medicine, Tohoku University Graduate School of Medicine, Sendai, Japan

<sup>c</sup>Division of Epidemiology, Miyagi Prefectural Cancer Research Center, Natori, Japan

### ARTICLE INFO

#### Article history:

Received 15 September 2013

Received in revised form 26 December 2013

Accepted 2 January 2014

Available online 9 February 2014

#### Keywords:

Pancreatic cancer

Fruits

Vegetables

Seaweeds

Prospective cohort study

### ABSTRACT

Studies on the effects of consumption of fruits, vegetables, and seaweeds on the incidence of pancreatic cancer are not conclusive. We examined the association (if any) between the consumption of fruits, vegetables, and seaweeds and the risk of pancreatic cancer in Japan. Data from 32,859 participants registered in the Ohsaki National Health Insurance Cohort Study who were 40–79 years old and free of cancer at baseline were analyzed. Consumption of fruits, vegetables, and seaweeds was assessed at baseline using a self-administered food frequency questionnaire (containing 40 items). Incidences of pancreatic cancer were identified by computer linkage with the Miyagi Prefectural Cancer Registry. During 11 years of follow-up, 137 pancreatic cancers (67 men and 70 women) were identified. The hazard ratios (95% confidence interval) of pancreatic cancer risk for the highest versus the lowest tertile were 0.82 (0.40–1.68, trend  $P = 0.57$ ) in men and 0.64 (0.35–1.20, trend  $P = 0.22$ ) in women for total consumption of fruits, 0.89 (0.46–1.73, trend  $P = 0.76$ ) in men and 0.67 (0.33–1.35, trend  $P = 0.23$ ) in women for total consumption of vegetables, and 0.92 (0.46–1.84, trend  $P = 0.81$ ) in men for consumption of seaweeds (results for the consumption of seaweeds in women were not analyzed because of poor reliability), respectively. Total consumption of fruits, vegetables, and seaweeds was not associated with a reduced risk of pancreatic cancer.

© 2014 Elsevier Ltd. All rights reserved.

### 1. Introduction

Pancreatic cancer is a leading cause of cancer mortality in Japan (the fifth cause in men and the fourth in women) [1]. The 5-year relative survival rate for pancreatic cancer was only 7% in 2009 [2]. Pancreatic cancer is diagnosed late in the natural history of the disease as a result of the few indicators of early illness and the lack of screening tests for pancreatic cancer. Therefore, primary prevention could play an important role in reducing mortality from pancreatic cancer [3].

Consumption of fruits and vegetables is helpful in preventing major diseases [4–9] such as cardiovascular diseases [5–7] and

certain cancers [4,8,9]. However, studies on the association between the consumption of fruits and vegetables and the risk of pancreatic cancer are not conclusive. Although case-control studies have reported favorable effects of total consumption of fruits plus vegetables, fruits, and vegetables on the risk of pancreatic cancer [10–12], no cohort study has found associations between total consumption of fruits plus vegetables, fruits, and vegetables and the risk of incidence of pancreatic cancer [13–15]. In the Hawaii/Los Angeles multiethnic cohort study, in which 183,522 participants (529 cases of pancreatic cancer) were analyzed with an average follow-up of 8.3 years, current smokers, who were at increased risk of pancreatic cancer, had a decreased risk with higher intake of dark green vegetables, but this study found no evidence for an inverse association between vegetable intake and pancreatic cancer overall [16]. Comparable data on the association between consumption of fruits and vegetables and the risk of pancreatic cancer are not available in Japan. Fruits, vegetables and seaweeds also contain several nutrients – such as carotene and dietary fibers [17] – that may have a protective effect on pancreatic cancer by modulating hormonal pathways linked to pancreatic carcinogenesis, such as insulin-like growth

**Abbreviations:** NHI, National Health Insurance; FFQ, food frequency questionnaire; ICD-O-3, International Classification of Diseases for Oncology, 3rd version; HRs, hazard ratios; 95%CI, 95% confidence intervals.

\* Corresponding author at: Division of Molecular Epidemiology, Environment and Genome Research Center, Tohoku University Graduate School of Medicine, 2-1, Seiryō-machi, Aoba-ku, Sendai, Miyagi 980-8575, Japan. Tel.: +81 22 717 8104; fax: +81 22 717 8106.

E-mail address: [shigi@med.tohoku.ac.jp](mailto:shigi@med.tohoku.ac.jp) (M. Shigihara).

factors [18–21]. Seaweeds are commonly consumed by the Japanese population and are called “sea vegetables” owing to their phytochemicals. However, the association between seaweed consumption and the risk of cancer incidence has not been investigated anywhere.

Therefore, possible associations between total consumption of fruits plus vegetables, fruits, vegetables, and seaweeds and the risk of pancreatic cancer incidence were investigated using data from a large, population-based, prospective cohort study in Japan.

## 2. Materials and methods

### 2.1. Participants

Data from the Ohsaki National Health Insurance (NHI) Cohort Study, the design of which has been described in detail elsewhere [22,23], were used. Briefly, between October and December 1994 a self-administered 40-item food frequency questionnaire (FFQ) was delivered to men and women aged 40–79 years living in the catchment area of Ohsaki Public Health Center, a local government agency providing preventive health services in 14 municipalities in the Miyagi Prefecture in northeastern Japan. Of the 54,996 eligible individuals, 52,028 responded to the questionnaire (94.6%), but 776 who had withdrawn from the NHI before the baseline questionnaire survey were excluded, leaving 51,252 (24,573 men and 26,679 women) in the study cohort. The study protocol was approved by the institutional review board of the Tohoku University School of Medicine. Return of the questionnaire was assumed to imply the participant's consent to participate in the study.

### 2.2. Data collection

The self-administered questionnaire also covered personal and family histories of cancer, history of diabetes mellitus, lifestyle factors (such as smoking status, alcohol consumption, and time spent walking per day), education, marital status, job status, and meat consumption. Participants who had a history of cancer at any individual site before the beginning of follow-up ( $n = 3,172$ ), who did not report on consumption of fruits, vegetables, or seaweeds ( $n = 14,893$ ), and who reported extreme values of total daily caloric intake (sex-specific cut-offs for highest 0.5% and lowest 0.5%;  $n = 328$ ) were excluded. Therefore, 32,859 participants (16,065 men and 16,794 women) remained for this analysis.

### 2.3. Exposure

In the FFQ, there were five items relating to vegetables (i.e., green leafy vegetables, carrots and pumpkins, tomato, cabbage and lettuce, and Chinese cabbage), three items relating to fruits (oranges, other fruits, and fresh fruit juices), and one item relating to seaweeds. Frequency was in five categories: almost never, 1–2 days per month, 1–2 days per week, 3–4 days per week, or almost every day. For seasonal foods, participants were asked to report their intake in the high season. Furthermore, 12-day dietary records were collected from a subsample of 133 subjects, and the portion size for each food item was determined on the basis of the median values in the records. The validity of consumption of fruits, vegetables, and seaweeds – as well as that of each food item – as assessed by the FFQ has been reported previously [24]. The results showed that the Spearman rank coefficient for the correlation between the total amounts of fruits and vegetables consumed according to the questionnaire and the amounts consumed according to the food records was 0.75 for men and 0.57 for women; the correlation between the total amounts of fruits consumed according to the questionnaire and the amounts

consumed according to the food records was 0.76 for men and 0.70 for women; the correlation between the total amounts of vegetables consumed according to the questionnaire and the amounts consumed according to the food records was 0.60 for men and 0.45 for women; and the correlation between the amounts of seaweeds consumed according to the questionnaire and the amounts consumed according to the food records was 0.44 for men [24]. However, because the Spearman's correlation coefficient between the FFQ and the dietary record for seaweed consumption and for consumption of fresh fruit juice in women was 0.00 and  $-0.06$ , respectively [24], the association between seaweed consumption and the risk of pancreatic cancer and the association between consumption of fresh fruit juice and the risk of pancreatic cancer were not examined in women in the current analysis.

### 2.4. Outcome

Incident cases of cancer were ascertained by computer linkage with the Miyagi Prefectural Cancer Registry, which covers the study area, during the follow-up period. Cancers were coded according to the International Classification of Diseases for Oncology, 3rd version (ICD-O-3), as pancreatic cancer (C25.0–C25.9). None of the participants died of unknown causes. Because the Family Registration Law in Japan requires registration of death, death certificates confirmed all deaths that occurred in the study area, except for participants who died after emigration from the area.

### 2.5. Follow-up

Participants were followed for up to 11 years from January 1, 1995 to December 31, 2005. The end point was diagnosis of pancreatic cancer, death, emigration, or end of the follow-up period, whichever occurred first. Withdrawals data from the NHI because of death, emigration, and loss of NHI qualification were collected from the NHI withdrawal history files.

### 2.6. Statistical analysis

The participants were divided into tertiles on the basis of the weight of total fruits plus vegetables, total fruits, total vegetables, seaweeds, or each food item consumed per day, and the association of each with pancreatic cancer risk was examined. Person-years of follow-up were estimated for each participant from January 1, 1995 to the end of follow-up. Cox proportional hazards regression analysis was used to estimate the hazard ratios (HRs) and 95% confidence intervals (95% CIs) for pancreatic cancer incidence according to the lowest tertile of total fruits plus vegetables, total fruits, total vegetables, seaweeds, or each food consumed per day as the reference group, after adjustment for potential confounders.

The following variables were considered to be potential confounders: age (continuous variable, years), total caloric intake (continuous variable, kcal/day), body mass index ( $<18.5$ ,  $18.5$ – $24.9$ , or  $\geq 25.0$  kg/m<sup>2</sup>), family history of cancer (yes or no), history of diabetes mellitus (yes or no), smoking status (never smoked, formerly smoked, currently smoking  $<20$  cigarettes/day, or currently smoking  $\geq 20$  cigarettes/day), alcohol consumption (never consumed alcohol, formerly consumed alcohol, current ethanol intake  $<45.6$  g/day, or current ethanol intake  $\geq 45.6$  g/day), time spent walking ( $\leq 0.5$  h/day,  $0.5$ – $0.9$  h/day, or  $\geq 1.0$  h/day), education (junior high school or less, high school, or college/university or higher), marital status (married or unmarried), job status (employed or unemployed), and meat consumption (continuous variable, g/day) [13,14,25–30]. The  $P$ -values for the test of linear trend (trend  $P$ ) were estimated using the weight of relevant foods consumed per day as a continuous

Download English Version:

<https://daneshyari.com/en/article/2109515>

Download Persian Version:

<https://daneshyari.com/article/2109515>

[Daneshyari.com](https://daneshyari.com)