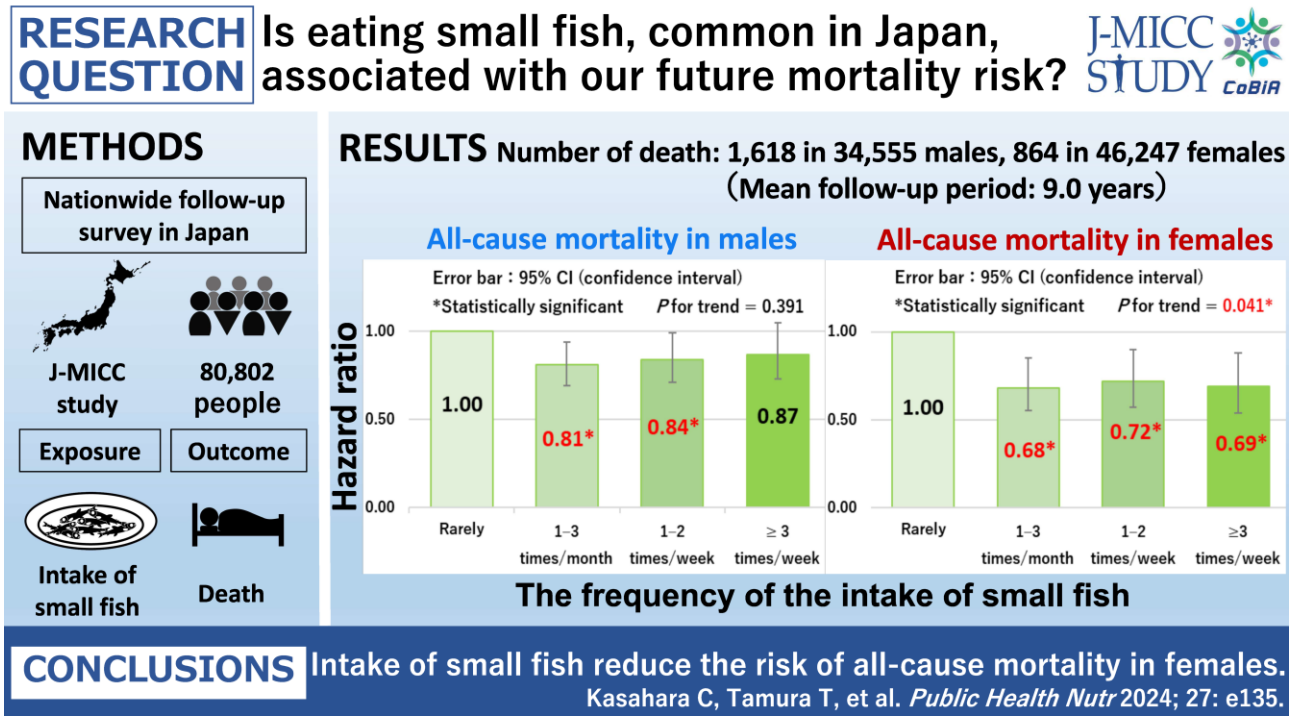
News Release

Association between intake of small fish and mortality risk

-Eating small fish common in Japan can prolong life expectancy-



Key Points

- Intake of small fish is associated with a lower mortality risk in Japanese females.
- Nutrients and physiologically active substances unique to small fish may be linked to lower mortality risk.
- This study highlights the importance of including small fish in the daily diet.

Summary

Dr. Chinatsu Kasahara (Ph.D. candidate), Associate Prof. Takashi Tamura and Prof. Kenji Wakai from Department of Preventive Medicine, Nagoya University Graduate School of Medicine, along with their collaborators conducted a cohort study[*1] to investigate the association between the frequency of the intake of small fish and mortality risk. They utilized follow-up survey data from the Japan Multi-Institutional Collaborative Cohort Study (J-MICC Study, principal investigator: Dr. Keitaro Matsuo from Division of Cancer Epidemiology and Prevention, Aichi Cancer Center Research Institute)[*2]. They found that the dietary habit of frequently eating small fish is associated with lower risks of all-cause and cancer mortality in females.

Small fish, such as whitebait and Atlantic capelin (shishamo), have the unique characteristic of being consumable whole, including the head, bones, and organs. These small fish are consumed as part of a different dietary habit from common fish, where the head, bones, and organs are often discarded and only the flesh is eaten. The head, bones, and inner organs of fish are reservoirs of the nutrients such as calcium and vitamin A, which contribute to the prevention of diseases. Small fish, which provide these nutrients all at once, are considered an important source of nutrients that are often lacking in the modern diet. The intake of nutrients contained in small fish has been reported to lower blood pressure, prevent arteriosclerosis, and reduce the risk of certain types of cancers, drawing renewed attention to their role in human disease prevention.

Previous epidemiological researches[*3] suggest that the dietary habit of eating fish is associated with a lower risk of all-cause, certain types of cancer, and cardiovascular disease (CVD) mortality. Nevertheless, few cohort studies have focused on small fish and examined the association between their intake and mortality risk. This research group, therefore, conducted a follow-up survey over a period of 9 years with approximately 81,000 participants from the J-MICC Study to evaluate the association between the frequency of the intake of small fish and mortality risk. The participants' frequency of the intake of small fish was assessed using a food frequency questionnaire[*4]. The study statistically accounted for confounding factors[*5] such as participants' age, smoking and alcohol consumption habits, BMI, and intake of various nutrients, all of which can affect mortality risk.

As a result, females who eat small fish 1–3 times/month, 1–2 times/week, and 3 times or more/week had 0.68, 0.72, and 0.69 times the risk of all-cause mortality, and 0.72, 0.71, and 0.64 times the risk of cancer mortality, compared to those who rarely eat small fish (P for trend[*6] = 0.041, 0.027, respectively). The risk of all-cause and cancer mortality in males showed a similar trend to females, although not statistically significant (P for trend = 0.391 and 0.161, respectively).

The results of this study suggest the importance of including small fish in the daily diet. In addition to vitamin A and calcium, the unique nutrients and physiologically active substances in small fish may contribute to lower mortality risk.

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Research Background

Japanese people habitually consume small fish, such as whitebait and Atlantic capelin (shishamo). These small fish have the unique characteristic of being consumable whole, including the head, bones, and organs. They are consumed as part of a different dietary habit from common fish, where the head, bones, and organs are often discarded and only the flesh is eaten. The head, bones, and inner organs of fish are reservoirs of the nutrients such as calcium and vitamin A, which contribute to the prevention of diseases. Small fish, which provide these nutrients all at once, are considered an important source of nutrients that are often lacking in the modern diet. The intake of nutrients contained in small fish has been reported to lower blood pressure, prevent arteriosclerosis, and reduce the risk of certain types of cancers, drawing renewed attention to their role in human disease prevention.

Previous epidemiological researches suggest that the dietary habit of eating fish is associated with a lower risk of all-cause, certain types of cancer, and CVD mortality. Nevertheless, few cohort studies have focused on small fish and examined the association between their intake and mortality risk. This research group, therefore, conducted a follow-up survey over a period of 9 years with approximately 81,000 participants from the J-MICC Study to evaluate the association between the frequency of the intake of small fish and mortality risk. The participants' frequency of the intake of small fish was assessed using a food frequency questionnaire. The study statistically accounted for confounding factors such as participants' age, smoking and alcohol consumption habits, BMI, and intake of various nutrients, all of which can affect mortality risk.

Research Results

Figure 1 shows the association between the frequency of the intake of small fish and mortality risk in females. Females who eat small fish 1–3 times/month, 1–2 times/week, and 3 times or more/week had 0.68, 0.72, and 0.69 times the risk of all-cause mortality, and 0.72, 0.71, and 0.64 times the risk of cancer mortality, compared to those who rarely eat small fish (*P* for trend[*6] = 0.041, 0.027, respectively). Regarding the risk of CVD mortality, a similar association was observed, although not statistically significant (*P* for trend = 0.486).

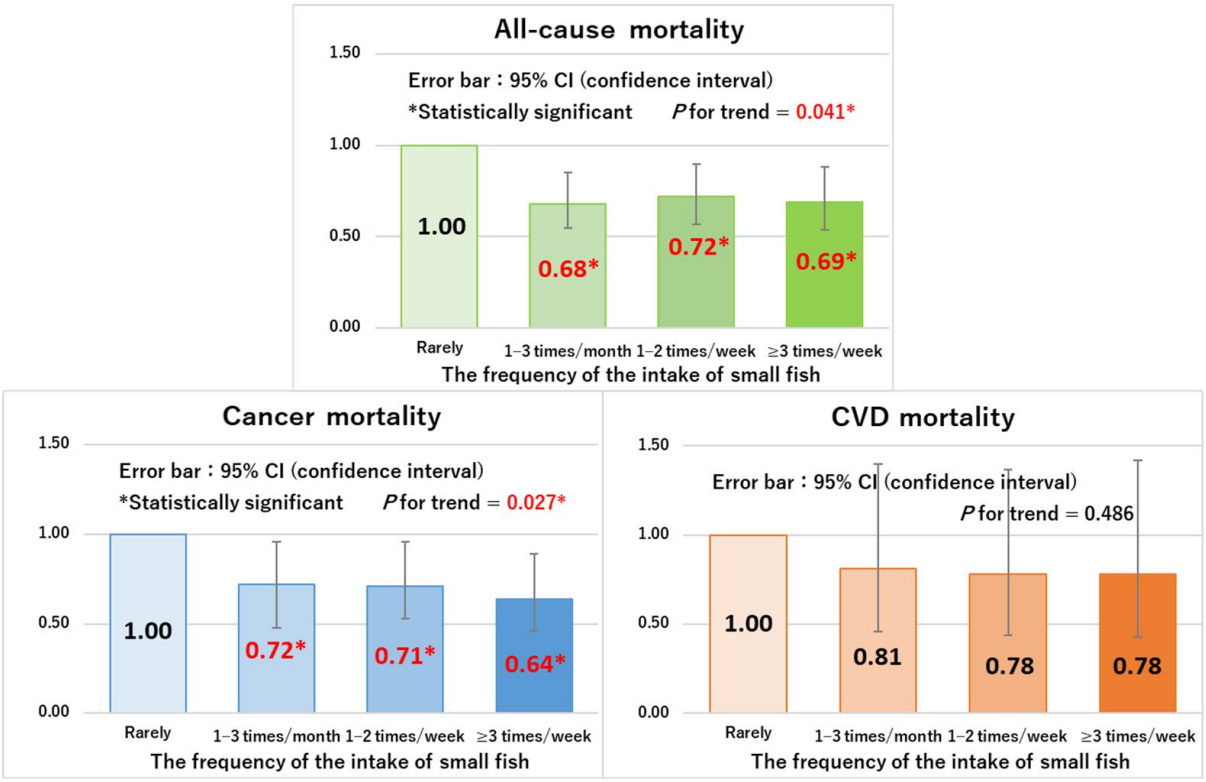

Fig. 1 The association between the frequency of the intake of small fish and mortality risk in females.

Participants who eat small fish frequently are more likely to eat other types of fish frequently. Thus, they performed an additional analysis considering the frequency of the intake of general fish such as grilled fish, boiled fish, and sashimi, and found no significant effect on the association between the intake of small fish and mortality risk. This implies that the intake of small fish is inversely associated with mortality risk independently of the intake of other common fish.

Figure 2 shows the association between the frequency of the intake of small fish and mortality risk in males. The risk of all-cause and cancer mortality tended to be lower according to the frequency of the intake of small fish, although not statistically significant. (*P* for trend = 0.391 and 0.161, respectively). There was no association between the frequency of the intake of small fish and the risk of CVD mortality. The analysis considering the frequency of the intake of other common fish also showed no significant effect on the association between the intake of small fish and mortality risk.

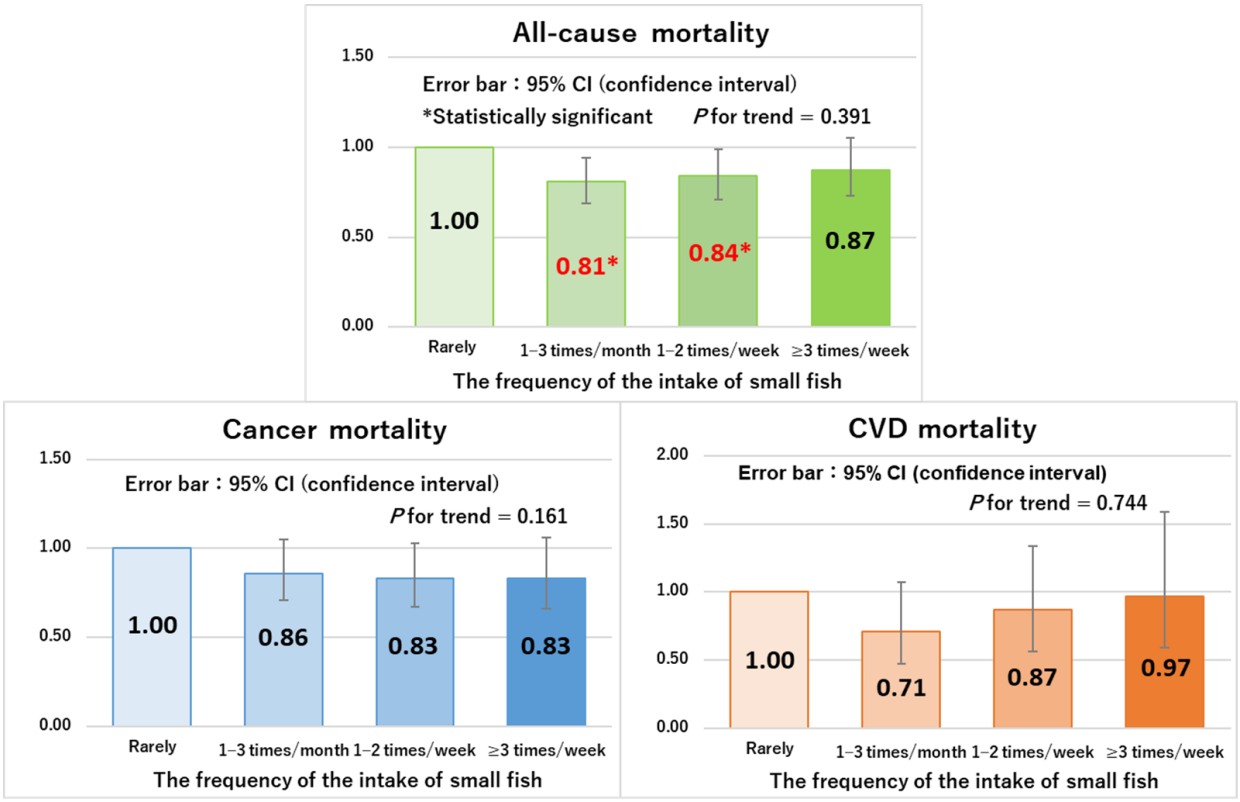

Fig. 2 The association between the frequency of the intake of small fish and mortality risk in males.

Research Summary and Future Perspective

This study shows that the dietary habit of frequently consuming small fish reduces the risk of all-cause and cancer mortality in females, suggesting the importance of including small fish in our daily diet. A longer follow-up survey of the J-MICC Study with a larger number of cases will enable more detailed analyses of specific causes of death and evaluations based on different cancer sites. The authors anticipate elucidating whether the intake of small fish is associated with lower cancer mortality/incidence at any specific site, whether the findings will be replicated in the general population through other cohort studies, and the mechanism by which the intake of small fish reduce the risk of mortality.

Glossary

*1 **The Japan Multi-Institutional Collaborative Cohort Study (J-MICC Study)**: this study is a nationwide follow-up survey conducted over a 20-year period, involving approximately 100,000 participants in Japan. Its aim is to identify factors that make individuals more susceptible to certain diseases by following the health status of participants, including cancer incidence and mortality. The survey was launched in 2005 and is currently being carried out by 13 research groups in Japan. This study examines not only participants' lifestyle habits but also their genetic background in order to explore the underlining causes of diseases. It is the first large-scale molecular epidemiological cohort study in Japan.

*2 **Cohort study:** a type of study that follows a group of individuals with a particular characteristic and a group without that characteristic over time to assess differences in future outcomes such as mortality rates and disease incidence. Cohort studies allow for the examination of various factors and their associations with outcomes. By recoding the characteristics of individuals before the occurrence of outcomes and tracking the outcomes over a long period, cohort studies can provide reliable evidence.

*3 **Epidemiological research:** a general term for studies that investigate factors related to diseases and health in human populations. Recently, it has become common to analyze large-scale epidemiological survey data to evaluate differences in mortality rates and disease incidence, taking into account not only lifestyle factors but also genetic factors. This research plays a crucial role in disease prevention and the development of public health policies.

*4 **Food frequency questionnaire:** a tool used to assess the frequency and quantity of food intake, listing specific food items such as soybeans, small fish, yogurt, and green tea. Participants select responses from the provided options to indicate how often they consume each food and beverage and the portion size during the past year. Based on the responses to this questionnaire, dietary nutrient and food group intakes can be estimated. The purpose of this questionnaire is to understand an individual's dietary habits or trends in nutrient intakes. By combining estimated nutrient intakes with lifestyle and follow-up data, accurate evaluations of their impact on health can be made.

*5 **Confounding factors:** factors not being studied that meet the following three conditions: 1) they influence the outcome, 2) they are correlated with the factors being studied, and 3) they are not intermediate factors between the factors being studied and the outcome. If confounding factors are not properly controlled, spurious associations (i.e., incorrect associations caused by other factors) may be observed, highlighting the importance of controlling confounding factors to accurately infer causal relationships.

*6 ***P* for trend:** it is a statistical measure used to evaluate the significance and relevance of a dose-response relationship between exposure and outcome. It clarifies whether the association between causes and results is due to chance, and emphasizes that a lower *P*-value (typically below 0.05) suggests a higher likelihood that the association is not simply a result of chance.

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