



Knowledge, Attitudes, and Practices Regarding Food Hygiene of Nursing Homes in South Korea

JOO-EUN LEE

Department of Food and Nutrition, Seowon University, Cheongju City, South Korea.

Abstract

The purpose of this study is to investigate the importance of hygiene education for the safe and healthy diet of the elderly by analyzing hygiene knowledge, attitude, and practice of food hygiene in nursing homes that do not legally be required to hire a dietitian. A total of 40 nursing homes participated in a survey that combines telephone and mail. As a result, most of the food service management of the nursing home surveyed was conducted by the director (80.5%) or secretary (13.8%), not by dietitians, and their answer rate of hygiene knowledge related to elderly foodservice was 54.7%. In 6 of the 7 hygiene knowledge questions, there was a significant difference in the distribution of correct answer rates between the groups with and without hygiene education ($p < 0.05$, $p < 0.01$, $p < 0.001$). In 5 out of 8 food hygiene attitude questions, all respondents (100%) showed a desirable hygiene attitude, and 99.0% of the respondents responded with a desirable attitude. The overall average practice rate for 8 hygienic practices items was 69.7%, and 6 of the 8 items showed significant differences in the distribution between those with and without hygiene education ($p < 0.05$, $p < 0.01$, $p < 0.001$). Therefore, in order for the foodservice for the nursing home resident elderly to be managed hygienically and safely, hygiene education and training programs for foodservice managers such as directors and secretaries must be provided, and in order to manage the nursing home foodservice field, it is necessary to investigate the hygiene knowledge and practice degree of cooks and to prepare education and field management measures.



Article History

Received: 21 July 2021

Accepted: 15 October 2021

Keywords

Attitude;
Food Safety;
Hygiene Education;
Knowledge;
Nursing Home;
Practice.

Introduction


The ratio of elderly people over the age of 65 in Korea is 15.7% in 2020 and has become an aging society since 2018 (14.3%). Life expectancy also increased, with 82.7 years old in 2018, 79.7 years

for men and 85.7 years for women.^{1,2} However, the lifespan of healthy life without being sick was 64.4 out of 82.7 in 2018, and on average 18.3 years, as a result of various diseases or old age, it was shown that people spend their life at home or in a

CONTACT Joo-Eun Lee ✉ joody88@hanmail.net 📍 Department of Food and Nutrition, Seowon University, Cheongju City, South Korea.



© 2021 The Author(s). Published by Enviro Research Publishers.

This is an  Open Access article licensed under a Creative Commons license: Attribution 4.0 International (CC-BY).

Doi: <http://dx.doi.org/10.12944/CRNFSJ.9.3.10>

facility while needing to depend on someone.² Due to these social phenomena, the importance of medical services has increased, and the demand for long-term care services has increased and diversified.³

The importance of eating cannot be overlooked in order to maintain a happy life during the life of the elderly, and in order to make their lives more enjoyable and enriching, it is needed to provide a variety of meal types to meet their nutritional needs, and in particular, the elderly who have entered the facility should be provided with psychological participation to make them feel like they belong to the home, and be able to choose the meal themselves and give them the satisfaction of choice.⁴ However, with older age, the prevalence is higher due to chronic diseases, malnutrition, and reduced activity, and the risk is greater for infection of various diseases, including food poisoning, due to damage to the immune system, which means more attention is needed in hygiene when providing meals.⁵ According to the US National Hospital Discharge Survey,⁶ in 17 years from 1979 to 1995, the hospitalization rate of gastroenteritis, including food poisoning, among elderly aged 75 and over was 4 times higher than that of the 24-49 years old group, and their population-based death rates were 33 times higher. Looking at examples of food poisoning among elderly people in facilities, *Salmonella enteritidis* and *Staphylococcus aureus* were known to be the most common causative organisms, and 40% of those who died from *Salmonella* were found in nursing homes, an elderly facility.^{7,8} In addition, there were 115 cases of food poisoning in elderly facilities (nursing homes) in 26 states in the United States from 1975 to 1987, and their mortality rate was 10 times higher than that of food poisoning across the United States.⁸ As such, elderly people can have to high incidence rates of infection and death, just because there has been an unsanitary process in preparing food and handling food.⁹ Therefore, when preparing meals for elderly people, it is necessary to prevent food poisoning accidents in advance by observing 'thorough personal hygiene', 'observing proper cooking and storage temperatures', 'preventing cross contamination', and 'purchasing hygienic food'.¹⁰ This study has an intention to investigate the level of hygienic knowledge and food hygiene attitudes and practices of foodservice managers in nursing homes in Korea and intend to prepare basic data for healthy eating of elderly people residing

in facilities by analyzing the relationship between various factors such as demographic characteristics and hygiene education.

Materials and Methods

Research subject and methods

In this study, a survey was conducted from July to September 2019 on foodservice managers in nursing homes in Korea. The selection of nursing homes for the survey was selected according to the distribution ratio of nursing homes in 7 regions nationwide, including Seoul, Gyeonggi, Gangwon, Gyeongsang, Chungcheong, Jeolla, and Jeju provincethrough a stratified extraction method among 300 elderly nursing facilities that do not have to legally hire a nutritionist with less than 50 eating persons listed in the '2019 elderly welfare facility status' 11 posted on the Ministry of Health and Welfare's website. This research was explained by contacting the facility by telephone and the questionnaires and consent forms for the study were delivered by post and email. Of the 300 nursing homes that were sent the questionnaire, 87 respondents (recovery rate 29.0%) were used for statistical analysis of the study.

Survey Tools and Contents

The questionnaire tool used in this study was partially modified from a study on food hygiene knowledge, attitude, and practice of foodservice facility managers or workers¹²⁻¹⁷ in accordance with the aim of this study. The questionnaire was largely composed of two parts exploring general information, food safety knowledge, attitude, and practice. In general information, the respondents were asked on a nominal scale about gender, age, job title, educational background, working period, and hygiene education completion. Food safety knowledge consists of 7 questions, and the questions about food cooking and digestive diseases were answered by answering 'Yes', 'No', and 'Unsure', or by presenting the temperature of the freezer and the refrigerator and the storage temperature for the cold and hot food. The food hygiene attitude consists of 8 questions to respond to 'Yes', 'No', and 'Unsure' on the basic attitude of food handlers and the need for hygiene education, hand washing, cross-contamination, hygiene clothing, and wearing accessories. In the food hygiene practice, 8 questions were asked to respond with 'Yes', 'Sometimes', and 'No' to personal hygiene, sanitary

clothing, use of cooking utensils, food thawing, and shelf life confirmation.

Data Analysis

For statistical analysis, SPSS ver. 20.0 for Windows was used (Statistical Package for Social Science, SPSS Inc, Chicago, IL, USA). The frequency and percentage of respondents' general information, food hygiene knowledge attitudes, and practices were calculated, and cross-analysis was done to find out whether there was a difference in the distribution of food hygiene knowledge, attitudes, and practices regarding hygiene education. In addition, logistic regression analysis was performed on the food hygiene knowledge, attitude, and practice items, with the respondent's age, education, and career as independent variables, and in order to make responses to knowledge, attitudes, and practices into dichotomous variables, they were divided into two categories, 'safe' and 'unsafe'(Divided in

knowledge with 'Yes' (vs) 'No'/'Unsure', in attitude, 'Yes' (vs) 'No'/'Unsure', in practice, 'Yes' (vs) 'Sometimes', and 'No').

Results

General Aspects of Research Subjects

Table 1 shows the general information of the subject nursing home foodservice managers. Of the 87 respondents who answered the questionnaire, 54.0% were women and 46.0% were men, and the highest rate was 35.6% among people in their 50s. In position, director was the most frequent with 80.5%, followed by secretary with 13.8%. In terms of academic background, university graduate was the most frequent with 44.8%, and duration of work was the most frequent for from 5 years to less than 10 years with 31.0%. The hygiene education experience was 65.5% in those who received it, which was more than those who did not (34.5%).

Table 1: General characteristics of foodservice manager in nursing homes

| Characteristics | | Frequency | Percentage(%) |
|--------------------------------------|-----------------|-----------|---------------|
| Gender | Male | 40 | 46.0 |
| | Female | 47 | 54.0 |
| Age(yrs) | 20 ~ 29 | 1 | 1.2 |
| | 30 ~ 39 | 12 | 13.8 |
| | 40 ~ 49 | 20 | 23.0 |
| | 50 ~ 59 | 31 | 35.6 |
| | 60 ~ 69 | 20 | 23.0 |
| | ≥ 70 | 3 | 3.4 |
| Duty | Director | 70 | 80.5 |
| | Office manager | 12 | 13.8 |
| | Dietitian | 4 | 4.6 |
| | Cook | 1 | 1.1 |
| Education level | High school | 5 | 5.7 |
| | College | 13 | 14.9 |
| | University | 39 | 44.8 |
| | Master degree | 26 | 29.9 |
| | Doctoral degree | 4 | 4.7 |
| Duration of work (yrs) | < 1 | 5 | 5.7 |
| | 1 ≤ ~ < 5 | 24 | 27.6 |
| | 5 ≤ ~ < 10 | 27 | 31.0 |
| | 10 ≤ ~ < 15 | 19 | 21.8 |
| | 15 ≤ ~ < 20 | 7 | 8.1 |
| | ≥ 20 | 5 | 5.8 |
| Experience of food hygiene education | Yes | 57 | 65.5 |
| | No | 30 | 34.5 |
| Total | | 87 | 100.0 |

Table 2: Respondent's food hygiene knowledge

| Statement | Experience of food hygiene education | Respondents N(%) | | | χ^2 |
|--|--------------------------------------|------------------------|----------------------|----------------------|-----------|
| | | Correct | Not correct | Don't know | |
| K1. Food poisoning (stomachache, diarrhea, etc.) can occur when food for dinner is cooked in the morning in advance. | Yes | 53(93.0) ¹⁾ | 2(3.5) ¹⁾ | 2(3.5) ¹⁾ | 29.463*** |
| | No | 12(40.0) | 12(40.0) | 3(20.0) | |
| | Total | 65(74.7) | 14(16.1) | 8(9.2) | |
| K2. Food poisoning can occur when we eat food cooked in the morning for dinner without boiling it properly (higher than 75°C). | Yes | 56(98.2) | 0(0.0) | 1(1.8) | 52.222*** |
| | No | 8(26.7) | 16(53.3) | 6(20.0) | |
| | Total | 64(73.6) | 16(18.4) | 7(8.0) | |
| K3. Food poisoning can occur when participating in the cooking when having stomachache or diarrhea. | Yes | 52(91.4) | 3(5.3) | 2(3.5) | 52.003*** |
| | No | 4(13.3) | 15(50.0) | 11(36.7) | |
| | Total | 56(64.4) | 18(20.7) | 13(14.9) | |
| K4. The proper temperature of the refrigerator is ()°C. (ex. 1°C, 3°C, 5°C, 10°C, 15°C) | Yes | 39(68.4) | 17(29.8) | 0(0.0) | 21.123*** |
| | No | 5(16.7) | 24(80.0) | 0(0.0) | |
| | Total | 44(50.6) | 41(47.1) | 0(0.0) | |
| K5. The proper temperature of the freezer is ()°C. (ex. -20°C, -18°C, -15°C, -10°C, -5°C, -3°C) | Yes | 40(70.2) | 17(29.8) | 0(0.0) | 20.639** |
| | No | 6(20.0) | 23(76.7) | 1(3.3) | |
| | Total | 58(35.6) | 71(43.6) | 0(0.0) | |
| K6. The hot cooked food needs to be kept at ()°C before distribution. (ex. 30°C, 40°C, 50°C, 60°C, 70°C, 80°C) | Yes | 23(40.4) | 34(59.6) | 0(0.0) | 3.663 |
| | No | 6(20.0) | 24(80.0) | 0(0.0) | |
| | Total | 29(33.3) | 58(66.7) | 0(0.0) | |
| K7. The cold cooked food needs to be kept at ()°C before distribution. (ex. 5°C, 10°C, 15°C, 20°C, 25°C) | Yes | 34(59.6) | 23(40.4) | 0(0.0) | 5.445* |
| | No | 10(33.3) | 20(66.7) | 0(0.0) | |
| | Total | 44(50.6) | 43(49.4) | 0(0.0) | |

¹⁾Totals are 100%, *p<0.05, **p<0.01, ***p<0.001

Food Hygiene Knowledge of Nursing Home Foodservice Managers

Table 2 shows the question of hygiene knowledge about foods of the nursing home foodservice manager to be surveyed, and analyzed whether there is a difference in distribution depending on whether or not the subject received hygiene education. Hygiene knowledge consisted of 7 questions, with the average respondent's rate of correct answer being 54.7%. Among the 7 questions,

the highest correct answer rate was 'Food poisoning can occur if you prepare food for dinner in the morning.', which was 74.7%, and the lowest correct answer rate was 'Temperature for storage before serving hot food (60°C)', which was 33.3%. Among the 7 questions, there were significant differences in the distribution of correct answer rates between the groups with and without hygiene education in 6 items except 'Temperature for storage before serving hot food (60°C)' ($p < 0.05$, $p < 0.01$, $p < 0.001$).

Table 3: Respondent's food hygiene attitudes

| Statement | Experience of food hygiene education | Respondents N(%) | | | χ^2 |
|--|--------------------------------------|-------------------------|----------------------|----------------------|----------|
| | | Correct | Not correct | Un certain | |
| A1. Safe management of food is an important part in my job responsibilities. | Yes | 57(100.0) ¹⁾ | 0(0.0) ¹⁾ | 0(0.0) ¹⁾ | - |
| | No | 30(100.0) | 0(0.0) | 0(0.0) | |
| | Total | 87(100.0) | 0(0.0) | 0(0.0) | |
| A2. It is important to have food hygiene education for my job (nursery staff member). | Yes | 56(98.2) | 1(1.8) | 0(0.0) | 0.532 |
| | No | 30(100.0) | 0(0.0) | 0(0.0) | |
| | Total | 86(98.9) | 1(1.1) | 0(0.0) | |
| A3. We must wash our hands before handling food to reduce the risk of food contamination. | Yes | 57(100.0) | 0(0.0) | 0(0.0) | - |
| | No | 30(100.0) | 0(0.0) | 0(0.0) | |
| | Total | 87(100.0) | 0(0.0) | 0(0.0) | |
| A4. Raw food and cooked food need to be kept separately.. | Yes | 55(96.5) | 2(3.5) | 0(0.0) | 0.002 |
| | No | 29(96.7) | 1(3.3) | 0(0.0) | |
| | Total | 84((96.6) | 3(3.4) | 0(0.0) | |
| A5. The risk of food contamination can be reduced if we wear hygiene gloves, masks, caps, and aprons when handling the cooked food such as distribution. | Yes | 57(100.0) | 0(0.0) | 0(0.0) | - |
| | No | 30(100.0) | 0(0.0) | 0(0.0) | |
| | Total | 87(100.0) | 0(0.0) | 0(0.0) | |
| A6. Foods can be exposed to contamination if we wear accessories such as rings and watches when handling the cooked food such as distribution. | Yes | 57(100.0) | 0(0.0) | 0(0.0) | - |
| | No | 30(100.0) | 0(0.0) | 0(0.0) | |
| | Total | 87(100.0) | 0(0.0) | 0(0.0) | |

| | | | | | |
|--|-------|-----------|--------|--------|-------|
| A7. We should wash our hands after going to the bathroom to reduce pollution caused by bacteria. | Yes | 57(100.0) | 0(0.0) | 0(0.0) | - |
| | No | 30(100.0) | 0(0.0) | 0(0.0) | |
| | Total | 87(100.0) | 0(0.0) | 0(0.0) | |
| A8. We do not refrigerate thawed food again. | Yes | 56(98.2) | 1(1.8) | 0(0.0) | 2.162 |
| | No | 28(93.3) | 1(3.3) | 1(3.3) | |
| | Total | 84(96.6) | 2(2.3) | 1(1.1) | |

¹⁾ Totals are 100%

Food Hygiene Attitude of Nursing Home Foodservice Managers

Table 3 shows the elderly nursing home foodservice managers' attitude toward food hygiene and whether there is a difference in the distribution according to presence of hygiene education. Of the 8 food hygiene attitude items needed to prepare an elderly

foodservice, in 5 questions, the entire respondent group (100%) showed a desirable hygiene attitude, and the overall average was 99.0%, showing a very desirable level. There was no significant difference in the distribution of hygiene education in food hygiene attitude.

Table 4: Respondent's food hygiene practices

| Statement | Experience of food hygiene education | Respondents N(%) | | | χ^2 |
|---|--------------------------------------|-------------------------|----------------------|----------------------|-----------|
| | | Always | Sometimes | Never | |
| P1. I always wash my hands before cooking or distributing food. | Yes | 57(100.0) ¹⁾ | 0(0.0) ¹⁾ | 0(0.0) ¹⁾ | 1.922 |
| | No | 29(96.7) | 1(3.3) | 0(0.0) | |
| | Total | 86(98.9) | 1(1.1) | 0(0.0) | |
| P2. I always wash my hands after going to the bathroom. | Yes | 57(100.0) | 0(0.0) | 0(0.0) | - |
| | No | 30(100.0) | 0(0.0) | 0(0.0) | |
| | Total | 87(100.0) | 0(0.0) | 0(0.0) | |
| P3. I do not wear rings or watches when cooking or distributing. | Yes | 55(96.5) | 2(3.5) | 0(0.0) | 62.725*** |
| | No | 4(13.3) | 26(86.7) | 0(0.0) | |
| | Total | 59(67.8) | 28(32.2) | 0(0.0) | |
| P4. I separately use the dishes and utensils (knives, cutting boards) that handle the raw foods and cooked foods. | Yes | 55(96.5) | 1(1.8) | 1(1.8) | 62.305*** |
| | No | 4(13.3) | 10(33.3) | 16(53.3) | |
| | Total | 59(67.8) | 11(12.2) | 17(19.9) | |

| | | | | | |
|--|-------|----------|----------|----------|-----------|
| | Total | 59(67.8) | 11(12.6) | 17(19.5) | 87(100.0) |
| P5. When thawing frozen food, I melt it at refriger temperature or using microwave oven, not putting it on a sink. | Yes | 24(42.1) | 14(24.6) | 19(33.3) | 7.632* |
| | No | 5(16.7) | 15(50.0) | 10(33.3) | |
| | Total | 29(33.3) | 29(33.3) | 29(33.3) | 87(100.0) |
| P6. I always check the expiration date on the wraps of the processed food. | Yes | 56(98.2) | 1(1.8) | 0(0.0) | 66.213*** |
| | No | 4(13.3) | 26(86.7) | 0(0.0) | |
| | Total | 60(69.0) | 27(31.0) | 0(0.0) | 87(100.0) |
| P7. The dishcloth used in the cafeteria kitchen is boiled and disinfected with boiling water every day. | Yes | 50(87.7) | 6(10.5) | 1(1.8) | 46.795*** |
| | No | 4(13.3) | 25(83.3) | 1(3.3) | |
| | Total | 54(62.1) | 31(35.6) | 2(2.3) | 87(100.0) |
| P8. I always wear sanitary gloves when carrying or distributing food | Yes | 48(84.2) | 9(15.8) | 0(0.0) | 44.909*** |
| | No | 3(10.0) | 26(86.7) | 1(3.3) | |
| | Total | 51(58.6) | 35(40.2) | 1(1.1) | 87(100.0) |

¹⁾Totals are 100%, *p<0.05, ***p<0.001

Table 5: Effect of demographic characteristics on knowledge, attitude, and practice (logistic regression analysis)

| Independent variables | Wald | p value | Odds Ratio | 95% CI |
|--------------------------------|--------|---------|------------|-------------|
| Knowledge | | | | |
| K3 | | | | |
| Duration of work ¹⁾ | 4.412 | 0.005 | 1.702 | 1.003-2.586 |
| K5 | | | | |
| Duration of work | 4.931 | 0.005 | 1.351 | 1.125-1.842 |
| K6 | | | | |
| Duration of work | 5.115 | 0.042 | 1.680 | 1.169-1.987 |
| Practice | | | | |
| P1 | | | | |
| Age ²⁾ | 6.165 | 0.023 | 0.625 | 0.417-0.937 |
| P8 | | | | |
| Age | 6.521 | 0.033 | 0.669 | 0.462-0.969 |
| Education level ³⁾ | 10.562 | 0.001 | 1.658 | 1.395-1.984 |

¹⁾ ①<1 ②1≤<5 ③ 5≤<10 ④10≤<15 ⑤15≤<20 ⑥≥20 yrs)

²⁾ ①20s ②30s ③40s ④50s ⑤60s ⑥≥70s

³⁾ ①High school ② College ③ University ④ Master degree ⑤ Doctoral degree

Food Hygiene Practice of Nursing Home Foodservice Managers

Table 4 shows the results of food hygiene practices of elderly nursing home directors and other foodservice managers and the distribution of hygiene education. The overall average practice rate of 8 items of hygienic practices required to prepare the elderly foodservice was 69.7%, and the item with the highest practice rate was 'Washing hands after going to the bathroom', and 100.0% of all respondents answered that they always practiced. The item that showed the lowest practice rate was 'When thawing frozen food, do not melt it at room temperature and place it in the refrigerator or defrost it in the microwave', and only 33.3% were found to practice at all times. Food hygiene practice showed a significant difference in the distribution of hygiene-trained and non-hygiene groups in 6 out of 8 items ($p < 0.05$, $p < 0.01$, $p < 0.001$).

The Effect of the Demographic Characteristics of the Survey Subjects on Food Hygiene Knowledge, Attitude, And Practice

To investigate the effect of the demographic characteristics of the subjects on food hygiene knowledge, attitude, and practice, the respondents' gender, age, duration, job title, and education were set as independent variables, and food hygiene knowledge, attitude, and practice were set as dependent variables (safe / unsafe) to perform logistic regression analysis and the statistically significant results are shown in Table 5. 'Employment experience' was significantly related to knowledge of 'Food poisoning relationship with stomach upset and diarrhea', 'the proper temperature of the freezer', and 'the storage temperature before serving hot food' ($p < 0.05$, $p < 0.01$). With longer employment experience, respondents responded with 'safe' answers about 'Food poisoning can occur when a person with stomach upset and diarrhea participates in cooking', 'The proper temperature in the freezer' and 'the storage temperature of hot food'. 'Age' was significantly related to 'washing hands' and 'wearing sanitary gloves' among food hygiene-related practices ($p < 0.05$), and younger the age, the more respondents practiced 'safe' for 'washing hands before cooking or serving' and 'wearing hygiene gloves when transporting and serving food'. 'Educational level' was also significantly related to 'sanitary gloves wearing practice' ($p < 0.01$), and with higher education level, the practice of wearing sanitary gloves was being done more faithfully.

Discussion

This study investigated the food hygiene knowledge, attitude, and practice necessary for the preparation of elderly foodservice for nursing home foodservice managers in Korea, and analyzed the relationship between hygiene education and other demographic characteristics. As a result of the survey, the average knowledge score for food hygiene such as director or secretary in charge of foodservice management at nursing home was 54.7 (out of 100), indicating insufficient knowledge level to manage elderly meals. In addition, only 65.5% of the respondents had experience in hygiene education and showed significant differences in the distribution of correct answers to hygiene knowledge between those who received hygiene education and those who did not, indicating that presence of hygiene education was related to hygiene knowledge level. This was similar in a study by Buccheri *et al.*¹² where it also showed safe levels of knowledge in 'Preparing food in advance can lead to food poisoning', 'The importance of reheating', and 'Storage temperature of hot food' with hygiene education of food service staff working in nursing homes and long term care facilities, which are elderly facilities. In the study by Cunha *et al.*,¹⁴ it was said that hygiene knowledge of food handlers had a significant effect on hygiene knowledge, and that especially, hygiene knowledge in the food handling field is very helpful for good practice. For example, the accurate hygiene knowledge of a competent foodservice manager can be managed to enable hygienic cooking, because unsanitary and inappropriate food handling practices can be monitored and corrected in the field.¹⁵ In the studies,¹⁵ it was found that 'Prohibit wearing jewelry such as rings when cooking', 'Use knives and cutting boards separating cooked food from raw food', and 'Check shelf life of food and disinfect cloths' were well practiced in hygiene practice when hygiene education was received.

In meta-analysis of the relationship between hygiene education and hygiene knowledge and attitude on hand washing,¹⁶ appropriate hygiene education showed positive results that improved not only the level of knowledge for good hand washing practice but also improved attitude. In this study, there was no significant difference in hygiene attitude between the groups with and without hygiene education, and all showed desirable attitudes. However, those with desirable hygiene attitudes were not directly

connected in practice, and the practice rate of those without hygiene education was low. In some studies of hygiene knowledge, attitudes and practice, hygiene knowledge was not linked to attitude or practice, or hygiene attitude was not linked to practice.^{12-14,16,18} In this study, there was a significant difference in the distribution of practice between those who received hygiene education and those who did not, and the correlation between hygiene education and hygiene knowledge (correlation coefficient = 0.758) and hygiene education and hygiene practice (correlation coefficient = 0.796) also showed significant positive correlation ($p < 0.01$). It is said that desirable education can improve attitude while improving knowledge level.¹⁸ In addition, it is possible to stimulate the improvement of the behavior directly in the practice field and to increase the effectiveness of education through continuous training, and it is said that at least once every six months to one year, the regular educational programs should be provided so that students will not forget what they have learned.¹⁴ In addition to providing education, facilities and sanitary tools such as washing facilities or thermometers that can be practiced with hygiene in order to enable desirable hygiene practices, if the foodservice manager corrects the cooks with accurate knowledge in the field, it will be possible to create sanitary cooking work to provide healthy and safe foodservice for elderly people.¹⁵

Conclusions

This study investigated the hygiene knowledge, attitude, and practice necessary for the preparation of resident elderly meal by foodservice managers of nursing homes in Korea, and aimed to prepare basic data for safe and healthy eating of elderly people by analyzing the relationship between them (the hygiene knowledge, attitude, and practice) and "the hygiene education/demographic characteristics". As a result of the study, most of the foodservice management of nursing homes free from nutritionist hire obligation with less than 50 eating persons was

mostly directed by a director or secretary, not a nutritionist, and their correct answer rate of hygiene knowledge related to elderly foodservice was insufficient at 54.7%. In attitude, 99.0% responded with a hygienically safe attitude, but of the practice rate in the field, only 69.7% was found to be safe. Among the respondents, hygiene knowledge and hygiene practice were desirable in case of receiving hygiene education, and in some cases, hygiene knowledge and hygiene practice were safe when the employment experience was long or the education level was high. However, the rate of hygiene education was 65.5%, which was mostly about once a year. If foodservice managers have low levels of hygiene knowledge and poor hygiene practice, it may be difficult to safely manage foodservice meal preparation in the field. Therefore, in order for the food service of nursing home resident elderly to be managed hygienically and safely, hygiene education and training programs for food service managers such as directors and secretaries must be prepared, and in order to manage the nursing home foodservice field, it is necessary to investigate the hygiene knowledge and practice degree of cooks and to prepare education and field management measures.

Acknowledgement

The author acknowledges the help received from the scholars whose articles are cited and included in references of this manuscript. The author is also grateful to authors / editors / publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

The author declares no conflict of interest.

References

1. Statistics Korea. Major population index. http://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT_1BPA002&checkFlag=N. Accessed July 21, 2021.
2. Statistics Korea. Life expectancy excluding
3. life expectancy and prevalence period (health life). http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=2758. Accessed July 21, 2021.
3. OECD. Homepage of Organisation for

- Economic Co-operation and Development. Health at a Glance 2019. <http://www.oecd.org/health/health-at-a-glance-19991312.htm>. Accessed July21, 2021.
4. Hoffmann A.T. Quality of life, food choice and meal patterns - field report of a practitioner. *Ann Nutr Metab.* 2008; 52(Suppl):20–24. doi:10.1159/000115343.
 5. Buzby J.C. Older adults at risk of complications from microbial foodborne illness. *Food Review.*2002; 25(2): 30-33. doi:10.22004/ag.econ.234617.
 6. Mounts A.W., Holman R.C., Clarke M.J., Bresee J.S., Glass R.I. Trends in hospitalizations associated with gastroenteritis among adults in the United States, 1979-1995. *Epidemiol Infect.*1999;123(1):1-8. doi:10.1017/s0950268899002587.
 7. McCabe-Sellers B.J., Beattie S.E. Food safety: emerging trends in foodborne illness surveillance and prevention. *J Am Diet Assoc.* 2004;104(11):1708-1717. doi:10.1016/j.jada.2004.08.028.
 8. Levine W.C., Smart J.F., Archer D.L., Bean N.H., Tauxe R.V. Foodborne disease outbreaks in nursing homes, 1975 through 1987. *JAMA.* 1991;266(15):2105–2109. doi:10.1001/jama.1991.03470150077034.
 9. Smith J.L. Foodborne illness in the elderly. *J Food Prot.*1998;61(9):1229-1239. doi: 10.4315/0362-028x-61.9.1229.
 10. Kendall P.A., Hillers V.V., Medeiros L.C. Food safety guidance for older adults. *Clin Infect Dis.* 2006;42(9):1298-1304. doi:10.1086/503262.
 11. Ministry of Health and Welfare. 2019 Status of Welfare Facilities for the Elderly in Korea. http://www.mohw.go.kr/react/jb/sjb030301s.jsp?PAR_MENU_ID=03&MENU_ID=0321&page=2. Accessed July21, 2021.
 12. Buccheri C., Mammina C., Giammanco S., *et al.* Knowledge, attitudes and self-reported practices of food service staff in nursing homes and long-term care facilities. *Food Control*2010;21(10):1367–1373. doi:10.1016/j.foodcont.2010.04.010.
 13. Tokuç, B., Ekuklu, G., Berberoglu, U., Bilge, E., Dedeler, H. Knowledge, attitudes and self-reported practices of food service staff regarding food hygiene in Edirne, Turkey. *Food Control.*2009; 20(6):565-568. doi: 10.1016/j.foodcont.2008.08.013.
 14. Cunha D.T., Stedefeldt E., Rosso V.V. The role of theoretical food safety training on Brazilian food handlers'knowledge, attitude and practice. *Food Control.*2014;43(1):167-174. doi: 10.1016/j.foodcont.2014.03.012.
 15. Meysenburg R., Albrecht J.A., Litchfield R., Ritter-Gooder P.K. Food safety knowledge, practices and beliefs of primary food preparers in families with young children: A mixed methods study. *Appetite.*2014;73 (1):121–131. doi:10.1016/j.appet.2013.10.015.
 16. Soon J.M., Baines R., Seaman P. Meta-analysis of food safety training on hand hygiene knowledge and attitudes among food handlers. *J Food Prot.*2012;75(4):793-804. doi:10.4315/0362-028X.JFP-11-502.
 17. Asmawi U.M., Norehan A.A., Salikin K., *et al.* An assessment of knowledge, attitudes and practices in food safety among food handlers engaged in food courts. *Curr Res Nutr Food Sci Jour.* 2018; 6(2):346-353. doi:10.12944/CRNFSJ.6.2.09
 18. Zanin LM, Cunha DT, Rosso VV, Capriles VD, Stedefeldt EI. Knowledge, attitudes and practices of food handlers in food safety: An integrative review. *Food Res Int.*2017;100(1):53–62. doi:10.1016/j.foodres.2017.07.042.