should be carefully considered by health professionals,[4,7] and pharmacological alternatives to Z-drugs must be highlighted.[8] For example, melatonin and Z-drugs, which have few residual side-effects, could be considered as an alternative to benzodiazepines for treating insomnia.[9]

Health service staff do not generally have specific training in sleep medicine, but even some basic training about the link between sleep and falls might help to decrease this concern. Professionals could learn how to carry out general assessments of sleep quality that would enable them to refer their patients to specialized care when necessary.[10] Health professionals need more information about sleep stages and the perception of older people in relation to their sleep. A multidisciplinary team trained to identify sleep disorders would help to improve even other comorbid illnesses that sleep has a bidirectional relationship with. The assessment can be carried out using the gold standard that is polysomnography, which is a highly capable instrument to identify sleep disorders or actigraphy, which is another objective and validated way to diagnose sleep complaints. A low-cost strategy is questionnaires, which could be widely used in clinical practice, such as the Pittsburgh Sleep Quality Index, Insomnia Severity Index and Berlin Apnea Questionnaire, among others. Sleep organizations in partnership with local health entities can offer courses on sleep medicine to health professionals. If outcomes show the possible presence of a sleep disorder, patients should be referred to a sleep specialist.

In conclusion, evaluating the sleep of older patients might help to reduce their risk of falling, and consequently prevent several serious health-threatening conditions. Reducing fall risk in older adults through sleep assessment could potentially improve mortality and quality of life, prevent disability, and reduce healthcare costs.

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Disclosure statement

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Data Availability Statement

Not applicable.

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Antibody response to BNT162b2 mRNA vaccine in healthcare workers and residents in a long-term care facility

Dear Editor,

Starting on 12 April 2021, Japan began administering coronavirus disease 2019 vaccines to senior citizens aged ≥65 years. As of September 2021, >80% of them already completed two doses of vaccination. As a result, the new cases of infections among older adults have decreased and the incident of clusters in long-term care facilities (LTCFs) have dramatically reduced. Coronavirus disease 2019 vaccine booster shots are considered in Japan at this point due to the waning immunity. To determine who should receive the booster shot, it is necessary to investigate the antibody response by the different age group and situation.

We compared the serological response induced by two doses of the mRNA vaccine, BNT162b2, between LTCF residents and healthcare workers (HCWs).

Written informed consent was obtained from all participants. If residents lacked the capacity to consent, the responsible guardian's permission was obtained. This study was approved by Health Sciences University of Hokkaido Research Ethics Boards (20N037045). A total of 75 residents of a LTCF and 69 HCWs of the LTCF and the affiliated hospital were included in the present study. Those previously infected with SARS-Cov-2 were excluded from this study. Almost all residents had more than two comorbidities and required assistance for activities of daily living. Four groups were compared: group 1: HCWs aged ≤64 years; group 2: HCWs aged between 65 and 84 years; group 3: LTCF residents aged between 65 and 84 years; and group 4: LTCF residents aged ≥85 years. Blood samples were collected at 28–45 days after the second injection using the BNT162b2 mRNA vaccine.

The quantitative enzyme-linked immunosorbent assay test to measure an anti-SARS-Cov-2 immunoglobulin G antibody to S1 protein was carried out by using the Vitros Immunodiagnostic Product anti-SARS-Cov-2 S1 Quant immunoglobulin G test (Ortho Clinical Diagnostics, Raritan, NJ, USA) according to the manufacturer's instructions. Results were expressed as binding activity units per mL (BAU/mL; positive threshold: 17.8 BAU/mL; upper limit: 4000 BAU/mL).

For comparative analysis of antibody levels between four groups, the Kruskal–Wallis test followed by the Mann–Whitney *U*-test, using the Bonferroni correction with adjustment of the probability ($P < 0.05 / 4 = 0.0125$) was carried out.

After vaccination, all residents tested positive for antibodies, except two residents. However, the median antibody titers were eightfold and fivefold lower in group 3 (median antibody titer 127 BAU/mL) and group 4 (median antibody titer: 200 BAU/mL), respectively, compared with those of group 1 (median antibody titer 1095 BAU/mL; $P = 7.25465E-08$ and 1.11602E-14, respectively; Fig. 1). Compared with the median antibody titers of group 1, those of group 2 tended to be lower, but the difference was not significant ($P = 0.26341$; Fig. 1). However, the median antibody titers of group 2 were higher than those of group 3 ($P = 0.000415$; Fig. 1).

The present study found that serological response to two doses of the mRNA vaccine, BNT162b2, in LTCF residents was significantly lower than those in HCWs aged between 65 and 84 years, as well as in HCWs aged <64 years. This finding is in accordance with previous studies that compared the response to the vaccination in LTCFs and HCWs.[1,2] In addition, the present study showed that the serological response of older HCWs did not show any significant difference compared with that of younger HCWs, in accordance with previous studies that examined the response to the vaccination among older adults.[3,4] These results suggest that LTCF residents are thought to be immunocompromised by a variety of factors in addition to aging, such as comorbidity, malnutrition and inactivity,[5] and that LTCF residents should be included in the target population for the third booster vaccine. Limitations include the small sample size, possible selection bias, failure to identify factors other than aging and failure to investigate cellular immunity.

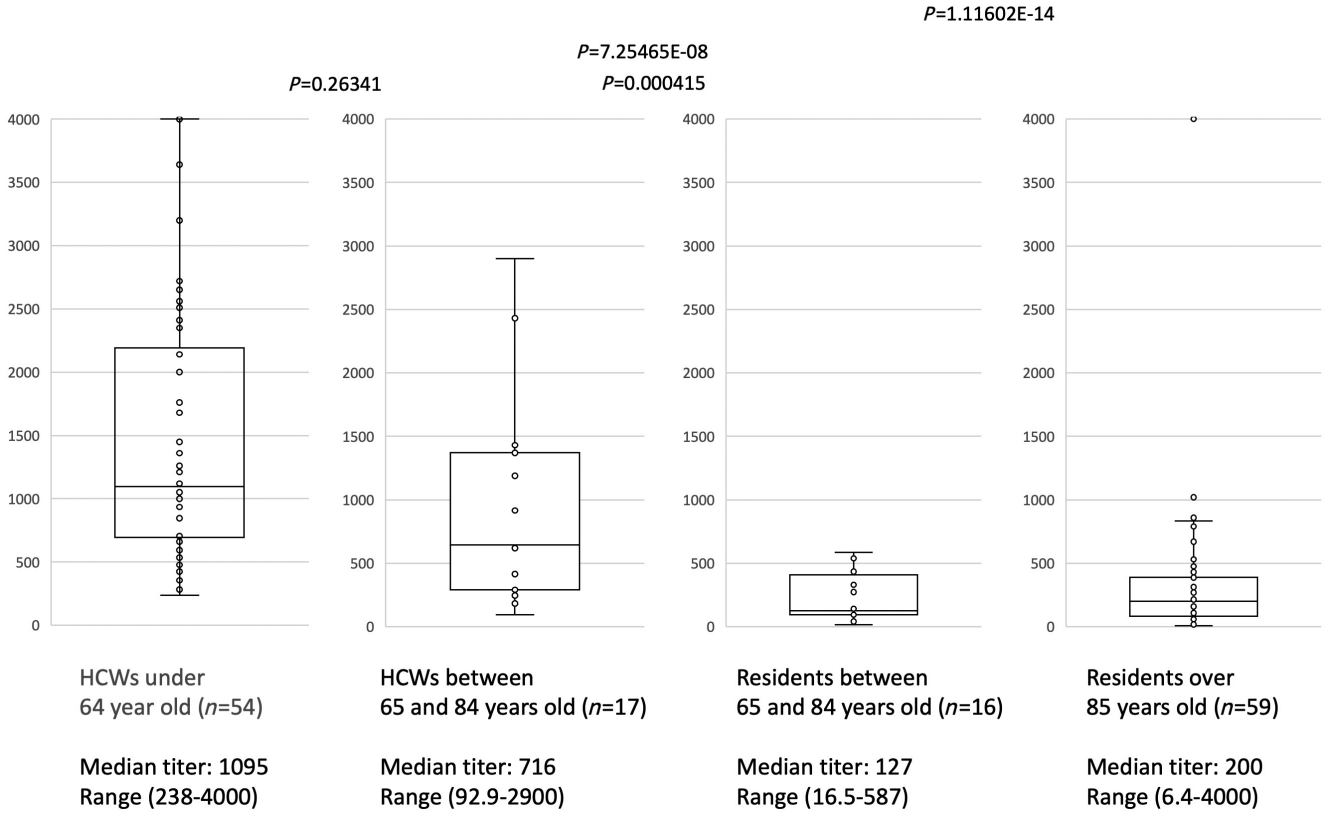

Figure 1 Serological response induced by two doses of the mRNA vaccine, BNT162b2. The quantitative SARS-Cov-2 spike antibody titers (expressed as BAU/mL) in 75 long-term care facility residents and 69 healthcare workers (HCWs) 28–45 days after the second injection of BNT162b2 mRNA vaccine are shown. Medians with interquartile ranges are shown.

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Disclosure statement

The authors declare no conflict of interest.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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How many food items must be consumed to meet the recommended dietary protein intake for older Japanese adults?

Dear Editor,

In humans, muscle mass and strength begin to decline after the age of 30.[1] We previously reported a dose–response relationship between protein intake and muscle mass through a systematic review and meta-analysis that examined the effects of protein intake on lean body mass.[2] The Dietary Reference Intake for Japanese (2020) set the recommended dietary allowance (RDA: covers the needs of 97.5% of the population) for protein intake for older adults aged ≥65 years at 60 g/day for males and 50 g/day for females. The 2012 National Health and Nutrition Survey in Japan (NHNS-J) reported that approximately 20% of middle-aged and older adults had a protein intake of less than 1.0 g/kg body weight/day.[3] A systematic review published in 2021 reported that dietary diversity is a useful measure of dietary adequacy.[4] Dietary diversity has been associated with better physical performance in older Japanese adults.[5] However, to the best of our knowledge, there is no reported cut-off of the number of food items needed to meet the RDA for protein intake for older adults. The purpose of this study was to clarify these relationships regarding Japanese adults aged ≥65 years.

We used data pertaining to 143 older adults (78 males and 65 females) aged 65–88 years who participated in the Kyoto–Kameoka Study in Japan and kept a dietary record (DR) for seven consecutive days, from May to June 2012.[6] The research staff taught the participants how to keep a DR using a record sheet that was completed at the orientation session. The registered dietitians instructed the participants to keep a record of all the food and beverages that they consumed. We provided each participant with a blank DR sheet, a digital scale (TANITA, Tokyo, Japan), and educational handouts to record food intake. The number of food items was calculated based on the number of foods consumed from 18 food groups. Included in the count were cereals, potatoes and starches, pulses, nuts and seeds, vegetables, fruits, mushrooms, algae, fish, mollusks and crustaceans, meat, eggs, milk and milk products, and fats and oils. Excluded in the count were sugars and sweeteners, confectionaries, beverages, seasonings and spices, and prepared foods. These were the same criteria as followed in the NHNS-J 2013.[7]

The participants' mean (standard deviation) age, body mass index (BMI), energy intake, protein intake, and number of food items consumed were 73.2 (5.3) years, 22.8 (3.2) kg/m^2, 1943 (301) kcal/day, 73.6 (12.7) g/day, and 23.1 (7.3) items, respectively. Based on the seven-day DRs (1001 days' worth of data), the proportion of males and females who did not meet the RDA for protein intake was 18.1% and 13.4%, respectively. To determine the number of food items needed to meet the RDA for protein intake, we calculated the area under the receiver operating characteristic curves, which was 0.738 (95% CI: 0.686–0.789) for males and 0.702 (95% CI: 0.631–0.774) for females (Fig. 1a, b). The cut-off number of food items required to meet the RDA for protein intake was 20 for both males and females. Multivariate adaptive regression splines analysis showed that increasing the number of food items by one was associated with