

be influenced by unmeasured factors, including instrumental social support, educational attainments and neighbourhood environment [13–17]. Responses to the frequency of going out may be influenced by the lifestyles and perceptions of respondents. For example, some persons may regard going to a field next to their houses as going out, but others may not. We do not know whether this factor may have systematically caused a misclassification. Moreover, the generalisability of the results is limited, as the data did not include the residents of temporary housing and other earthquake-damaged areas.

Recent studies have reported the link between neighbourhood environment and physical activity of older adults, including the association with self-rated health [18, 19] and more objective health measures [20–23]. However, these studies used road or community information in the form of small-area data, such as census collection districts, not the geographical information of total road networks. Among the few exceptions was the study by Hanibuchi *et al.* [24], which evaluated road distances using total road network data and identified the positive association between road distances and physical activities, such as leisure-time sports activity. Our analysis represents an advance in terms of additionally accounting for the physical load due to road slopes; it provides more realistic calculations of road distances, which are particularly important when evaluating neighbourhood environments in mountainous areas.

This study has important implications for public health, especially in the setting of post-disaster community reconstruction. First, community diagnosis in a post-disaster setting should cover the built environment, including access to shopping facilities. Second, to prevent homebound status of older victims, it is clearly essential to provide access to the facilities that fulfil their daily needs. Given the findings of this study, such access could be increased by the private sector, suggesting the importance of public–private partnerships for post-disaster reconstruction. The results of this study may be used directly to design community recovery plans for Rikuzentakata. Because many rural municipalities affected by the 2011 earthquake and tsunami have similar backgrounds and challenges, the results of this study can be generalised to those other areas.

Key points

- The homebound status of older victims of the 2011 Great East Japan Earthquake is a matter of concern.
- Geographical analysis indicated that distances to retail stores were associated with the risk of homebound status.
- Hawker and shopping bus services contributed to improved access, providing more opportunities for going out.

Acknowledgements

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Conflicts of interest

None declared.

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Ethical approval

The protocol of this study was approved by the Ethics Board of The University of Tokyo Faculty of Medicine (No. 10197).

Authors' contributions

H.H. developed the ideas of this study, analysed the data and drafted. N.K. contributed to the management of research group, conceptualisation, data analysis and drafting. R.S., S.I., H.M., R.O. and K.S. contributed to data acquisition and intensively participated in improving analysis and manuscript.

Supplementary data

Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

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Risk of being homebound among older adults in Japan

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RESEARCH STUDIES

Cognitive examination in older adults living in temporary apartments after the Great East Japan Earthquake

Dear Editor,

Northeast Japan experienced an earthquake of magnitude 9.0 in 2011, followed by enormous tsunamis. This seism destroyed coastal cities and killed nearly 20 000 people. After the disaster, many people who lost their houses were forced to live in temporary apartments with an area of just 5 m² per family. Our group recently recruited 686 older adults who lived in the temporary apartments in Kesenuma, Japan, and examined their cognitive functions using touch-panel computers¹ from February to May 2013. The participants were aged ≥ 66 years (male/female 235/451, mean age 76.4 ± 6.0 years). The program of using a touch-panel computer consisted of 15 questions that evaluate memory, orientation and pattern recognition. The full (best) score is 15, and scores of ≤ 12 are considered to be indicative of cognitive impairment according to Urakami *et al.*¹ The study was approved by the Tohoku University ethical committee. Figure 1 shows the score distribution, showing that 36.0% of older adults in this group scored ≤ 12 . This result suggests that a significantly high percentage of older adults who live in the temporary apartments could be cognitively impaired, because 36.0% is much higher than the data in the previous reports using the same device in another area.^{2,3} In addition, this 36% is also much higher than the prevalence of dementia reported in Japan, which is 14.1%.⁴ Our group previously reported exacerbation of symptoms of Alzheimer's disease after the earthquake,^{5,6} and the present study is the first to epidemiologically investigate the prevalence of dementia in older adults living in temporary residences. There are several reasons expected for the possibility of the high prevalence of dementia, which are as follows: (i) changes in living circumstances; (ii) loss of families, relatives and friends; (iii) loss of their daily activities, such as farming and fishing; and (iv) isolation from families and neighbors. Although it is not easy to resolve the problem, we are now planning some anti-dementia programs including exercise, diet, and management for lifestyle-related disorders to prevent development and progression of dementia.

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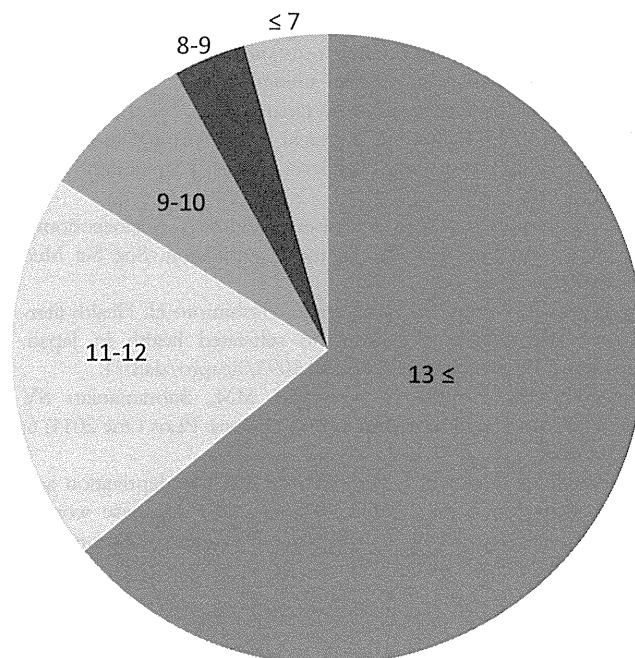


Figure 1 Score distribution of the touch-panel computer program to examine cognition. Scores of ≤ 12 are suspected to be indicative of cognitive impairment.

and the Ministry of Education, Culture, Sports, Science and Technology of Japan. No potential conflicts of interest were disclosed.

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Development of conversion formulae between 4-m, 5-m and 6-m gait speed

Dear Editor,

Physical performance is considered an essential component of the definition of sarcopenia and its diagnostic strategy.¹ Recently, the Asian Working Group on Sarcopenia has recommended that 6-m usual gait speed be used for measurement of physical performance.^{2,3} Unfortunately, the measurement method of usual gait speed varies considerably by study, minimizing the ability to generalize the study findings. In Japan, 5-m gait speed has been used in several major cohort studies in the elderly.^{4–6} In the present study, we aimed to develop conversion formulae between 6-m and 5-m gait speed.

Data were taken from the second year examinations of the Kashiwa study. Briefly, the Kashiwa study is a prospective cohort study on community-dwelling, functionally independent adults aged 65 years or older living in Kashiwa, Chiba, Japan, and the second year examination was conducted between September and November 2013.⁵ All 1529 participants who underwent gait speed measurements were included in the analysis (782 men, 747 women). Gait speed measurements were conducted by instructing participants to walk over an 11-m straight course on a flat floor at their usual speed, during which the time was measured for both a 5-m walk (from 3-m to 8-m line) and 4-m walk (from the starting line to 4-m line) during one walk. Gait speed for both measurements was calculated in m/s. The correlation between these two measurements was 0.82.

The non-parametric locally weighted scatter plot smoothing (LOESS) method showed that the relationship between 4-m gait speed and 5-m gait speed was piecewise linear with an inflection point (change of slope) at a 5-m usual gait speed of 1.6 m/s. The piecewise linear model had better fit than a simple linear model, and the change of slope was statistically significant ($P < 0.001$). We also tested if the relationship between 4-m gait speed and 5-m gait speed was modified by sex, but the modification effect was not statistically significant ($P = 0.22$). All analyses were conducted using SAS version 9.3 (SAS Institute, Cary, NC, USA).

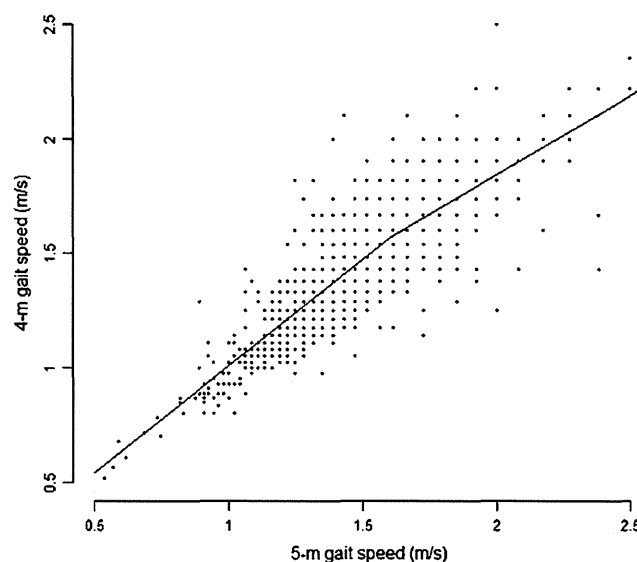


Figure 1 Scatter plot for 4-m gait speed and 5-m gait speed, and fitted piecewise linear relationship.

Participant characteristics (mean \pm standard deviation) were: age 73.9 ± 5.5 years, 5-m gait speed 1.52 ± 0.25 m/s and 4-m gait speed 1.48 ± 0.26 m/s. Piecewise linear regression showed that the following equations could be used to convert from 5-m to 4-m gait speed:

For 5-m gait speed ≤ 1.6 m/s:

$$4\text{-m gait speed} = 0.934 \times (5\text{-m gait speed}) + 0.074$$

For 5-m gait speed > 1.6 m/s:

$$4\text{-m gait speed} = 0.69 \times (5\text{-m gait speed}) + 0.463$$

The scatter plot of 4-m and 5-m gait speed, and their piecewise linear relationship are shown in Figure 1. The $R^2 = 0.68$.

To convert to 6-m gait speed, we substituted the aforementioned equations for 4-m gait speed in the formula with the R^2 of 0.93 from a previous study on a

Health Effects of a Farming Program to Foster Community Social Capital of a Temporary Housing Complex of the 2011 Great East Japan Earthquake

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ABSTRACT

Objective: We launched a health promotion program called the *Hamarassen* (“let’s get together”) Farm, which provided farming opportunities for the victims of the Great East Japan Earthquake who resided in temporary housing. The aim of this study was to evaluate the effects of this program on physical and mental health in terms of bone mineral density (BMD) and a sense of purpose in life.

Methods: Among 39 female participants in whom BMD was evaluated, there were 12 *Hamarassen* participants, 8 self-farming control subjects, and 19 non-farming control subjects. BMD was measured by calcaneal quantitative ultrasound immediately after the project launch and 5 months later. A sense of purpose in life prior to and 2 months after the project’s commencement was measured in 21 additional *Hamarassen* participants by use of the K-I Scale. Interviews were also conducted to qualitatively evaluate the effects of the *Hamarassen* program.

Results: The mean BMD T-score improved by 0.43 in the *Hamarassen* group, by 0.33 in the self-farming group, and by 0.06 in the controls ($p = 0.02$). Among the 21 *Hamarassen* participants in whom mental health was evaluated, the average score for a sense of purpose in life improved from 20.5 to 24.9 ($p = 0.001$).

Conclusions: The *Hamarassen* Farm provided disaster victims with opportunities for social participation, interpersonal interaction, and physical exercise; such opportunities may improve physical and psychosocial well-being. (*Disaster Med Public Health Preparedness*. 2015;0:1-8)

Key words: preventive health services, public health practice, earthquakes

The Great East Japan Earthquake occurred on March 11, 2011, and caused a massive tsunami with a maximum wave height of 40.1 m, which affected over 500 km of Japan’s northeastern coastal areas. As of December 2013, over 300,000 victims were reported as still living in temporary housing provided by the Japanese government for those who lost their homes as a result of the tsunami. The city of Rikuzentakata, examined in the present study, was one of the areas most seriously affected by the disaster. Of its total population of 23,302 before the disaster, 1773 people died or are still missing. Of 8550 households, 3368 were affected, and 13,474 people in 3159 households had to move to temporary housing within 3 months of the tsunami.¹ Many of the people who were obliged to move to temporary housing were older adults. The average age of the city’s population was high before the disaster occurred: in 2010, individuals older than 65 years accounted for 34.9% of the total population.²

Depression and mental illness among victims have been identified as a central issue in major disasters.³ The Great East Japan Earthquake was no exception, and mental health care has become a basic aid activity in victim support. After the earthquake, it was widely observed that older residents in temporary housing suffered from multiple physical and mental burdens that were attributable not only to the disaster itself but also to the loss of the communities to which the residents originally belonged.^{4,5} Such individuals have shown the tendency to be sedentary and to suffer from high stress owing to the loss of their social roles and the opportunity to participate in community life, and these stresses are compounded by coping with the new living environment of small rooms in the temporary housing.⁶ The weakened physical, cognitive, and mental functioning of older adults following loss of social participation has been observed in connection with previous large-scale disasters in Japan and is known as “disuse syndrome.”⁷ Although agriculture is

the primary industry in the study area, many individuals after the disaster were unable to engage in farm work because they had lost their land, were unable to access the land owing to a lack of transport, or did not own any land even if they wished to undertake farm work.

To prevent the development of disuse syndrome by providing opportunities for social participation and physical activities for older residents in temporary housing in Rikuzentakata, Iwate Prefectural Takata Hospital in 2012 launched a farming project called *Hamarassen* (“let’s get together”) Farm. In theory, social participation may not only improve physical and mental health but also increase community social capital, i.e., as Putnam defined, “the collective value of all ‘social networks’ and the inclinations that arise from these networks to do things for each other.” Empirical evidence also suggests that social capital may play an important role in disaster resilience.⁸⁻¹⁰ Therefore, the objectives of this study were to evaluate the effect of the *Hamarassen* Farm project on physical and mental health in terms of differences in changes in bone mineral density (BMD) between participants and nonparticipants and changes in the sense of purpose in life of the *Hamarassen* participants over a 5-month period. We also qualitatively evaluated narrative comments provided by the *Hamarassen* participants to consider the potential mechanisms of the effects of *Hamarassen* Farm on physical and mental health.

METHODS

Hamarassen Farm

Regardless of age, gender, or experience, all residents in temporary housing in Rikuzentakata were eligible to participate in the *Hamarassen* Farm project. All leaders of the self-governing bodies of 50 temporary housing complexes in Rikuzentakata were asked to take part in this project. Of those leaders, 41 replied and 11 expressed interest in participation (another 11 were already involved in community farmland projects). In establishing the *Hamarassen* Farm, from May to August 2012, members of the project team of Iwate Prefectural Takata Hospital looked for fallow farmland adjacent to or within 5 minutes’ walk of the participating temporary housing complexes. Appropriate pieces of farmland were found and negotiation for leasing took place with the landowners. Only free farmland was leased (the landowners received no rent or financial reward). Eventually, 11 farms were set up. Landowners or local residents were asked to help cultivate the farmland (if necessary, hospital workers also cultivated it), and the cultivated farmland was handed over to the study participants. The participants provided their own seeds, seedlings, farming tools, and equipment and they developed their own farming plans (Figure 1).

Recruitment of Hamarassen Participants

In June 2012, 12 female *Hamarassen* participants were recruited who were residing in 3 temporary housing complexes that were

built shortly after the earthquake and their BMD was measured (*Hamarassen* group). At the same time, health-promotion seminars for the general population in Rikuzentakata were carried out, and volunteers who were willing to have their BMD measured were recruited. Five months later, the BMD of 19 women who were not engaged in farming activities and 8 women who grew vegetables on their own farms or in their own kitchen gardens were measured; the data of the former were used for the nonparticipating group and those of the latter were used as the self-farming group. For all 3 groups, BMD was measured in June and November 2012. None of the participants received any osteoporosis treatment before or during the project.

As of December 2013, the *Hamarassen* project was ongoing at 11 locations. There were approximately 80 participants, with the male:female ratio being 1:8. The age range of the participants was from 30 to 95 years, with the median age being 70. Approximately 40% of the participants had no experience with farming. Only female *Hamarassen* participants participated in our BMD evaluation.

To evaluate the changes in the *Hamarassen* participants’ psychosocial well-being, the sense of purpose in life (subjective attitude toward living significantly) among an additional 21 participants in 3 *Hamarassen* farms was measured before the beginning of farming in June and August 2012. Purpose in life was measured only in the *Hamarassen* group.

Measurement of BMD

Bone densitometry was performed by using quantitative ultrasound methods of the heel bone (GE Healthcare Japan) at the launching of the project at the health lectures in June 2012 and 5 months later in November 2012. The calcaneus is a widely used measuring spot for BMD by quantitative ultrasound. The device used requires the application of alcohol or gel to the foot, after which the foot can be placed in the device for measurement, which takes up to 30 s. The calcaneus of the left foot was measured to assess the lowest value of BMD. T-score-derived variables were used for the evaluation.

Evaluation of the Sense of Purpose in Life

The K-I Scale was included in our self-administered questionnaire survey and the Feeling That Life is Worth Living Among the Aged, a validated psychometric scale designed for older adults in Japan,¹¹ was used for the surveys. This scale was constructed through the investigation of the notion of purpose in life and has been verified to have high reliability and validity. The scale quantifies the sense of having purpose in life by means of questions on a sense of fulfillment, a desire to improve oneself, motivation, and a sense of being. Participants were also asked retrospectively about their sense of purpose before becoming involved in the farm project. The K-I Scale consists of four factors: (1) self-actualization and motivation (challenging spirit with purpose and motivation toward everything),

FIGURE 1

Participants of the Hamarassen Farm Project in Rikuzentakata, Japan.



(2) satisfaction with life (challenging spirit with self-awareness of making a contribution to others), (3) motivation to live (sense of self-progression), and (4) sense of existence (sense of being approved of by others). There are a total of 16 questions. Each question was scored by using the following scale: (1) agree (2 points), (2) neither agree nor disagree (1 point), and (3) disagree (0 points). The total score was calculated, with 32 points signifying a perfect score. To assess the change in responses before and after the intervention, an additional evaluation using narrative interviews with open-ended questions was performed. Further, to assess the quality of having been involved in the farm project, participants were given an opportunity to provide free comments 5 months after having commenced the farm work.

Statistical Analyses

Changes in BMD among the 3 groups were analyzed with a difference-in-difference estimator, employing generalized

estimating equations under the assumption of normal distribution of the BMD parameter. For comparability across groups, the T-score, standardized for average, and standard deviations were used. This approach can formally control the effects of confounding factors. For confounding factors, age, baseline BMD T-score, and residential temporary housing complex were considered. Changes in purpose in life within Hamarassen participants were modeled by using a generalized estimating equation to address within-individual clustering. One subject was omitted whose age information was not provided. All analyses were conducted by using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA).

Ethical Considerations

Participants gave their oral consent to have a physical examination including measuring BMD and brief medical interviews. This research was approved by the Iwate Prefectural Takata Hospital Ethical Committee.

TABLE 1

Characteristics of the Female Participants in Whom Bone Mineral Density Was Evaluated

	Hamarassen Farm Group	Self-Farming Group	Nonparticipating Control Group	Total
Number of participants, n	12	8	19	39
Age, y, mean (SE)	74.3 (5.6)	73.5 (6.9)	81.1 (6.3)	77.4 (7.1)
Residential temporary housing complex, n (%)				
Complex H	0 (0)	4 (50)	10 (52.6)	14 (35.9)
Complex M	0 (0)	4 (50)	0 (0)	4 (10.3)
Complex S	7 (58.3)	0 (0)	1 (5.3)	8 (20.5)
Complex Ta	1 (8.3)	0 (0)	2 (10.5)	3 (7.7)
Complex Te	0 (0)	0 (0)	5 (26.3)	5 (12.8)
Complex Y	4 (33.3)	0 (0)	0 (0)	4 (10.3)
Complex U	0 (0)	0 (0)	1 (5.26)	1, (2.6)
Bone mineral density T-score, mean (SE)				
Baseline	-2.76 (0.78)	-2.51 (1.09)	-3.33 (0.76)	-2.99 (0.89)
Follow-up	-2.33 (0.9)	-2.19 (1.12)	-3.33 (0.61)	-2.76 (0.95)
Difference	0.43 (0.46)	0.33 (0.47)	0.06 (0.34)	0.23 (0.43)
P value	0.009	0.09	0.4	0.002

RESULTS

Changes in BMD

The individuals in whom BMD was evaluated were all women. Those in the Hamarassen group and the self-farming group were younger than the nonparticipants: the participants' mean ages were 74.3 (SD = 5.6), 73.5 (SD = 6.9), and 81.1 years (SD = 6.3) in the Hamarassen group, self-farming group, and control group, respectively (Table 1). The mean BMD was also high in the Hamarassen and self-farming groups. The change in BMD T-scores in the Hamarassen group was 0.43 (standard error [SE], 0.46; $P = 0.009$); that in the self-farming group was 0.33 (SE, 0.47; $P = 0.09$) and that in non-participating subjects was 0.06 (SE, 0.34; $P = 0.43$).

The GEE-based difference-in-difference models showed that even with adjustment for baseline BMD, age, and residential temporary housing complex, the differences in the changes in BMD T-score compared with the control group were 0.36% (95% confidence interval: 0.07 to 0.66) for the Hamarassen group and 0.26 (95% confidence interval: -0.08 to 0.60) for the self-farming group (Table 2).

Changes in Purpose-in-Life Score

At baseline, the total score was 20.5 (SD, 9.0) on average, and that score increased to 24.9 (SD, 6.4) after 2 months of participation ($P = 0.005$; Table 3 and Figure 2). The GEE models revealed that even after adjustment for age, sex, and residential temporary housing area, the total score and 3 of the 4 components of the K-1 system increased over time after involvement in the Hamarassen project. The total score rose by 5.46 points ($P = 0.0004$), and there were increases in self-actualization and motivation (1.81, $P = 0.01$), satisfaction with life (2.42, $P = 0.0002$), and motivation to live (0.73, $P = 0.01$). However, there was no large increase in

TABLE 2

Differences in the Change in Bone Mineral Density T-score: Results of Difference-Indifference Models With Generalized Estimating Equations^a

	Estimates	95% Confidence Intervals		P value
Intercept	-1.99	-5.36	1.38	0.2
Hamarassen Farm Group	-0.69	-1.3	-0.04	0.04
Self-Farming Group	-0.048	-1	0.95	0.9
Nonparticipating Group	Referent			.
Time (follow-up vs. baseline)	0.063	-0.09	0.21	0.4
Time × Hamarassen	0.36	0.07	0.66	0.02
Time × Self-Farming	0.26	-0.08	0.61	0.1
Time × Nonparticipating	Referent			.
Age	-0.0045	-0.05	0.037	0.8

^aFixed effects of residential temporary housing complex (7 complexes) were adjusted for.

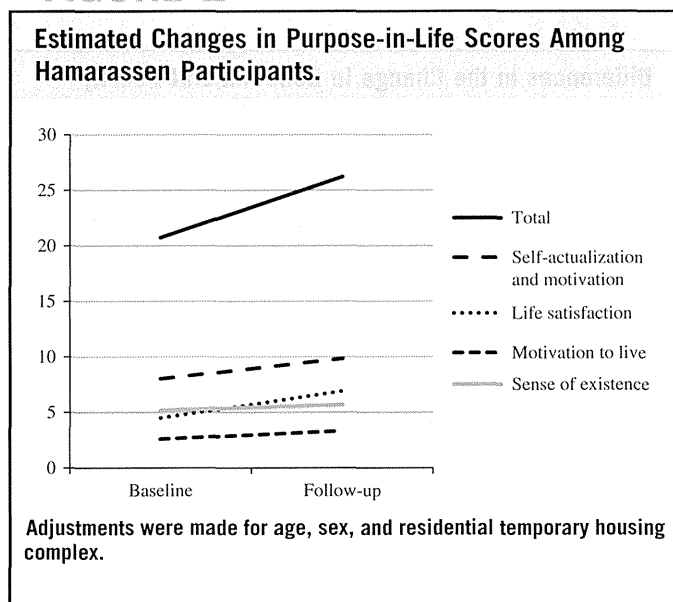
sense of existence (0.51, $p = 0.14$) (Table 4). Because the K-1 system was originally designed for application among subjects aged 60 years or older, a sensitivity analysis using only 16 participants aged 60 and above was conducted. However, the results were the same as in the original analyses, with only very small differences appearing in the estimated values.

Most of the free comments about the Hamarassen project provided by the participants were positive, and they signaled happiness and enjoyment related to the scheme (Table 5). The participants' positive feelings were related to the development of new, continuous interpersonal connections with other participants and the acquisition of emotional social support through those communications.

TABLE 3

	Baseline	Follow-Up	Difference	P value
Number of participants, n	21	—	—	—
Age, y, mean (SE)	65.7 (12.2)	—	—	—
Women, n (%)	17 (81)	—	—	—
Residential temporary housing complex, n (%)				
Complex Y	5 (23.8)	—	—	—
Complex S	9 (42.9)	—	—	—
Complex O	7 (33.3)	—	—	—
Purpose in life score (range), mean (SE)				
Total (0–32)	20.5 (9.0)	24.9 (6.4)	4.3 (6.4)	0.005
Self-actualization and motivation (0–12)	8.1 (3.4)	9.5 (2.0)	2.0 (2.6)	0.002
Life satisfaction (0–10)	4.8 (3.5)	6.8 (3.1)	1.5 (2.6)	0.02
Motivation to live (0–4)	3.0 (1.4)	3.6 (1.0)	0.6 (1.1)	0.03
Sense of existence (0–6)	4.6 (1.9)	5.0 (1.5)	0.4 (1.3)	0.20

FIGURE 2



DISCUSSION

The results of this study showed a remarkable improvement in the participants' mental and physical health in terms of the sense of having a purpose in life and BMD. The increased sense of purpose in life among Hamarassen participants points to the development of new interpersonal networks and continuous communications among the participants. It appears that collective activities were beneficial to the participants' health beyond simply the opportunity for physical exercise through farming. An increased social network and community social capital operates as a resource that allows mutual instrumental, emotional, and informational social support among the group members.¹²⁻¹⁸ In other disaster settings, Haines and colleagues reported that after Hurricane Andrew, interpersonal network density and local bonds were key

TABLE 4

	Score Change	95% Confidence Intervals		P value
Total Score				
Time (follow-up vs. baseline)	5.46	2.42	8.51	0.0004
Age	0.04	-0.18	0.26	0.72
Sex (women vs. men)	5.94	2.82	9.06	0.0002
Self-Actualization and Motivation				
Time (follow-up vs. baseline)	1.81	0.54	3.08	0.01
Age	-0.02	-0.08	0.04	0.59
Sex (women vs. men)	1.74	0.44	3.03	0.01
Life Satisfaction				
Time (follow-up vs. baseline)	2.42	1.16	3.68	0.0002
Age	0.02	-0.09	0.14	0.68
Sex (women vs. men)	2.20	0.73	3.68	0.003
Motivation to Live				
Time (follow-up vs. baseline)	0.73	0.18	1.28	0.01
Age	0.00	-0.03	0.03	0.94
Sex (women vs. men)	0.83	0.22	1.45	0.01
Sense of Existence				
Time (follow-up vs. baseline)	0.51	-0.16	1.17	0.14
Age	0.02	-0.02	0.07	0.31
Sex (women vs. men)	0.65	-0.05	1.36	0.07

^aFixed effects of residential temporary housing complex (3 complexes) were adjusted for.

determinants of the provision of post-disaster support.⁸ Aldrich analyzed data of recent disasters including the 1995 Hanshin-Awaji (Kobe) earthquake in Japan and Hurricane Katrina in New Orleans, Louisiana. He found evidence that recovery was faster in the community where social capital was rich.⁹ Moreover, Kage discussed that the rapid post-war

TABLE 5

Comments From Hamarassen Participants in November 2012

Participants communicated with each other. I saw more smiley faces. We helped each other to grow vegetables. My health condition got better. Local residents lent us farming tools and equipment, shared seeds and seedlings with us, and gave us advice on farming. I would like to make more friends. I may have been in shock from the earthquake; I could not get used to this new environment and tended to stay home all the time, which caused pain in my knees and arms. Now, I enjoy weeding and watering.

After I joined the project, I got to know many people and started chatting and laughing with them. Now I remember them by name. We talk more and more and I now enjoy life every day. I even look forward to meals every day.

I leased farmland and did farming on my own before, but now I enjoy farming together with many people.

Every time I go to the farmland, I see someone. I look forward to seeing our vegetables grow. Even the course for my dog walk has changed. My husband used to take a walk purposelessly, but now he does it with a purpose (that is, dropping by the farmland to see people). I can eat the vegetables we grow and share them with other residents. I enjoy getting to know people in my housing complex.

I look forward to seeing our vegetables grow every day.

Before the project, I did greet other residents in the complex but did not know them well. Now, I got to know the participants well and talk more with them.

I think the farmland provides us with a place and opportunity to interact with others. We now have more topics in common, and I can't wait to go to the farmland.

Even those who did not join the project come to see our farmland. The farmland plays a role in connecting us.

I used to live my life purposelessly, but now I have a purpose.

Since I joined the project, I talk to neighbors with whom I did not talk much before.

I feel joy in growing and eating vegetables together with my children. I get to hang out with neighbors more.

recovery of Japanese society can be explained by the strong growth of civic engagement in both communities and society.¹⁰ It has also been pointed out that poor social capital is related to functional disability and mortality.^{19,20} A lack of communication with others has been reported as increasing the development of dementia.²¹ Because the work in this study was carried out on fallow farmland located outside the complexes, many residents were obliged to go beyond their complex to undertake the farming activities, and in the process they communicated with local people, which led to the development of bridging social capital.²²

Before the earthquake, the area around Rikuzentakata had large numbers of locals who were engaged in farm work. However, approximately half of the Hamarassen participants lacked prior experience with farm work, which suggests that their primary intention in taking part was to have the opportunity for socialization rather than physical activity. This observation was reflected in the respondents' comments in the questionnaire survey (Table 5).

Among the four components of the purpose-in-life scale used in this study, improvements were observed in self-actualization, satisfaction with life, and motivation to live. This finding supports the notion that farm work and communication among the participants changed their state of mind from emptiness to fulfillment. Nevertheless, no evidence was obtained for a large improvement in the participants' sense of existence. An individual's sense of existence is a fundamental component, and enhancing this sense may require more intensive interventions or perhaps the large-scale recovery of the entire community.

An improvement in the participants' BMD was also observed. A meta-analysis has demonstrated a significant positive effect of exercise on BMD,²³ and it has also been determined that farm

work is correlated with BMD in elderly Japanese women.²⁴ The BMD of postmenopausal women is reportedly related more to high-intensity loads applied to bone rather than to muscle.²⁵

Strengths and Limitations

This study was based on a unique hospital-led program in a disaster-affected area in which farm work was introduced to maintain the mental and physical health of temporary housing residents. The program is highly generalizable to many places, because this study was based on a real-life situation after the Great East Japan Earthquake. Caution is needed, however, when interpreting these results as an evaluation of the health impacts. First and foremost, the participants were not randomly separated into 3 groups for comparison, and there is thus potential selection bias. However, this issue was partly addressed by adjusting for differences in multiple baseline characteristics. Second, because the sample size was small, there is the possibility of type II error. Although the Hamarassen participants had a wide age range and the effect of the activity on physical and mental health might vary across ages, given the limited sample size, the differential effects by age could not be evaluated. Third, information about the purpose in life at baseline was based on the respondents' recollection of the time when they first participated in the program. Thus, there is also the possibility of recall bias. Moreover, the participants in our evaluation of BMD changes were women only. Evaluation of male participants will be necessary in the future.

CONCLUSIONS

Most similar voluntary activities, such as setting up flower gardens and small farms near temporary housing areas, have been very small or unsustainable owing to the failure of the self-management scheme. The Hamarassen Farm project is

thus an exception, being maintained as a large-scale operation. Its success may be attributable to the involvement of a local hospital and its maintenance by the hospital staff as a primary prevention activity as part of its preventive medical practices.²⁶ The indirect involvement of familiar hospital workers, rather than complete strangers, may help to remove doubts on the part of residents regarding participation.

The Hamarassen Farm project faced 2 challenges. One is that the number of male participants was limited. This has been observed in other intervention programs promoting social participation.²⁷ After the Hanshin-Awaji (Kobe) earthquake in 1995, Okamoto et al found in their study at temporary housing for victims that social connections could be developed in the community relatively easily among women but not among men, because social connections among men were mostly based not in the community but at the work place.²⁸ Okamoto et al also found that men's participation in social gatherings in the community was only 50% of women's. Empirical studies and narrative observations have identified that unlike women men usually require specific roles in the group or other reasons to be a part of group activities.²⁹ Although Hamarassen Farm did not have a particular gender-oriented strategy to promote men's participation, one approach to increasing male participation emerged from the experience. In the case of participating married couples, the husbands sometimes visited their wives' farmlands during their walks, which could lead to a spillover effect on the husbands. A second challenge was the closed nature of the Hamarassen Farm: the members of the farm became basically fixed, and there was subsequently little chance for new participants to join. This has become a barrier to the project's efforts to increase the total number of participants and their diversity.³⁰ Recently, community health-promotion activities have been recommended for medical professionals in addition to public health practitioners.³¹ Although the limitations mentioned above require further study, health-promotion interventions such as the Hamarassen project, which aim to strengthen social networks and community social capital, may be effective in preventing disuse syndrome among adult disaster victims. With the rapidly aging populations in many countries, similar approaches may be adopted in non-disaster settings as a possible option for the health-promotion activities of medical institutions.³²

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日本の介護老人保健施設における眼疾患に関する検討

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要約 目的: 在宅医療の前段階である介護老人保健施設の眼疾患の実態を調査すること。**対象および方法:** 介護老人保健施設において同意の得られた症例 29 例 58 眼 (男性 5 例, 女性 24 例), 平均年齢 84.6±9.1 歳を対象に眼鏡の有無の問診と眼科一般検査を行った。**結果:** 外眼部疾患 6 眼 (10.3%), 白内障は 31 眼 (53%) に認めた。後眼部疾患は, 緑内障 (疑いを含む) 30 眼 (52%), その他 7 眼 (12%), 異常なし 21 眼 (36%) であった。健眼視力が 0.5 未満かつ 0.1 を超える症例は 6 例 (20.7%), 0.1 以下の症例は 2 例 (6.9%) であった。**結論:** 介護老人保健施設入所者には, 高い割合で眼疾患があり在宅医療を含めたスクリーニングが必要と思われた。

Incidence of eye disease in a nursing home for the elderly in Japan

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Abstract. Purpose: To report the state of eye diseases in elderly persons attending a nursing home as preliminary to home care. **Cases and Method:** This study was made on 58 eyes of 29 aged persons attending a day-care nursing home in the outskirts of Kyoto. The series comprised 5 males and 24 females. The age averaged 85 years. They were asked as to the use of spectacles and received routine ophthalmological examinations. **Results:** External eye disease was present in 6 eyes (10%) and cataract in 31 eyes (53%). Diseases of posterior ocular segment included glaucoma or its suspect in 30 eyes (52%) and others in 7 eyes (12%). Visual acuity in the better eye was less than 0.1 in 2 cases (7%) and between 0.1 and 0.5 in 6 cases (21%). **Conclusion:** There was a high incidence of eye disorders in elderly persons attending a nursing home.

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緒言

わが国は急速に高齢化が進行し 2007 年に超高齢化社会時代を迎えた。この状況下で厚生労働省は「認知症施策推進 5 か年計画 (オレンジプラン)」など国の政策を打ち出しており, 在宅医療の充実が次第に重要性を増してきている。在宅医療における部分的な眼科疾患の報告はあるものの, 在宅医療を必要とする集団における眼疾患の実態や治療状況に関する報告は筆者らが知る限りない。この原因は, あまり在宅医療に関して今まで

着目されていなかったこと, 視覚障害のある在宅医療の患者は 1 人では通院が困難で検査されていない可能性があること, 往診診療を行ううえで種々の眼科検査機器の移動が困難であることなどが考えられる。今回筆者らは, 自宅復帰や在宅医療の前段階の役割をもつ介護老人保健施設に着目し, その眼疾患の実態に関して調査を行った。

対象と方法

2013 年 3~4 月に, 定員約 100 名の介護老人保健施設において, 今回の研究に関する説明により

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表 1 今回用いた使用機器と各種検査項目

検査項目	使用機器
①角膜乱視	ARK-700 A (NIDEK 社製)
②屈折	ARK-700 A (NIDEK 社製)
③裸眼視力測定	SC-2000 (NIDEK 社製)
④矯正視力測定	SC-2000 (NIDEK 社製)
⑤非接触眼圧測定	NT-3000 (NIDEK 社製)
⑥細隙灯顕微鏡検査	SL-15 (KOWA 社製)
⑦眼底検査	単眼倒像鏡 (HEINE 社製) +20D レンズ
⑧眼底カメラ撮影	M5 (Optmed 社製)

同意の得られた(本人から得られない場合は家族) 29 例 58 眼(平均年齢 84.6 ± 9.1 歳, 男性 5 例, 女性 24 例)を対象とした。介護老人保健施設は, 地理学的には日本の中心に位置し, 気候に関しても平均的で代表的な地域と考えられる場所にあるものを選択した。定員は約 100 名であり, 2013 年の半年間で 37% の入所者が在宅医療に復帰している。一般病院まで約 2 km 弱の距離にあり, 病状の急変もしくは不調時には比較的容易に受療できるなど環境は良好である。介護施設における点眼治療の状況の問診と同時に表 1 のような眼科検査を行った。また診察は 1 名の眼科医により行われ, その際同時に撮影した眼底カメラ画像は複数の緑内障専門医によって読影および判定された。疾患が発見された患者は, その重症度により救急もしくは後日の眼科受診を勧めた。

結果

平均角膜乱視は, $-1.65 \pm 1.11D$, 平均全乱視は, $-1.14 \pm 0.48D$ であり中等度であった。平均等価球面度数は全体で $-0.44 \pm 1.80D$ であり, 白内障眼 $0.28 \pm 1.95D$ なのに対し眼内レンズ挿入眼 $-1.27 \pm 1.54D$ であり, 白内障眼では有意に遠視寄りであった (Mann-Whitney U 検定, $p < 0.05$) (図 1)。眼鏡の装用率は 6 例 (21%) であった。

眼疾患の内訳は, 外眼部においては眼瞼炎 5 眼 (8%), 眼瞼内反症 1 眼 (2%) であった。中間透光体においては, 白内障 31 眼 (53%), 眼内レンズ挿入眼 27 眼 (47%) であり約半数は白内障であった。後眼部においては視神経乳頭陥凹または緑内障 30 眼 (52%), 糖尿病網膜症 2 眼 (3%), 網膜静脈分枝閉塞症 2 眼 (3%), 加齢黄斑変性症

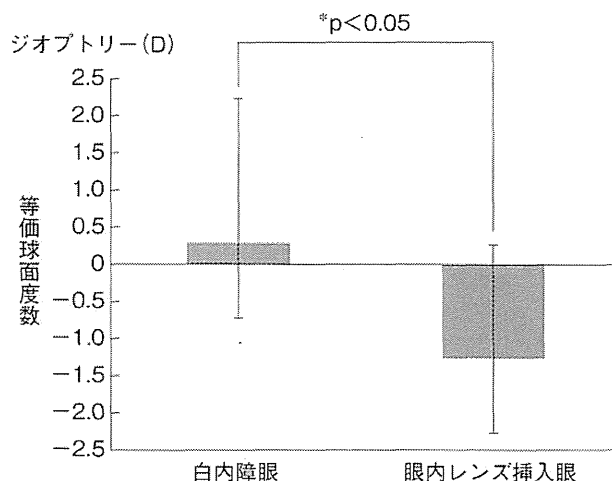


図 1 白内障眼および眼内レンズ挿入眼における等価球面度数の相違

1 眼 (2%), 黄斑円孔網膜剥離 1 眼 (2%), 黄斑前膜 1 眼 (2%), 異常なし 21 眼 (36%) (図 2) であった。

平均裸眼視力 (logMAR), 矯正視力 (logMAR) は, 0.76 ± 0.57 , 0.5 ± 0.57 であり, 小数視力に換算すると 0.1, 0.3 程度であり生活に十分な視力ではなかった。平均眼圧は 13.9 ± 3.5 mmHg であった。視力障害に関しては健眼の小数視力が 0.5 未満かつ 0.1 を超える症例は 6 例 (平均年齢 85.7 ± 7.8 歳) (21%), 0.1 以下の症例は 2 例 (平均年齢 85.0 ± 0 歳) (6.9%) であった。

考 按

わが国は, 1970 年にすでに高齢化社会に突入し, 1995 年には高齢社会, 2007 年に超高齢化社会となっている。その状況下で厚生労働省は, 医療・介護の適切な機能分担と居住系, 在宅サービスの充実を目指すことや認知症を早期発見し早期治療・介護を行うことで介護施設から在宅医療への移行を目指す「オレンジプラン」などを国の政策として推し進めており, 特に在宅医療の重要性が高まっている¹⁾。

前述のようにこれまで在宅医療に注目が集まっていなかったこと, 視覚障害のある在宅医療の必要な患者は通院が不可能なこと, 従来の眼科検査機器はサイズが大きく移動が困難なこと, などの理由により, 在宅医療患者の眼疾患の実態や治療状況に関する報告はほとんど存在しない。この状況下で筆者らは, 自宅復帰や在宅医療の前段階の

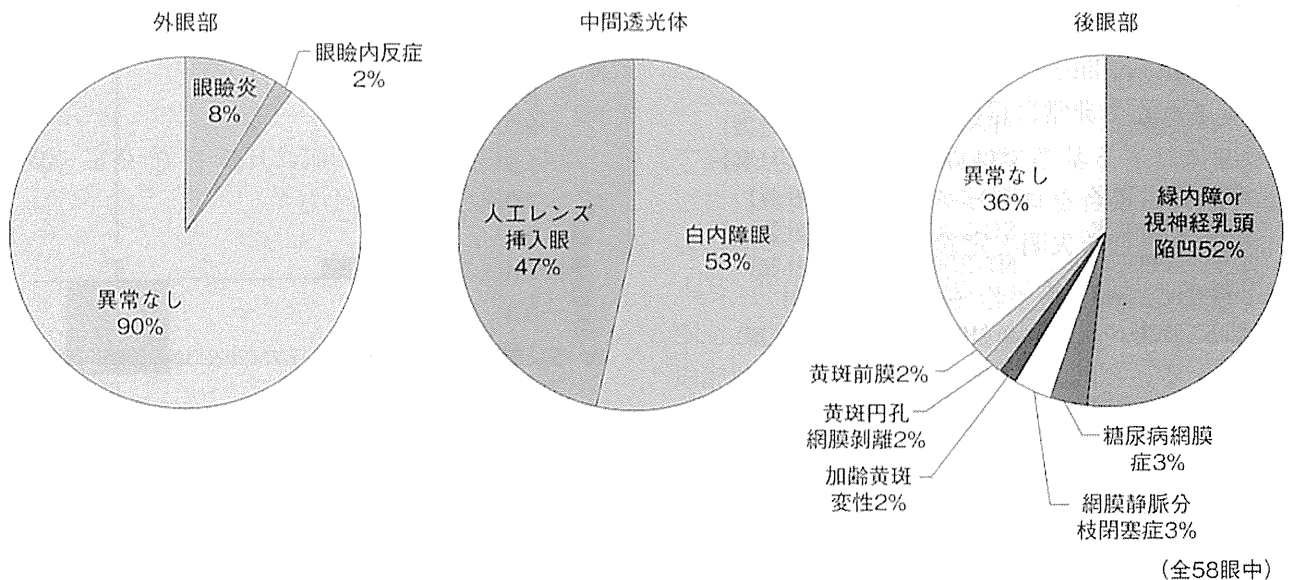


図 2 外眼部・中間透光体・後眼部別の疾患の割合

役割をもつ介護老人保健施設に着目し眼疾患の実態を調査した。

今回、介護老人保健施設での角膜乱視と全乱視の平均を算出した。年齢が上がるほど乱視は大きく倒乱視化するという報告があるが²⁾、今回対象となった高齢者でも同様で、その大きさは中等度であった。乱視眼は脳視覚処理系による処理と調節微動を行うことにより網膜像の鮮明化をしていると考えられているが、それが困難となる高齢者の中等度の乱視は、通常裸眼視力の低下につながるため矯正が必要と考えられる。

今回の施設においては6例(21%)の眼鏡装用率であり、矯正が必要と考えられるが、されていない実態が明らかとなった。平均等価球面度数は有意に白内障眼で遠視寄り、眼内レンズ挿入眼では近視寄りの結果であった。この理由として40歳以降では高齢化とともに、水晶体の屈折率の減少や毛様体筋の生理的緊張の減少などの影響により遠視傾向となること³⁾、白内障術者の眼内レンズ度数選択が術後の屈折度数の狙いを-1D程度に合わせる術者が多い可能性などが推測される。

今回の検討では、外眼部、中間透光体、後眼部と各種部位別の疾患を算出した。外眼部においては眼瞼部の発赤と、眼瞼睫毛への眼脂の付着を認める眼瞼炎が8.6%認められた。多くの症例は高度の眼脂付着もあり乾燥も進行し、ガーゼによる除去が困難で慢性眼瞼炎の状態であった。これま

での報告によれば、このような免疫機能低下による易感染性でなおかつ高齢者の多い介護老人保健施設での眼瞼炎と結膜炎にはMRSA (methicillin-resistant *Staphylococcus aureus*) 保有の割合が高いという報告⁴⁾がされている。患者自身が眼脂を手などでぬぐう行動や、薬剤耐性の問題など、今後の治療における課題となると考えられる。

中間透光体については白内障と眼内レンズ挿入眼が約半数ずつであった。介護老人保健施設から一般病院への距離を考えると、白内障の治療が施されているほうだと考えられる。特に白内障および眼内レンズにかかわる合併症はみられなかった。後眼部においては多くの眼底疾患が認められた。その大半は緑内障もしくは視神経乳頭陥凹であった。

疫学報告の視点から考えると、多くの加齢性眼疾患は年齢が上がるほど有病率が高くなることが報告されている。わが国の有名な緑内障疫学報告によると、40歳以上で緑内障罹患率は5%と考えられているが、80歳以上で11.4%と報告されている⁵⁾。他の眼底疾患についても加齢により罹患率は上昇することが考えられる。

今回の検討では、平均裸眼視力と矯正視力は小数視力に換算し0.1, 0.3程度と悪い結果であった。日常生活において新聞を読むこと、テレビの字幕を見ることには文字のポイント数などの関係があるが、0.4程度の視力が必要とされており⁷⁾、

その視力に到達していなかったことは、患者の QOL (quality of life) や ADL (activities of daily life) を考えるうえで非常に重要な点と考えられる。

米国における基準では健眼視力が 0.5 未満で 0.1 を超える場合をロービジョン、健眼の視力が 0.1 以下の場合を失明と定義される。わが国においてはロービジョンの患者は推定 145 万人 (1.1%)、失明の患者は 19 万人 (0.15%) と推定されている。今回調査を行った介護老人保健施設でのロービジョンと失明の割合はそれぞれ 21%、6.9% で、ロービジョンについては 20 倍、失明については 50 倍程度であり非常に高率であった。

現在、眼科検査機器の小型化や進化には眼を見張るものがある。従来不可能であったオートレフラクトメータ・眼圧測定機器・眼底写真など、一部の高度な機器を除いては手軽に持ち運びできる機械を入手することが可能となってきた。これらを駆使した在宅医療など個々に医療サービスを提供することは、時間や人員などの問題は残されるものの理論上は可能である。今回の結果を踏まえたうえで効率よく眼疾患をスクリーニング・診断・治療に導くことが、今後高齢化の進行するわが国では重要になると考えられる。

今回は標準的な介護老人保健施設を選択したが、一般病院との距離が近く医療サービスは享受されやすく、一般病院と距離のある実際の在宅医療の現場では眼疾患がもっと多い可能性がある。

今回の結果が今後の医療サービス向上に活用されることを期待したい。

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利益相反：該当なし

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Seminar

8. 視覚障害と認知症

福岡 秀記

KEY WORD

■認知症 ■視覚障害 ■視力障害 ■白内障 ■加齢黄斑変性

SUMMARY

■超高齢化社会を迎え、認知症とともに加齢性眼疾患による視覚障害も増加している。認知症を合併した眼科患者は、検査が理解できず静止できないなどの原因により眼科の精密な検査が困難なことが多いこと、重症の場合は局所麻酔でなく全身麻酔での手術の適応になることなどから、眼科的には敬遠されやすい。本稿では視覚と脳との関係、視覚障害の状況、視覚障害と認知症との関係、今後の介護施設や在宅医療の眼科からの視点について述べてい。

はじめに

わが国の高齢化率(65歳以上の高齢者人口が総人口に占める割合)は平成19年に21%を超え、超高齢化社会を迎えている。今後も高齢化率の上昇が予想され、社会問題化している認知症に加え、関連する様々な問題は今後も増加すると考えられる。その状況を踏まえ高齢者は、加齢による感覚機能低下を来すため、その一部である眼科の役割は大きくなっている。特に日常生活から得る情報の大部分は視覚と関連があるとされ、脳細胞の80%近くが視覚と関連があるとされている。何らかの加齢性眼疾患により視覚情報が減少するということは、脳自体の処理すべき情報が減少することを意味し、様々な脳機能に影響を及ぼすことが推測される。

視覚障害の状況

わが国の視覚障害の状況は、厚生労働省による「平成23年生活のしづらさなどに関する調査(全国在宅障害児・者等実態調査結果)」¹⁾によると、平成18年度の調査時²⁾から微増の全国で

約31.6万人もの身体障害者手帳の交付を受けた視覚障害者が推定されている。ここで注目すべきことは、年齢階級別の割合、つまり年代ごとの偏りの変化である。平成18年では70歳以上は49.6%であった身体障害者手帳所持者の割合は、平成23年には57.3%と7.7%も増加し、高齢者の視覚障害者の増加が観察される(図1)。また、この中の視覚障害の原因の内訳を推察するのには、平成17年の厚生労働省難治性疾患克服研究事業「視覚系疾患調査研究班」³⁾を参考とした。その中で視覚障害の原因疾患の内訳は、第1位が緑内障(20.7%)・2位糖尿病網膜症(19.0%)・3位網膜色素変性症(13.7%)・4位は加齢黄斑変性(age-related macular degeneration, 以下AMD)(9.1%)となっている(図2)。ただし白内障は現在、一般的に手術によって治療可能な疾患であり、身体障害者手帳の申請を受けけるケースは非常に少ないと考えられ、これらの調査では抽出されていないと考えられる。以上から視覚障害の主な原因となる疾患は、白内障、緑内障、糖尿病網膜症、網膜色素変性症、加齢黄斑変性であると推察される。

■ふくおか ひでき(国立長寿医療研究センター眼科医長)

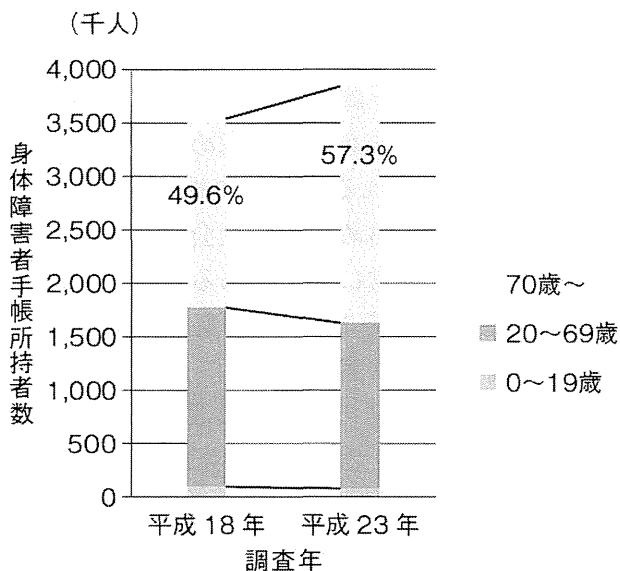


図1 平成18年、23年調査時における身体障害者手帳所持者数および年代ごとの偏りのグラフ
69歳以下では減少しているのと対照的に70歳以上では増加が明らかである。

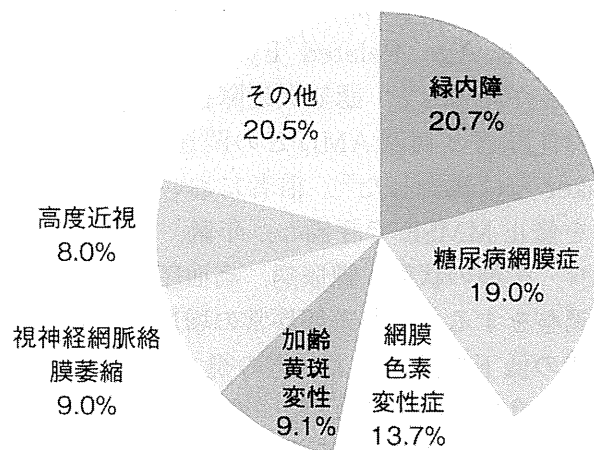


図2 視覚障害者の原因疾患の内訳
第1位が緑内障(20.7%)・2位糖尿病網膜症(19.0%)・3位網膜色素変性症(13.7%)・4位は加齢黄斑変性(9.1%)、白内障はその他に含まれている(文献3より引用)。

認知機能と視覚障害の考察

1. 近見視力と認知機能

認知機能と視力との報告はあるが、多くは眼科疾患の種類は調べられていないことが多く、近見視力や矯正視力・実用視力のみでの評価を行っていることが特徴的である。なかでも Reyes-Ortizらは、近見視力の障害が認知機能低下と関連していたと報告した⁴⁾。具体的にはメキシカンアメリカンを対象として、通常の矯正眼鏡またはコンタクトレンズでの常用近見視力、遠見視力と聴力を測定し、7年間の視覚障害者用の Mini-Mental State Examination(以下MMSE)を用いて認知機能の経過を観察している。常用近見視力障害群は、視力良好群と比較し有意に認知機能の低下を認めており、遠見視力障害の有無や聴力障害の有無では、有意な認知機能の低下を認めなかった。このことはやはり、屈折異常を含む近見障害が認知機能を含む脳機能に影響したのではないかと考えられる。

2. 遠見視力と認知機能

遠見視力の障害と認知機能との関連があるとの報告がある。よい方の視力が0.5未満の視力障害群と0.5以上の視力良好群と比較した場合、有意に認知機能の低下を生じているとの報告がある⁵⁻⁸⁾。このように眼の疾患の種類にかかわらず、視力障害が認知機能に影響を及ぼしていることが明らかとなってきた。

3. 白内障と認知機能

白内障は視力を低下させる主要な眼疾患であるが、先進国の医療体制において、白内障手術により視力回復可能な疾患である。白内障自体が認知機能を低下させる要因と仮定すると、白内障手術により認知機能の改善が見込まれる。実際 Tamuraら⁹⁾は白内障手術前と比較し、白内障手術後に長谷川式認知症スケール(HDS-R)の平均値が改善したと報告し、Ishiiら¹⁰⁾も白内障手術により視力が改善し、NEI-VFQ25(National Eye Institute Visual Functioning Questionnaire 25)とともにMMSEも改善したと報告している。

4. 加齢黄斑変性と認知機能

白内障以外特定の眼疾患と認知症との関係に関する報告は少ない。高齢者の認知機能障害と進行したAMDおよび視力低下との関連を、2006年にAge Related Eye Disease Study Groupが報告し¹¹⁾、認知機能障害と高齢者の認知機能障害と初期AMDとの関連を2009年にBakerらは報告した¹²⁾。前者においては認知機能を修正MMSEで評価し、年齢、性別、人種、教育、喫煙の状態、糖尿病、高血圧、うつ状態で調整をすると、黄斑部異常の増加により認知機能の低下を認め、よい方の視力が0.5未満の視力不良群では、それ以上の視力良好群よりも修正MMSE(80<)が低下する傾向にあることが明らかとなった(オッズ比2.88)。後者においては認知機能をDSST(Digit Symbol Substitution Test)により評価し、AMDをグレード分類し、年齢、性別、人種、研究施設で調整をすると、DSSTの最低群は高値群に比べ初期AMDを発症しやすい傾向が認められた(オッズ比1.38)。また学歴、糖尿病、喫煙の状態、収縮期血圧、アポリポ蛋白E(ApoE)遺伝子型で調整すると、この関連性はオッズ比2.00と強くなった。このことは、初期AMDと認知機能低下に共通する加齢に関連した因子が存在する可能性を示唆していると考えられる。

超高齢者と認知症

厚生労働省は、オレンジプランなど認知症に対する施策を重視している。具体的には、認知症高齢者を早期発見し適切な医療・介護ケアを行い、住み慣れた地域で生活できるよう施設介護から在宅介護へ移行を促している。介護老人保健施設は、自宅療養・在宅復帰を促す役割もあるため、介護施設の現状を調べることは、認知症高齢者の在宅医療・介護の将来を予測するのに役立つ。そこでわれわれは倫理委員会の承認のもと、介護老人保健施設の様々な認知症の程度の患者に対し、視覚障害の現状について調査を行った¹³⁾。100名の定員の施設の約30%である29名58眼(男性5例、女性24例)の視力・

眼圧・細隙灯顕微鏡検査・眼底検査など、眼科的な基本的な検査を行った。その中で白内障は約半数の方に認め、緑内障(疑いを含む)を含む眼底疾患のある方を6割強で認めた。また、視覚障害者と定義されるよい方の視力が0.5未満の方が2~3割を占め、一般社会の疫学調査と比較し数十倍と非常に高度であることがわかってきた。認知機能をHDS-Rで測定したところ、視覚障害者は非障害者と比較して有意に低値を示していた。HDS-Rの一部分の設問には、物を順番に提示し名前を言いながら記銘させるものがあり、視覚機能が一部影響している可能性は考えられるが、視覚障害者が非常に多くの認知機能との関連も示され、今後調査すべき領域であると思われる。

おわりに

以上述べたように、視覚機能と認知症は密接な関係にあることが考えられる。筆者が考えているのは、平成19年のオーストラリアの住民を対象としたBlue Mountains Eye Study¹⁴⁾の報告では白内障がある場合、単純に死亡に関連する予測因子で調整しても、死亡の追跡期間を考慮したハザード比が1.3倍であったことから、加齢性眼疾患の中で一部の白内障などは、全身の老化の状態(酸化ストレスなどのストレス老化)の程度を反映している可能性がある。視覚障害は、運動能力に異常がなくても活動性を低下による虚弱、転倒¹⁵⁾や認知機能低下につながることを考えなければならない。

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