

Original article

What lifestyles are risk factors for low well-being of healthy elderlies dwelled in a local city in super-aging Japan? —Kizugawa cohort study—

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Abstract

The purpose of this cohort study is to clarify the risk factors of low well-being of elderly people who residing in a local city of a super-aging country, Japan.

Subjects are people, who have selected randomly from healthy elderly people resided in Kizugawa City, Kyoto Prefecture, in 2010, followed until 2015. Question survey was conducted in both year, and questionnaire consisted of items such as basic attributes, lifestyles (health practices, consultation behaviors, social activities and so on) and well-being (WHO-5). In analysis we made multi-logistic regression analysis using lifestyle variables as an independent variable and well-being as a dependent variable.

The results were as follows.

1. Risk factors were not to exercise, knowledge of appropriate diet, subjective feeling of stress for at least a month, not to participate in voluntary activities, age and bad subjective feeling of health.
2. Risk factors in regard to changes of lifestyles using good-good lifestyles as a reference were sustainment of having no time for hobby or relaxation, sustainment or deterioration of subject feeling of stress for at least a month, sustainment or deterioration of having no time for relaxation and deterioration of having no activities with pleasure or aim. A factor promoting well-being is to have more frequencies for going out home.

This study shows that in a longevity society it is important for community-dwelling elderly Japanese to have good health practices, appropriate consultation behaviors and good social activities for the purpose of keeping good well-being, and that these results are contributed to health promotion policy for community-dwelling elderly people.

Key words: well-being, risk factors, elderly, health practices, cohort study

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Introduction

As Japan faces a super-aging society unmatched in the world, the country also faces other complex problems such as a low birth rate, decreasing population, economic stag-

nation, and environmental changes. Therefore, achieving a sustainable society has become an urgent issue. In particular, population density in large cities has accelerated the aging of populations in rural areas. Since the declining birth rate has also led to decreases in populations in these areas, the emergence of marginal settlements has become a cause for concern. Thus, correcting the social disparities in both urban and rural areas and maintaining the standard and quality of living of residents are important issues for community development; additionally, the development of a multi-faceted approach focused on society as a whole is also important. The World Health Organization (WHO) points out that a comprehensive approach is essential for sustainable development¹⁾. For example, in a super-aging society with a low birth rate, emphasis is placed on the need for a comprehensive and sustainable strategy that aims for happi-

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ness, quality of life (QOL), and the well-being of its members²). These aims are also goals of health promotion.

The Organisation for Economic Co-operation (OECD) also recommends well-being as a goal of regional policy appropriate for a mature society³). This international trend provides a strategic perspective on what Japan should set as a goal for attaining a vibrant local community in preparation for a mature society. In other words, to solve the problems associated with the local population decline, health issues, etc., and achieve a sustainable mature society, it is essential to identify the characteristics of well-being for people from diverse backgrounds and devise creative strategies for maintaining well-being according to these various aspects⁴).

Therefore, the purpose of this study was to clarify the risk factors for poor levels of well-being among the elderly residing in a regional area in Japan based on a cohort study. The results will be useful for developing a strategic design for maintaining the well-being of the elderly.

Methods

Located about 30 km from the centers of the major cities of Kyoto and Osaka, Kizugawa City is blessed with an abundant natural environment and a long history. Recently, it has also become a regional core city with cutting-edge research institutes. Its total population was 70,415 as of October 1, 2010, and the percentage of minors under age 15 was 17%. Further, the percentage of residents in the productive age range of 15–64 was 64.3%, and the percentage of the elderly (over age 65) was 18.6%⁵). The city's population increased during the five years devoted to this study, and there has been a large social population influx along with the development of new housing areas.

We devise a health promotion plan of Kizugawa City and aim at improving the quality of life of inhabitants based on an idea of the health promotion. Therefore Kizugawa was a study field in this study.

Survey targets and methods

1) Survey 1 (Baseline)

Regarding the survey method, a self-administered questionnaire with a request to reply was mailed to 2,500 randomly elected citizens aged 65 and over. Of these, 1,003 valid responses were obtained (40.1%). The survey was conducted by Kizugawa City's Health Promotion Division, Health and Welfare Department, December 14–27, 2010.

2) Survey 2

Beginning October 1, 2015, another survey was sent to 2,473 randomly selected citizens aged 65 and above, including respondents from the previous survey. Subsequently, 1,769 valid responses were obtained (71.5%). The survey period was November 27–December 18, 2015, and the sur-

vey method was the same as that used for the baseline survey. Out of the baseline of 1,003 respondents, 706 were valid (70.4%).

Survey details

1) Basic attributes

Attributes included were gender, age, family construction, and occupation.

2) Health

(1) Physical health

Questions on physical health included subjective health views, medical history, BMI, physical and dental examinations, etc. Subjective health view is an index¹⁴) associated with the life prognosis of the elderly; a 4-point scale ranging from “I think I am very healthy” to “I am not healthy” was used.

(2) Lifestyle

Lifestyle includes routine habits such as exercise, nutrition, smoking, drinking, and resting. It also includes social activities, social participation, social networks, behavioral consultations, etc.

(3) Well-being

Well-being is defined by the Japanese version of WHO-5⁶), a scale consisting of five items for assessing an individual's mental health status for the past two weeks. A person who scores a total of 13 or more points (from 0–25) is considered to have a “good” level of well-being, whereas someone who scores less than 13 has a “poor” level⁶).

Health perceptions and current medical history were also examined.

Analysis method

In this study, the risk factors for “poor” well-being among elderly people dwelling in a regional community were analyzed.

First, a univariate analysis was performed to examine the distribution of well-being and the relationship between baseline lifestyle habits and the endpoint for well-being. The relationship between changes in lifestyle habits from the baseline to within five years of the endpoint for well-being was also examined. The chi-squared test and Fisher's exact test were analytical methods employed.

Next, a multivariate analysis was conducted, and a logistic regression analysis was performed with the endpoint for well-being designated as the objective variable (WHO-5: *poor/good*) and the baseline lifestyle habits as explanatory variables. A similar analysis was conducted with the endpoint for well-being as the objective variable and changes in lifestyle habits within five years of that point as the explanatory variables.

Ethical considerations

This study was conducted with the approval of the Ethics Committee of the Graduate School of Medicine and Faculty of Medicine, Kyoto University, and Kyoto University Hospital (R1262-2).

Results

The subjects were 706 elderly people who provided valid responses at the baseline, and among them were those who provided valid responses after five years (Fig. 1).

Well-being of the elderly in the regional community

The distribution of those evaluated with “poor” well-being levels is shown in Table 1.

Lifestyle as a risk factor for “poor” well-being

1) Results of the univariate analysis

Relationships between good and poor lifestyles and “good” and “poor” well-being are shown in Table 2.

Regarding lifestyle and health, subjective health perceptions, exercise, time for hobbies and recreation, attention to nutritional intake, knowledge about a balanced diet, a regular routine, regular health check-ups and early visits to the doctor when symptomatic, daily tooth brushing, dental check-ups, adequate rest during the past month, outdoor activities, participation in district events, relationships with non-work friends and neighbors more than once a week, enjoyable goal-oriented activities, and participation in regional and volunteer activities were more characteristic of individuals evaluated with “good” well-being compared to those with “poor” well-being. On the other hand, during treatment for liver disease or diabetes, eating dinner within two hours of bedtime contributed significantly to lowering stress within the past month for those whose well-being was “good” compared to those whose well-being was “poor.”

2) Results of the multivariate analysis

Risk factors for “poor” well-being are shown in Table 3.

Risk factors include age (OR 1.08), poor subjective health perceptions (OR 3.16), no exercise (OR 1.95), inadequate knowledge regarding a balanced diet (OR 2.39), stress within the past month (OR 2.93), and no participation in community or volunteer activities (OR 2.57). On the other hand, a well-being promotion factor is the non-use of an interdental cleaning device (OR 0.03).

Lifestyle changes as a risk factor for “poor” well-being

1) Results of the univariate analysis

The relationship between good and bad lifestyle changes with well-being is shown in Table 4.

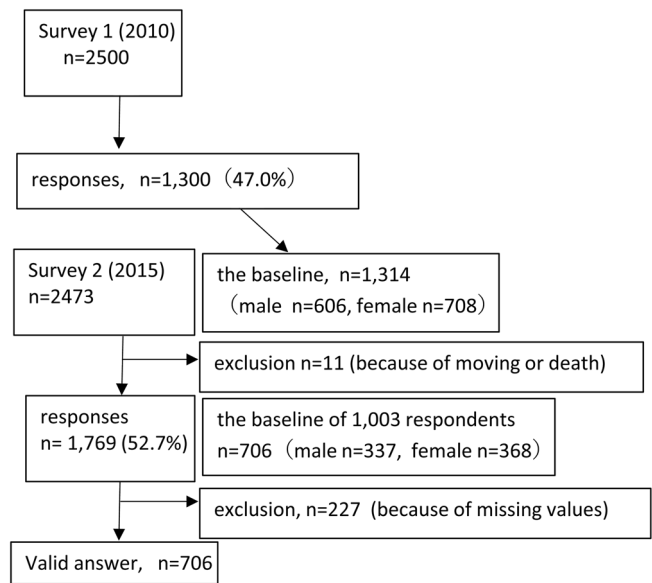


Figure 1 Subjects for analysis.

Table 1 Well-being

	Good well-being n (%)	Poor well-being n (%)	P
Male	179 (71.6)	71 (28.4)	ns
Female	169 (73.8)	60 (26.2)	
Overall	348 (72.7)	131 (27.3)	

Well-being: WHO-5, χ^2 test, ns: not significant.

Well-being: Good (WHO-5 ≥ 13), Poor (WHO-5 < 13).

Subjective health perceptions, exercise, time for hobbies and recreation, attention to nutritional intake, a regular routine, regular health check-ups, liver disease, diabetes, attention to food amounts and ingredients, knowledge regarding a balanced diet, daily exercise, dental check-ups, stress levels within the past month, adequate rest within the past month, seven to nine hours of sleep per night, outdoor activities, participation in district events, interaction with non-work friends and neighbors more than once a week, activities that are fun and goal-oriented, and participation in regional and volunteer activities were observed as being significantly associated with “good” and “poor” well-being.

2) Results of the multivariate analysis

Risk factors for “poor” well-being are shown in Table 5.

Overall, based on the continuation of a healthy lifestyle, the risk factors include the following: few hobbies or recreational outlets (OR 5.53), ongoing stress within the past month (OR 21.88) or worsening stress levels (OR 31.94), continuous, inadequate rest within the past month (OR 29.94) or a worsening of this situation (OR 8.85), and deteriorating participation in goal-oriented activities that are pleasurable

Table 2 Relationships between lifestyles and well-being in 2010

Lifestyles	Category	Well-being		P value
		Good	Poor	
Do you have good subjective feeling of health?	good	287 (83.4)	71 (55.5)	0.000
	poor	57 (16.6)	71 (44.5)	
Do you take an exercise?	yes	185 (53.8)	37 (28.5)	0.000
	no	159 (46.2)	93 (71.5)	
Do you have a time for hobbies or recreation?	yes	229 (66.6)	57 (43.8)	0.000
	no	115 (33.4)	73 (56.2)	
Do you pay attention to the amount and content of meals?	yes	236 (68.6)	74 (56.9)	0.018
	no	108 (31.4)	56 (43.1)	
Do you keep a regular routine?	yes	241 (70.1)	67 (51.5)	0.000
	no	103 (29.9)	63 (48.5)	
Do you have regular health check-ups?	yes	224 (65.1)	71 (54.6)	0.043
	no	120 (34.9)	59 (45.4)	
Do you try to consult a doctor early if you have symptoms?	yes	170 (49.4)	47 (36.2)	0.010
	no	174 (50.6)	83 (63.8)	
Do you have hypertension?	yes	142 (40.8)	58 (44.3)	0.533
	no	206 (59.2)	73 (55.7)	
Do you have heart disease?	yes	38 (10.9)	18 (13.7)	0.426
	no	310 (89.1)	113 (86.3)	
Do you have cerebrovascular disease?	yes	9 (2.6)	3 (2.3)	1.000
	no	339 (97.4)	128 (97.7)	
Do you have liver disease?	yes	7 (2.0)	10 (7.6)	0.009
	no	341 (98.0)	121 (92.4)	
Do you have diabetes?	yes	38 (10.9)	24 (18.3)	0.034
	no	310 (89.1)	107 (81.7)	
Do you have dyslipidemia?	yes	57 (16.4)	17 (13.0)	0.397
	no	291 (83.6)	114 (87.0)	
Do you have kidney disease?	yes	8 (2.3)	6 (4.6)	0.223
	no	340 (97.7)	125 (95.4)	
Do you have osteoporosis?	yes	25 (7.2)	14 (10.7)	0.260
	no	323 (92.8)	117 (89.3)	
Do you have periodontal disease?	yes	34 (9.8)	11 (8.4)	0.728
	no	314 (92.8)	120 (91.6)	
Do you pay attention to the amount and content of meals?	yes	312 (89.7)	113 (86.9)	0.415
	no	36 (10.3)	17 (13.1)	
Do you have knowledge about a right balance of diet?	yes	269 (77.5)	84 (64.6)	0.005
	no	78 (22.5)	46 (35.4)	
Do you have meals regularly?	yes	334 (96.0)	121 (93.8)	0.329
	no	14 (4.0)	8 (6.2)	
Do you eat breakfast?	yes	329 (94.5)	120 (92.3)	0.391
	no	19 (5.5)	10 (7.7)	
Do you have meals together with family?	yes	285 (81.9)	98 (75.4)	0.123
	no	63 (18.1)	32 (24.6)	
Do you eat at fast speed?	yes	89 (25.6)	37 (28.5)	0.560
	no	259 (74.4)	93 (71.5)	

Table 2 (Continued)

Lifestyles	Category	Well-being		P value
		Good	Poor	
Do you have dinner within two hours before bedtime?	yes	68 (19.7)	37 (28.9)	0.035
	no	278 (80.3)	91 (71.1)	
Do you eat snacks after dinner?	yes	156 (44.8)	55 (55.2)	0.680
	no	192 (55.2)	74 (57.4)	
Do you smoke?	yes	23 (7.2)	9 (7.2)	1.000
	no	295 (92.8)	116 (92.8)	
Do you drink more than appropriate amount?	yes	85 (26.1)	30 (25.0)	0.903
	no	241 (73.9)	90 (75.0)	
Do you always try to take an exercise?	yes	313 (90.7)	110 (85.3)	0.097
	no	32 (9.3)	19 (14.7)	
Do you brush your teeth every day?	yes	338 (99.4)	123 (96.9)	0.049
	no	2 (0.6)	4 (3.1)	
Do you use an interdental toothbrush?	yes	162 (48.8)	59 (46.5)	0.677
	no	170 (51.2)	68 (53.5)	
Do you have dental check-ups?	yes	213 (64.0)	62 (48.4)	0.003
	no	120 (36.0)	66 (51.6)	
Have you been stressed during the last month?	yes	153 (44.7)	92 (71.9)	0.000
	no	189 (55.3)	36 (28.1)	
Have you had enough rest during the last month?	yes	328 (96.2)	107 (84.9)	0.000
	no	13 (3.8)	19 (15.1)	
Do you have a sleep for 7–9 hours?	yes	184 (53.8)	60 (47.2)	0.214
	no	158 (46.2)	67 (52.8)	
Do you go out actively?	yes	280 (81.4)	81 (64.3)	0.000
	no	64 (18.6)	45 (35.7)	
Do you participate in district events?	yes	267 (76.9)	67 (52.3)	0.000
	no	80 (23.1)	61 (47.7)	
Do you have friendship with non-work friends or neighbors more than once a week?	yes	214 (63.7)	58 (46.8)	0.001
	no	122 (36.3)	66 (53.2)	
Do you lead a life with fun and goals?	yes	241 (72.4)	51 (43.2)	0.000
	no	92 (27.6)	67 (56.8)	
Do you do local or volunteer activities?	yes	134 (39.6)	204 (17.1)	0.000
	no	204 (60.4)	102 (82.9)	

χ^2 test, Fisher's exact test. Excluding non-answerer. Well-being: Good (WHO-5 ≥ 13), Poor (WHO-5 < 13).

(OR 6.82). Improvement in actively engaging in outdoor activities (OR 0.06) was a factor for enhanced well-being.

Discussion

In anticipation of depopulation in the future, the Japanese government has presented a model for community and city planning that envisions a revitalization strategy for sustainable regional development in rural areas. The new strategy is aimed at the realization of a society in which ev-

eryone can live out their lives with dignity and take on challenges with a sense of fulfillment as members of society. Well-being is not only a goal established by the government for the realization of a sustainable society in Japan, despite its super-aging society and low birth rate, with an ultimate goal of extending the healthy lives of citizens and employing health promotion measures.

Table 3 Risk factors for “poor” well-being

Factors	Categories	Well-being			
		OR	95% CI		P value
			Lowest	Highest	
Age	(add 1 year)	1.085	1.022	1.152	0.007
Gender	male (ref. female)	1.611	0.755	3.437	0.217
I have good subjective feeling of health	bad (ref. good)	3.166	1.579	6.348	0.001
I take an exercise	bad (ref. good)	1.956	1.021	3.745	0.043
I have a time for hobbies or recreation	bad (ref. good)	1.616	0.785	3.325	0.192
I pay attention to the amount and content of meals	bad (ref. good)	1.724	0.866	3.434	0.121
I keep a regular routine	bad (ref. good)	0.895	0.443	1.807	0.757
I have regular health check-ups	bad (ref. good)	1.154	0.601	2.215	0.667
I try to consult a doctor early if I have symptoms	bad (ref. good)	1.043	0.537	2.025	0.901
I pay attention to the amount and content of meals	bad (ref. good)	1.282	0.413	3.985	0.667
I have knowledge about a right balance of diet	bad (ref. good)	2.399	1.216	4.734	0.012
I have meals regularly	bad (ref. good)	1.154	0.288	4.628	0.840
I eat breakfast	bad (ref. good)	2.182	0.600	7.938	0.236
I have meals with family	bad (ref. good)	1.756	0.824	3.742	0.144
I eat at fast speed	bad (ref. good)	0.795	0.376	1.680	0.547
I have dinner within two hours before bedtime	bad (ref. good)	1.580	0.769	3.245	0.213
I eat snacks after dinner	bad (ref. good)	0.734	0.375	1.437	0.367
I always try to take an exercise	bad (ref. good)	0.331	0.108	1.014	0.053
I smoke	bad (ref. good)	0.805	0.229	2.832	0.736
I drink more than appropriate amount	bad (ref. good)	1.044	0.464	2.351	0.917
I brush my teeth every day	bad (ref. good)	0.969	0.047	19.853	0.983
I use an interdental toothbrush	bad (ref. good)	0.473	0.237	0.944	0.034
I have dental check-ups	bad (ref. good)	1.398	0.698	2.799	0.344
I have been stressed within the last month	bad (ref. good)	2.937	1.497	5.761	0.002
I have had enough rest in the last month	bad (ref. good)	4.347	1.291	14.633	0.018
I have a sleep for 7–9 hours	bad (ref. good)	1.360	0.728	2.542	0.335
I actively go out	bad (ref. good)	0.803	0.370	1.741	0.578
I participate in district events	bad (ref. good)	2.008	0.989	4.078	0.054
I have friendship with non-work friends or neighbors more than once a week	bad (ref. good)	0.750	0.372	1.511	0.420
I lead a life with fun and goals	bad (ref. good)	1.722	0.809	3.666	0.158
I participate in local or volunteer activities	bad (ref. good)	2.577	1.149	5.780	0.022

OR: Odds Ratio; ref.: reference=1.000; 95%CI: 95% Confidence Interval. Well-being: Good (WHO-5 \geq 13), Poor (WHO-5 <13).

Lifestyles and lifestyle changes that are risk factors for “poor” well-being

There are very few cohort studies in Japan examining the lifestyles of elderly people who live in regional communities that are risk factors for decreased well-being. The results of this study suggest that a healthy lifestyle, proper medical consultation, and healthy and ongoing social participation are important factors for the well-being of these individuals. According to previous research, well-being and QOL are associated with a survival prognosis⁽⁷⁾ in cases of the onset or present medical history of cancer⁽⁸⁾, cardiovascular disease^(9, 10), diabetes⁽¹¹⁾, etc., and also with the decline in vital functions⁽¹²⁾ and physical fitness⁽¹³⁾. Based on the results of the present study, disease prevention and health promotion are considered as contributors to the well-being of the elderly^(14, 15).

Other risk factors for “poor” well-being include poor psychosocial health conditions such as depression, loneliness, social isolation, decreases in conversations with people, socialization with friends, and the frequency of participation in local activities. This finding is consistent with those of some previous studies^(16, 17) that cite social isolation, depression, and the absence of relationships with neighbors as risks for “poor” well-being and death. In addition to subjective stress and a lack of social participation, the emergence and persistence of stress increases the risk for a decline in well-being. The elderly have more time to enjoy their hobbies, lessons, and volunteer activities⁽¹⁸⁾. For men, work is significantly related to the basic activities of daily living (BADL)⁽⁹⁾. Hence, the maintenance of social functions is essential for the well-being of the elderly. The fact that Japan has the highest incidence of socially isolated elderly people among the 20 OECD

Table 4 Relationship between changes of lifestyle and well-being

Lifestyles	Categories	Well-being		P value
		Good	Poor	
I have good subjective feeling of health	bad→bad	31 (9.2)	43 (33.6)	0.000
	good→bad	23 (6.8)	22 (17.2)	
	bad→good	23 (6.8)	14 (10.9)	
	good→good	260 (77.2)	49 (38.3)	
I take an exercise	bad→bad	115 (33.4)	76 (58.0)	0.000
	good→bad	52 (15.1)	14 (10.7)	
	bad→good	44 (12.8)	17 (13.0)	
	good→good	133 (38.7)	24 (18.3)	
I have a time for hobbies or recreation	bad→bad	59 (17.2)	64 (48.9)	0.000
	good→bad	44 (12.8)	24 (18.3)	
	bad→good	55 (16.0)	9 (6.9)	
	good→good	186 (54.1)	34 (26.0)	
I pay attention to the amount and content of meals	bad→bad	65 (18.9)	32 (24.4)	0.005
	good→bad	40 (11.6)	24 (18.3)	
	bad→good	43 (12.5)	24 (18.3)	
	good→good	196 (57.0)	51 (38.9)	
I keep a regular routine	bad→bad	53 (15.4)	47 (35.9)	0.000
	good→bad	45 (13.1)	30 (22.9)	
	bad→good	51 (14.8)	16 (12.2)	
	good→good	195 (56.7)	38 (29.0)	
I have regular health check-ups	bad→bad	81 (23.5)	40 (30.5)	0.000
	good→bad	33 (9.6)	27 (20.6)	
	bad→good	40 (11.6)	19 (14.5)	
	good→good	190 (55.2)	45 (34.4)	
I try to consult a doctor early if I have symptoms	bad→bad	119 (34.6)	57 (43.5)	0.099
	good→bad	56 (16.3)	15 (11.5)	
	bad→good	55 (16.0)	26 (19.8)	
	good→good	114 (33.1)	33 (25.2)	
I have hypertension	bad→bad	123 (35.3)	49 (37.4)	0.656
	good→bad	45 (12.9)	12 (9.2)	
	bad→good	19 (5.5)	9 (6.9)	
	good→good	161 (46.3)	61 (46.6)	
I have heart disease	bad→bad	23 (6.6)	13 (9.9)	0.582
	good→bad	25 (7.2)	11 (8.4)	
	bad→good	15 (4.3)	5 (3.8)	
	good→good	285 (81.9)	102 (77.9)	
I have cerebrovascular disease	bad→bad	3 (0.9)	0 (0.0)	0.658
	good→bad	13 (3.7)	7 (5.3)	
	bad→good	6 (1.7)	3 (2.3)	
	good→good	326 (93.7)	121 (92.4)	
I have liver disease	bad→bad	3 (0.9)	3 (2.3)	0.019
	good→bad	4 (1.1)	2 (1.5)	
	bad→good	4 (1.1)	7 (5.3)	
	good→good	337 (96.8)	119 (90.8)	
I have diabetes	bad→bad	29 (8.3)	21 (16.0)	0.031
	good→bad	9 (2.6)	7 (5.3)	
	bad→good	9 (2.6)	3 (2.3)	
	good→good	301 (86.5)	100 (76.3)	
I have dyslipidemia	bad→bad	34 (9.8)	7 (5.3)	0.464
	good→bad	23 (6.6)	10 (7.6)	
	bad→good	23 (6.6)	10 (7.6)	
	good→good	268 (77.0)	104 (79.4)	

Table 4 (Continued)

Lifestyles	Categories	Well-being		P value
		Good	Poor	
I have kidney disease	bad→bad	6 (1.7)	3 (2.3)	0.084
	good→bad	6 (1.7)	6 (4.6)	
	bad→good	2 (0.6)	3 (2.3)	
	good→good	334 (96.0)	119 (90.8)	
I have osteoporpsis	bad→bad	15 (4.3)	7 (5.3)	0.440
	good→bad	17 (4.9)	8 (6.1)	
	bad→good	1 (2.9)	7 (5.3)	
	good→good	306 (87.9)	109 (83.2)	
I have periodontal disease	bad→bad	10 (2.9)	5 (3.8)	0.054
	good→bad	13 (3.7)	13 (9.9)	
	bad→good	24 (6.9)	6 (4.6)	
	good→good	301 (86.5)	107 (81.7)	
I pay attention to the amount and content of meals	bad→bad	17 (5.0)	8 (6.2)	0.003
	good→bad	11 (3.2)	15 (11.6)	
	bad→good	17 (5.0)	9 (7.0)	
	good→good	297 (86.8)	97 (75.2)	
I have knowledge about a right balance of diet	bad→bad	31 (9.1)	30 (23.1)	0.000
	good→bad	30 (8.8)	25 (19.2)	
	bad→good	46 (13.5)	16 (12.3)	
	good→good	235 (68.7)	59 (45.4)	
I have meals regularly	bad→bad	4 (1.2)	3 (2.3)	0.648
	good→bad	7 (2.0)	3 (2.3)	
	bad→good	10 (2.9)	5 (3.9)	
	good→good	321 (93.9)	118 (91.5)	
I eat breakfast	bad→bad	8 (2.3)	7 (5.4)	0.369
	good→bad	7 (2.0)	3 (2.3)	
	bad→good	10 (2.9)	3 (2.3)	
	good→good	318 (92.7)	117 (90.0)	
I have meals together with family	bad→bad	40 (11.8)	18 (14.0)	0.058
	good→bad	30 (8.8)	16 (12.4)	
	bad→good	18 (5.3)	14 (10.9)	
	good→good	251 (74.0)	81 (62.8)	
I eat at fast speed	bad→bad	61 (17.7)	28 (21.5)	0.086
	good→bad	24 (7.0)	2 (1.5)	
	bad→good	28 (8.1)	9 (6.9)	
	good→good	231 (67.2)	91 (70.0)	
I have dinner within two hours before bedtime	bad→bad	30 (8.8)	13 (10.2)	0.067
	good→bad	36 (10.6)	14 (11.0)	
	bad→good	35 (10.3)	24 (18.9)	
	good→good	239 (70.3)	76 (59.8)	
I eat snacks after dinner	bad→bad	98 (28.8)	38 (29.5)	0.352
	good→bad	19 (5.6)	13 (10.1)	
	bad→good	53 (15.6)	17 (13.2)	
	good→good	170 (50.0)	61 (47.3)	
I smoke	bad→bad	23 (7.2)	9 (7.2)	1.000
	good→bad	0 (0.0)	0 (0.0)	
	bad→good	0 (0.0)	0 (0.0)	
	good→good	295 (92.8)	116 (92.8)	
I drink more than appropriate amount	bad→bad	22 (6.7)	6 (5.0)	0.651
	good→bad	13 (4.0)	2 (1.7)	
	bad→good	63 (19.3)	24 (20.0)	
	good→good	228 (69.9)	88 (73.3)	

Table 4 (Continued)

Lifestyles	Categories	Well-being		P value
		Good	Poor	
I always try to take an exercise	bad→bad	13 (3.8)	9 (7.2)	0.000
	good→bad	15 (4.4)	21 (16.8)	
	bad→good	19 (5.5)	8 (6.4)	
	good→good	296 (86.3)	87 (69.6)	
I brush my teeth every day	bad→bad	0 (0.0)	3 (2.5)	0.059
	good→bad	8 (2.4)	3 (2.5)	
	bad→good	2 (0.6)	1 (0.8)	
	good→good	320 (97.0)	115 (94.3)	
I use an interdental toothbrush	bad→bad	110 (34.4)	52 (42.6)	0.224
	good→bad	21 (6.6)	11 (9.0)	
	bad→good	51 (15.9)	14 (11.5)	
	good→good	138 (43.1)	45 (36.9)	
I have dental check-ups	bad→bad	72 (22.2)	47 (39.8)	0.004
	good→bad	27 (8.4)	7 (5.9)	
	bad→good	41 (12.8)	14 (11.9)	
	good→good	181 (56.4)	50 (42.4)	
I have been stressed during the last month	bad→bad	101 (29.6)	78 (61.9)	0.000
	good→bad	42 (12.3)	17 (13.5)	
	bad→good	51 (15.0)	12 (9.5)	
	good→good	147 (43.1)	19 (15.1)	
I have had enough rest during the last month	bad→bad	5 (1.5)	6 (4.8)	0.000
	good→bad	8 (2.4)	9 (7.3)	
	bad→good	8 (2.4)	13 (10.5)	
	good→good	319 (93.8)	96 (77.4)	
I have a sleep for 7–9 hours	bad→bad	96 (28.2)	50 (39.4)	0.012
	good→bad	47 (13.8)	25 (19.7)	
	bad→good	62 (18.2)	17 (13.4)	
	good→good	136 (39.9)	35 (27.6)	
I actively go out	bad→bad	32 (9.4)	38 (30.2)	0.000
	good→bad	25 (7.3)	18 (14.3)	
	bad→good	31 (9.1)	7 (5.6)	
	good→good	253 (74.2)	63 (50.0)	
I participate in district events	bad→bad	49 (14.2)	51 (40.2)	0.000
	good→bad	27 (7.8)	22 (17.3)	
	bad→good	31 (9.0)	10 (7.9)	
	good→good	237 (68.9)	44 (34.6)	
I have friendship with non-work friends or neighbors more than once a week	bad→bad	73 (22.6)	48 (40.0)	0.000
	good→bad	24 (7.4)	22 (18.3)	
	bad→good	44 (13.6)	15 (12.5)	
	good→good	182 (56.3)	35 (29.2)	
I lead a life with fun and goals	bad→bad	45 (14.2)	57 (49.1)	0.000
	good→bad	27 (8.5)	18 (15.5)	
	bad→good	43 (13.6)	8 (6.9)	
	good→good	201 (63.6)	33 (28.4)	
I participate in local or volunteer activities	bad→bad	168 (51.5)	95 (79.2)	0.000
	good→bad	41 (12.6)	12 (10.0)	
	bad→good	30 (9.2)	4 (3.3)	
	good→good	87 (26.7)	9 (7.5)	

χ^2 test or Fisher's exact test. Well-being: Good (WHO-5 \geq 13), Poor (WHO-5 <13).

Table 5 Risk factors for “poor” well-being

Factors	Categories	Well-being			
		OR	95% CI		P value
			Lowest	Highest	
Age	↑	1.056	0.961	1.159	0.256
Gender	male (ref. female)	1.636	0.609	4.394	0.329
I take an exercise	bad→bad (ref. good→good)	3.328	0.941	11.772	0.062
	good→bad (ref. good→good)	1.464	0.326	6.567	0.619
	bad→good (ref. good→good)	2.259	0.437	11.681	0.331
I lead a life with fun and goals	bad→bad (ref. good→good)	5.531	1.478	20.689	0.011
	good→bad (ref. good→good)	1.366	0.335	5.562	0.664
	bad→good (ref. good→good)	0.307	0.064	1.478	0.141
I pay attention to the amount and content of meals	bad→bad (ref. good→good)	0.249	0.056	1.115	0.069
	good→bad (ref. good→good)	0.463	0.099	2.177	0.330
	bad→good (ref. good→good)	2.653	0.663	10.615	0.168
I keep a regular routine	bad→bad (ref. good→good)	1.731	0.407	7.354	0.457
	good→bad (ref. good→good)	2.622	0.651	10.551	0.175
	bad→good (ref. good→good)	0.249	0.051	1.215	0.086
I have regular health check-ups	bad→bad (ref. good→good)	0.986	0.296	3.284	0.981
	good→bad (ref. good→good)	0.562	0.089	3.548	0.540
	bad→good (ref. good→good)	1.493	0.300	7.436	0.624
I try to consult a doctor early if I have symptoms	bad→bad (ref. good→good)	1.005	0.314	3.213	0.993
	good→bad (ref. good→good)	0.636	0.127	3.186	0.582
	bad→good (ref. good→good)	1.023	0.233	4.486	0.976
I pay attention to the amount and content of meals	bad→bad (ref. good→good)	3.469	0.398	30.254	0.260
	good→bad (ref. good→good)	2.757	0.412	18.450	0.296
	bad→good (ref. good→good)	3.129	0.376	26.008	0.291
I have knowledge about a right balance of diet	bad→bad (ref. good→good)	3.245	0.826	12.757	0.092
	good→bad (ref. good→good)	2.442	0.530	11.256	0.252
	bad→good (ref. good→good)	1.811	0.465	7.056	0.392
I have meals with family	bad→bad (ref. good→good)	1.187	0.256	5.498	0.826
	good→bad (ref. good→good)	1.112	0.257	4.798	0.887
	bad→good (ref. good→good)	5.460	0.903	33.017	0.065
I have dinner within two hours before bedtime	bad→bad (ref. good→good)	1.594	0.286	8.870	0.595
	good→bad (ref. good→good)	1.314	0.268	6.450	0.737
	bad→good (ref. good→good)	1.987	0.454	8.695	0.362
I eat snacks after dinner	bad→bad (ref. good→good)	0.709	0.253	1.983	0.512
	good→bad (ref. good→good)	3.929	0.361	42.808	0.262
	bad→good (ref. good→good)	0.998	0.244	4.082	0.998
I always try to take an exercise	bad→bad (ref. good→good)	0.443	0.053	3.712	0.453
	good→bad (ref. good→good)	3.587	0.610	21.104	0.158
	bad→good (ref. good→good)	0.201	0.025	1.629	0.133
I use an interdental toothbrush	bad→bad (ref. good→good)	0.790	0.233	2.687	0.706
	good→bad (ref. good→good)	0.376	0.045	3.151	0.367
	bad→good (ref. good→good)	0.554	0.129	2.373	0.426
I have dental check-ups	bad→bad (ref. good→good)	3.020	0.849	10.740	0.088
	good→bad (ref. good→good)	0.320	0.045	2.285	0.256
	bad→good (ref. good→good)	2.171	0.392	12.034	0.375

Table 5 (Continued)

Factors	Categories	Well-being			
		OR	95% CI		P value
			Lowest	Highest	
I have been stressed during the last month	bad→bad (ref. good→good)	21.886	5.501	87.067	0.000
	good→bad (ref. good→good)	31.940	5.603	182.078	0.000
	bad→good (ref. good→good)	4.372	0.767	24.924	0.097
I have had enough rest in the last month	bad→bad (ref. good→good)	29.943	2.003	447.603	0.014
	good→bad (ref. good→good)	8.851	1.056	74.213	0.044
	bad→good (ref. good→good)	4.628	0.561	38.148	0.155
I have a sleep for 7–9 hours	bad→bad (ref. good→good)	1.670	0.487	5.729	0.415
	good→bad (ref. good→good)	1.287	0.323	5.122	0.720
	bad→good (ref. good→good)	1.519	0.386	5.977	0.550
I actively go out	bad→bad (ref. good→good)	1.750	0.434	7.059	0.432
	good→bad (ref. good→good)	0.270	0.051	1.419	0.122
	bad→good (ref. good→good)	0.063	0.006	0.666	0.022
I participate in district events	bad→bad (ref. good→good)	2.455	0.682	8.841	0.170
	good→bad (ref. good→good)	3.452	0.750	15.883	0.112
	bad→good (ref. good→good)	0.981	0.148	6.499	0.984
I have friendship with non-work friends or neighbors more than once a week	bad→bad (ref. good→good)	0.512	0.123	2.141	0.359
	good→bad (ref. good→good)	2.337	0.449	12.168	0.313
	bad→good (ref. good→good)	1.417	0.330	6.089	0.640
I lead a life with fun and goals	bad→bad (ref. good→good)	1.552	0.355	6.777	0.559
	good→bad (ref. good→good)	6.820	1.225	37.973	0.028
	bad→good (ref. good→good)	0.472	0.076	2.955	0.423
I participate in local or volunteer activities	bad→bad (ref. good→good)	2.375	0.554	10.183	0.244
	good→bad (ref. good→good)	0.741	0.118	4.668	0.749
	bad→good (ref. good→good)	1.017	0.069	14.981	0.990

OR: Odds Ratio; ref.: reference=1.000; 95%CI: 95% Confidence Interval. Logistic regression analysis.

Well-being: Good (WHO-5 ≥ 13), Poor (WHO-5 < 13).

member countries³) points to the importance of social participation for the well-being of this population.

On the other hand, according to a study examining the influence of regional characteristics on health, in Japan, elderly people in administrative districts with greater social capital have less depression and weakness; further, their physical health and mental health are better²⁰). According to Sumida *et al.*²¹), Kizugawa City's social and environmental factors and sense of community are related to people's QOL; thus, regional characteristics are also important elements affecting the well-being of the elderly. The city has many social inflows and is one of the few cities in Japan with a growing population⁵). Local governments, based on their autonomy, need to create regionally inclusive care systems according to regional characteristics and encourage social participation. Regarding general support projects, particularly for the elderly, a support system that promotes seamless social participation based on the functions of liv-

ing is also necessary (in addition to health check-ups, health guidance and consultation, etc.). In emerging housing areas where there are few land boundaries, creating a community that promotes social participation and interaction, new activities, and which includes a mechanism for preventing the decline of social functions with multi-generational and multi-disciplinary collaboration is also necessary.

Limitations of this study

The subjects of this study were considered to have a selective bias because they are local government residents. Moreover, although lifestyle change was used as an explanatory variable, there was hardly any change observed at all.

Since lifestyle changes are likely to occur with aging of the elderly, it may be necessary to consider increasing the number of subjects for a more comprehensive analysis.

Another limitation is lower effective response rate. It is thought that this bias influenced results.

Conclusion

This study examined the risk factors related to “poor” well-being of community elderly cohorts residing in a rural city with an increasing population. Our study results suggest that for the elderly, a healthy lifestyle, disease prevention, and medical consultations are not only required to prevent a decline in well-being, but also for low levels of stress, rest, as well as the pursuit of hobbies, participation in social activities, and the maintenance of social roles. To maintain

the well-being of elderly people in the regional community, it is necessary to create a place for relaxation which promotes and active social exchanges and encourages them to engage in pleasurable and goal-oriented activities.

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