

Determinants of Self-Rated Health among Community-Dwelling Women Aged 40 Years and over in Japan

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KANAGAE, M., ABE, Y., HONDA, S., TAKAMURA, N., KUSANO, Y., TAKEMOTO, T. and AOYAGI, K. *Determinants of Self-Rated Health among Community-Dwelling Women Aged 40 Years and over in Japan.* Tohoku J. Exp. Med., 2006, **210** (1), 11-19 — In developed countries, the elderly population is growing rapidly. Self-rated health is an important indicator of health and has been the focus of a number of aging studies. However, little is known about the possible differences in determinants of self-rated health according to age. Self-rated health and its possible determinants were examined in 542 community-dwelling Japanese women aged 40 to 91 years. The proportion of women with poor self-rated health increased with age. Approximately half of the women had poor self-rated health among women aged 80 years and over. We used multiple logistic regression analysis to examine the association with poor self-rated health in women aged 40 to 64 years ($n = 248$) and 65 years and over ($n = 294$). Lower physical activity and a greater number of comorbidities were associated with poor self-rated health for ages 40 to 64 and 65 years and over. Furthermore, the risk of poor self-rated health increased by 1.5-fold with every increase in the number of painful joints in the lower extremities for the 40- to 64-year-old age group, and increased by 2-fold with back pain for those 65 years and over. The determinants of self-rated health were similar in both middle-aged and elderly Japanese women. Our results could contribute to effective interventions to improve quality of life among Japanese women. ——— self-rated health; physical activity; comorbidity; muscle strength; musculoskeletal pain

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Received January 25, 2006; revision accepted for publication June 17, 2006.

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In developed countries, the average life expectancy has increased markedly during the last century, causing a rapid growth in the elderly population (Kinsella 1992). In Japan, the proportion of those aged 65 years and older is projected to be over 25% of the population in 2015. In rural areas, the proportion of those aged 65 years and older has already reached nearly 40%. Therefore, public health strategies to maintain higher quality of life among the elderly are essential.

Functional status and self-rated health are two important indicators of health in old age (Hoeymans et al. 1997). They are also important elements of quality of life (Bowling 1991) and are widely-used indicators to calculate healthy life expectancy or disability-free life expectancy (van de Water et al. 1996). Self-rated health describes how a person perceives his or her own health and is an indicator of well-being (Hoeymans et al. 1997). Self-rated health has good test-retest reliability (Lundberg and Manderbacka 1996) and concurrent validity in relation to more complex, multi-item summary measures of general health (Rowan 1994). At present, self-rated health is one of the most common indicators of health in survey research (Manderbacka et al. 1999) and has also been recommended for health monitoring by the World Health Organization (de Bruin et al. 1996).

Self-rated health has been the focus of a number of aging studies (Era et al. 1992; Hays et al. 1996). Hays et al. (1996) reported that among the elderly, poorer self-rated health correlated with depressive symptomatology, poor functional status, and comorbidity, as well as some socioeconomic factors. Furthermore, Era et al. (1992) concluded that self-rated health was an important factor associated with muscle strength among different age groups. Poor self-rated health has been reported to be associated with being more dependent in daily life activities (Ebly et al. 1996), and it may also worsen the quality of life. There have been many studies that have evaluated self-rated health among the Japanese elderly (Ai and Hoshi 2005). However, few have studied younger (middle-aged) generations. To improve and maintain self-rated health among community residents, it is important to clarify the health-related factors that

could affect self-rated health depending on age, which leads to establish public health strategies for each age group.

The purpose of the present study was to elucidate the association of health-related factors with self-rated health among middle-aged and elderly Japanese women. The study is based on a survey conducted in community-dwelling women aged 40 years and over.

MATERIALS AND METHODS

This study was conducted as a part of the survey of age-related health status in a community (Oshima Health Study). We recruited community-dwelling women aged 40 years and over in Oshima town, Nagasaki prefecture, Japan. The women were identified by the municipal electoral list and invited to participate through a single mailing. The examination was performed at the Oshima Health Center between 2001 and 2003. The town of Oshima has a population of approximately 6,000, of which the population of women aged 40 years and over is approximately 2,000, according to the 2000 Census. All women aged 40 years and over were invited to participate. A total of 542 women aged 40 to 91 years, approximately 30% of the eligible women, participated in this study. The participation rate was 10% for 40- to 49-year-old women, 20% for 50- to 59-year-old, 33% for 60- to 69-year-old, 32% for 70- to 79-year-old, and 5% for women aged 80 years and over. Despite having a shipyard in the town, Oshima is mainly a rural (farming/fishery) district. Approximately half of the women who participated in the study continue to grow rice and vegetables by manual labor, though sometimes they use machinery (Zhang et al. 2003). All participants were non-institutionalized, lived independently, and had adequate cognitive function to answer the questionnaire. If subjects had some recent memory loss, we confirmed the information with their family members.

Self-rated health was measured by the question: "How would you rate your health in general?" with four response options (excellent, good, fair, and poor). In the present study, self-rated health was dichotomized into good ("excellent" and "good") and poor ("fair" and "poor").

Body weight (kg) and height (m) were measured with light clothing and without shoes. Body mass index (BMI) was calculated as weight (kg) divided by square of height (m). Grip strength of the dominant hand was measured using a hydraulic dynamometer (Jamar

hydraulic hand dynamometer, Jafayette Instrument Company, Inc., Jafayette, IN, USA). The best performance of two trials was accepted as the result.

We collected information on subjects' physical activity, comorbidities, painful joints at spine and non-spine sites, alcohol consumption, and current smoking status using a self-administered questionnaire. The questionnaire was handed to each subject prior to the examination and was checked by physicians and trained nurses at the time of the examination. We defined the physical activity index as the estimated caloric expenditure per kg body weight per day, which was calculated by the following formula (Sallis et al. 1985): physical activity index (kcal/kg/day) = $(A \cdot 1) + (B \cdot 1.5) + (C \cdot 4) + (D \cdot 6) + (E \cdot 10)$, where A, B, C, D, E denote the time (in hours) spent in one day for sleeping, sitting, and light, moderate, and heavy activity, respectively. High physical activity index values correspond to lifestyles that are relatively physically active; low levels correspond to habitual inactivity (Kannel and Sorlie 1979). Comorbidities included the following 15 diseases: heart disease, hypertension, stroke, diabetes, hyperlipidemia, osteoarthritis, cataracts, rheumatoid arthritis, severe pulmonary disease, liver disease, cancer, kidney disease, gastrectomy, thyroid disease, and collagen disease. For information on painful joints, subjects were asked, "Which of your joints has ever been painful on most days for at least one month or currently?". Specific response categories on both sides of the body were provided using an illustration of the skeleton. Upper extremities included shoulder, elbow, wrist, and hand/finger joints; lower extremities included hip, knee, ankle, and foot joints. Alcohol consumption was estimated by a semiquantitative food frequency questionnaire (Tsubono et al. 1996) and information on current smoking status (yes/no) was also obtained. All subjects gave written informed consent before examination. This study was approved by the Oshima local ethics committee.

The *t*-test for continuous variables and the chi-square test for categorical variables were used to examine differences in parameters between women with good and poor self-rated health. The Mann-Whitney's U-test was also applied to examine the difference in the number of comorbidities and painful joints between women with good and poor self-rated health. Diseases that directly affect the joints (osteoarthritis, rheumatoid arthritis, and collagen disease) were excluded from the list of comorbidities in this analysis. Furthermore, simultaneous effects of factors on self-rated health were analyzed

using a logistic regression model. The odds ratio (OR) and the 95% confidence interval (CI) were calculated for each covariate included in the model. Statistical analysis was performed using SPSS software version 10.0 J (SPSS Inc., Chicago, IL, USA).

RESULTS

Table 1 summarizes the characteristics of the study subjects. The mean BMI was 23.4 kg/m² in this population. Sixty-five percent of the participants had at least one comorbidity, and 28% had back pain.

Table 2 shows the classification of subjects by self-rated health and age group. The proportion of women with poor self-rated health increased significantly with age ($p < 0.001$). Only 8.9% of women aged 40 to 49 years had poor self-rated health, whereas among those aged 80 years and over, approximately half the women had poor self-rated health.

Since self-rated health was different among different age groups, we conducted the following analysis by dividing the subjects into two age categories: 40 to 64 years ($n = 248$) and 65 years and over ($n = 294$). Table 3 shows comparisons of various parameters between women with good and poor self-rated health among each age group. In both age groups, grip strength was significantly weaker in women with poor self-rated health than in those with good self-rated health. The physical activity index was also significantly lower in women with poor self-rated health than in those with good self-rated health. Women with poor self-rated health had significantly more comorbidities and painful joints in the lower extremities than those with good self-rated health. Similarly, the proportion of subjects suffering back pain was significantly higher in women with poor self-rated health than in those with good self-rated health.

Multiple logistic regression analysis was conducted to examine simultaneous effects of health-related factors on self-rated health. We did not observe any J-shaped or U-shaped correlations between self-rated health and selected variables. Higher BMI, weaker grip strength, lower physical activity, greater number of comorbidities, greater number of painful joints in upper and

TABLE 1. Characteristics of subjects ($n = 542$).

Variables	Mean (s.d.) ^a	Range		
Age (y)	64.5 (10.6)	40 - 91		
Height (cm)	150.0 (6.4)	134.3 - 167.0		
Weight (kg)	52.7 (8.5)	25.4 - 95.9		
Body mass index (kg/m ²)	23.4 (3.3)	13.3 - 42.0		
Grip strength (kg)	25.5 (5.7)	4.0 - 45.0		
Physical activity index (kcal/kg/day)	50.9 (14.2)	29.0 - 133.0		
	First quartile	Median	Third quartile	
Number of comorbidities	0	1	2	0 - 7
Number of painful joints in upper extremities	0	0	0	0 - 8
Number of painful joints in lower extremities	0	0	1	0 - 8
	Number (%)			
Back pain	153 (28.2)			
Current smoker	20 (3.7)			
Heavy drinker (≥ 20 g alcohol/day)	18 (3.3)			

^astandard deviation.

TABLE 2. Classification of subjects by self-rated health and age group.

Age groups (y)	Self-rated health	
	Good	Poor
40 - 49	51 (91.1)	5 (8.9)
50 - 59	91 (83.5)	18 (16.5)
60 - 69	133 (74.7)	45 (25.3)
70 - 79	116 (67.1)	57 (32.9)
≥ 80	14 (53.8)	12 (46.2)
Total	405 (74.7)	137 (25.3)

Data are number of subjects and (%).

lower extremities, and back pain were significantly associated with poor self-rated health when adjusted by age. Thus, we conducted the analysis including all these variables in the final model, among two age groups (i.e., 40-64 years, and 65 years and over). As shown in Table 4, lower physical activity and larger number of comorbidities were significantly associated with poor self-

rated health in both age groups. The risk of poor self-rated health significantly increased by 1.40-fold (95%CI: 1.04-1.86) with every 10 kcal/kg/day decrease in physical activity index for subjects aged 40 to 64 years and 1.37-fold (95%CI: 1.05-1.76) for subjects aged 65 years and over. The risk of poor self-rated health also significantly increased by 1.44-fold (95%CI: 1.03-2.02) with every increase in the number of comorbidities for subjects aged 40 to 64 years and 1.70-fold (95%CI: 1.35-2.15) for subjects aged 65 years and over. In addition, the risk of poor self-rated health significantly increased by 1.52-fold (95%CI: 1.07-2.14) with every increase in number of painful joints in the lower extremities for subjects aged 40 to 64 years, while the risk did not reach statistical significance for subjects aged 65 years and over. For subjects aged 65 years and over, the risk of poor self-rated health in those who suffered back pain was significantly higher by 2.01-fold (95%CI: 1.03-3.90). Weak grip strength had borderline association ($p < 0.1$) with poor self-rated health for both age groups.

TABLE 3. Comparison of body mass index, physical activity index, grip strength, number of comorbidities, number of painful joints in upper or lower extremities, and back pain between women with good and poor self-rated health ($n = 542$).

Variables	40-64 y			65 + y		
	Self-rated health			Self-rated health		
	good ($n = 203$)	poor ($n = 45$)	p value	good ($n = 202$)	poor ($n = 92$)	p value
Mean (S.D.)						
Body mass index (kg/m^2)	23.1 (3.1)	24.1 (3.3)	0.06	23.3 (3.3)	23.9 (3.7)	0.2
Grip strength (kg)	29.0 (5.0)	26.5 (4.3)	0.002	23.6 (4.8)	21.4 (5.2)	< 0.001
Physical activity index ($\text{kcal}/\text{kg}/\text{day}$)	54.1 (15.6)	46.9 (13.1)	0.004	51.2 (13.5)	45.3 (10.8)	< 0.001
Median (range)						
Number of comorbidities	0 (0-4)	1 (0-5)	< 0.001	1 (0-6)	2 (0-6)	< 0.001
Number of painful joints in upper extremities	0 (0-8)	0 (0-4)	0.2	0 (0-6)	0 (0-8)	0.09
Number of painful joints in lower extremities	0 (0-5)	1 (0-6)	< 0.001	0 (0-6)	0.5 (0-8)	< 0.001
Number (%)						
Back pain	47 (23.2)	18 (40.0)	0.02	46 (22.8)	42 (45.7)	< 0.001

TABLE 4. Estimates and confidence intervals of odds ratio for factors included in the multiple logistic regression analysis.

Variables	Unit change	40-64 y ($n = 248$)		65+ y ($n = 294$)	
		OR	95%CI	OR	95%CI
Age (y)	+10	1.33	0.69-2.57	0.95	0.52-1.74
BMI (kg/m^2)	+5	1.34	0.76-2.36	1.07	0.71-1.62
Physical activity index ($\text{kcal}/\text{kg}/\text{day}$)	-10	1.40	1.04-1.86	1.37	1.05-1.76
Grip strength (kg)	-5	1.52	0.96-2.39	1.36	0.98-1.89
Number of comorbidities	+1	1.44	1.03-2.02	1.70	1.35-2.15
Number of painful joints in upper extremities	+1	1.06	0.76-1.47	0.94	0.72-1.22
Number of painful joints in lower extremities	+1	1.52	1.07-2.14	1.17	0.89-1.53
Back pain	yes/no	1.75	0.79-3.89	2.01	1.03-3.90
R^2		0.27		0.26	

DISCUSSION

We found that poor self-rated health was significantly associated with lower physical activity and a larger number of comorbidities in both age groups. We also found that greater number of painful joints in the lower extremities was associated with poor self-rated health among subjects aged 40 to 64 years, and the existence of back pain was associated with poor self-rated health among subjects aged 65 years and over. Self-rated health is determined by an array of factors: physiological and psychological, objective and subjective; thus it is more than a mere reflection of physical health status (Hays et al. 1996). The World Health Organization's definition stresses that health is more than solely the absence of disease and infirmity. Good self-reported health is an essential element of good health.

In the present study, 25.3% of the subjects rated their health as poor ("fair" and "poor"). Interestingly, Goldman et al. (2004) reported similar results among a Taiwanese population. Other studies, however, reported that only 5% to 11.4% of subjects rated their health as poor among Swedish (Manderbacka et al. 1999) and Danish populations (Nybo et al. 2001). However, age distributions of subjects were different among those studies, which may in part explain the different results. Furthermore, self-health rating may be influenced by different categorizations and wording of the questionnaire, or even by various socioeconomic circumstances (Mossey and Shapiro 1982; Hays et al. 1996). Thus, it might be difficult to compare self-rated health directly among different populations.

Univariate analysis showed a significant increase in the proportion of women with poor self-rated health with age, suggesting that poor self-rated health is a common problem among the elderly. In several studies, self-rated health is reported to deteriorate with aging (Goldstein et al. 1984; Moum 1992). However, age was not significantly associated with self-rated health in the multiple logistic regression model, which included all the participants (data not shown). Self-rated health might be partly determined by objec-

tive health (Hays et al. 1996; Kaplan et al. 1996), such as functional status, which is considered to deteriorate with age. Objective health measures, such as the number of comorbidities and muscle strength, also correlated with age in our study (data not shown). This fact may partly explain the lack of association between self-rated health and age. Another explanation may be that other factors, such as activities of daily living (ADL), may be more important for self-rated health than actual age. Some studies showed that self-rated health was better among old senior citizens than young senior citizens (Idler 1993; Hays et al. 1996). Further studies are needed to determine the effect of aging on self-rated health.

Many cross-sectional and longitudinal studies have been conducted to investigate self-rated health and correlates, and predictive values for all-cause mortality or disability among Japanese (Ai and Hoshi 2005). It is now well recognized that self-rated health is closely associated with physical, mental, and socioeconomic factors. Shinkai et al. (1999) examined the relationship between mobility level and indices of quality of life including self-rated health and showed that the elderly with impaired mobility had lower self-rated health. Another study explored the impact of two socioeconomic indicators, education level and employment grade (type of occupation and positional rank), on several factors and found that self-rated health was inversely associated with employment grade (Nishi et al. 2004). However, few studies included younger adults; thus little is known about the possible differences of determinants of poor self-rated health according to age. Our study included women with a wide age distribution and examined the association of health-related factors with self-rated health by age groups.

In this study, an increased number of comorbidities was independently associated with poor self-rated health. Several studies have reported that the existence of diseases is an important risk factor for death and this factor has been consistently found to be associated with self-rated health (Friedsam and Martin 1963; LaRue et al. 1979; Mihara et al. 1983). People with a larger number

of comorbidities may have more functional limitations, which is an important factor for poor self-rated health (Hays et al. 1996). Furthermore, it has been reported that the mere diagnosis of comorbidity also directly affects an individual's self-rated health (Goldman et al. 2004). Affliction with comorbidities is thus an important predictor of poor self-rated health.

Women aged 40 to 64 years with poor self-rated health had a larger number of painful joints, and women aged 65 years and over with poor self-rated health had a higher frequency of back pain. Chronic pain is known to be a strong indicator of poor self-rated health (Reyes-Gibby et al. 2002). Furthermore, the existence of painful joints in the lower extremities or back pain could affect ambulatory ability. We previously reported that women with symptoms (pain, swelling, aching, or tenderness) at multiple joints had a higher risk for impairment than women with fewer joints involved (Jinbayashi et al. 2002). Frailty and lower extremity disability resulting from chronic musculoskeletal pain might have a direct influence on the ADL and on self-rated health.

We showed that regular physical activity is an independent predictor for better self-rated health. People with high levels of physical activity have good self-rated health, and the opposite is also true (Cott et al. 1999). In addition, an adequate level of physical activity has been reported to be beneficial in preventing several diseases, such as cardiovascular disease, stroke, and osteoporosis (Yahata et al. 2002; Oguma and Shinoda-Tagawa 2004). Our results suggest that women with high physical activity would have better objective health; thus they rate their health more positively than their counterparts. Moreover, regular physical activity may have a favorable effect on maintaining muscle strength (Petrofsky and Lind 1975; Bassey and Harries 1993), which could also be one of the most important factors of good self-rated health (Jylha et al. 1986; Era et al. 1992). Aging-associated decline in muscle strength could partly be explained by reduced physical activity among older people (Bassey 1985).

Our study has several limitations. First, the

cross-sectional design of the study cannot assess the causal relationship of self-rated health and observed variables. Second, although we attempted to obtain a representative sample of the population, the subjects had to be mobile enough to attend the study site. Only 5% of eligible women aged 80 and over participated in our study, which is a potential source of selection bias. The women with the most severe symptoms and disability may not have participated. Third, there may be inaccuracies in subjects' recall of physical activities. We did not obtain information about our subjects' cognitive status. In our study, information on physical activity from subjects with cognitive problems was provided by their family members, which may have influenced the results to some extent. Fourth, we did not obtain information about other factors that could have influenced self-rated health, such as individual demographic factors including education, employment status, and income; and social psychological resources including perceived social support, chronic stress, and distress (Cott et al. 1999; Wang et al. 2002; Nishi et al. 2004; Ahmad et al. 2005). Further studies are needed that include these factors for clarifying their overall association with self-rated health.

We have demonstrated in the present study that the determinants of self-rated health were similar in both middle-aged and elderly women. Certain health-related factors, such as poor physical activity, comorbidities, and painful joints in lower extremities for women aged 40 to 64 years and back pain for women aged 65 years and over, have a negative impact on self-rated health among community-dwelling Japanese women. We believe that our results could help to establish public health strategies for maintaining good quality of life. Better understanding of the determinants of self-rated health could contribute to effective interventions to improve the quality of life among Japanese women.

Acknowledgements

The study was partly supported by the Japan Society for the Promotion of Science (Grant in Aid for Scientific Research [C] #11670374). We thank

the staff of the Oshima Health Center for their valuable assistance in conducting the study. We are also grateful to all participants for their kind cooperation.

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