

61.7%) and in the higher altitude level of 3500–3999 (Sham: 46.4%, Leh town: 43.5%) in spite of a much lower rate of overweight in Sham (17.1%) compared with Leh town (33.6%). Different from people in the Leh block subdivision, people in Sham had much poorer availability of foods for a long time until recently and they may have vulnerability to the recent quick change of dietary habits, especially in older people and those dwelling in remote areas at higher altitude. We showed the high prevalence of impaired glucose tolerance (35%) in old people in Domkhar compared with Tibetan people in Qinghai, China in the previous report. We also suggested that there may be a vulnerability to glucose intolerance brought on by recent changes in lifestyle in people with long-term backgrounds of economically traditional lifestyles with limited food resources.<sup>31</sup>

Mutton, rice, momo (mutton), thukpa (comprising of Atta, vegetable mostly dry and dry cheese), kholak (Barley flour with local tea) and paba (a mix of barley flour, wheat flour and grounded pea cooked in plain water with salt added to taste) are the main diets of the Changthang population in both Ladakhis and Tibetans. Taking snacks is not in their food culture, and nor are modern snack items available at that remote high-altitude region. A relatively lower prevalence of hypertension was observed in Changthang Tibetan natives (19.7%) and Changthang Ladakhis (31.9%) living at higher altitude (4000–4900 m).

Zanskar subdivision, located at an intermediate high altitude (3500–3900 m), has a population mainly concerned with farming and cattle rearing. Butter tea, local beverage chang, thukpa, barley flour kholak, rice and pulses are the main dietary foods; meat is rarely eaten. Fresh fruit and vegetables are usually not available in Zanskar and Changthang. The crude prevalence of hypertension in Zanskar appears to be high (36.3%) but age-standardised prevalence (32.1%) was the same as in other rural areas, as the mean age was highest in Zanskar (table 4).

Modernised sedentary workers, rural-to-urban migrants, and dwelling in urban area population (Altitude 3300–3600 m) had a higher prevalence of hypertension and increased BMI as compared to the rural population. Previous reports support our hypothesis of highlanders' vulnerability to hypertension by socioeconomic globalisation.<sup>12–14 31–34</sup> A higher prevalence of hypertension was reported in Tibetans compared with immigrant Hans in the Tibetan plateau, with the prevalence being greater in the urban population around Lhasa than in the rural population.<sup>12</sup> In another report, a longitudinal survey was carried out in the prevalence of hypertension in people over 15 years in different ethnic groups in China in 1991 and 2002. The prevalence of hypertension in Tibetan people increased from 17.8% (in 1991) to 24.7% (in 2002), which was the highest compared with the other seven ethnic groups including Han (from 11.3% to 16.2%).<sup>32</sup> A recent report showed that

the prevalence of hypertension (SBP $\geq$ 140 or DBP  $\geq$ 90 or treatment) in 1289 Tibetan highlanders (Lhasa and suburbs; 3700–4200 m) aged 18 and more was 39%.<sup>13</sup> Another report showed that the prevalence of hypertension in 692 Tibetan highlanders (rural area of Lhasa; 3700 m) aged 30–80 years was 37% (SBP $\geq$ 130 or DBP  $\geq$ 85 or treatment).<sup>14</sup> The prevalence of hypertension was close to our result of 37% and higher than that of Chinese lowlanders aged 20 years and more (27% in 2007–2008).<sup>15</sup> Blood pressure in 332 highlanders in Leh (13–81 years old, mean 50 years) was compared with those in U town, Hokkaido, Japan (24–79 years, mean 56.8) in 2004. Higher DBP and a larger increase in blood pressure with age were observed in people living at a high altitude, as compared with Japanese living at a low altitude.<sup>35</sup> Younger people, but not adults and elderly people, among Tibetan immigrants from Leh to the lowlands in India were reported to have higher blood pressure compared with those living in the highlands. Measurements of adiposity had a significant effect on BP.<sup>33</sup> The prevalence of hypertension was higher (72.7%) in Tibetan highlanders in Shangrila (Altitude: 3300 m) compared with lowlanders in Jing Hong (57.0%) and Tosa (59.9%). There was a significant association between living in an urban area with a higher prevalence of hypertension and obesity in younger people under 60 years compared with those living in a rural area.<sup>34</sup> Younger people may be more vulnerable to hypertension by a quick modernised lifestyle change. Also in our report, a higher prevalence of hypertension in Leh town (44.7%) was observed, especially in the middle-aged group of 40–59 years, compared with other areas (19.6–30.7%).

A higher OR of altitudes from 3000 to 3999 m compared with an altitude below 3000 m was observed after adjustment with age, sex and overweight. One reason may be socioeconomic factor, as this altitude level was compatible with that of the urban area of Leh town and urban dwellers had a higher rate of hypertension and obesity by lifestyle change compared with rural dwellers. Another reason may be the effect of high altitude itself, as the dwellers in Sham subdivision at the altitude of 3000–3999 m had a higher prevalence of hypertension in spite of a lower prevalence of overweight compared with those dwelling below 3000 m. The highest prevalence in older people was shown at a higher altitude over 4000 m. Moreover, the prevalence of hypertension rose closely with altitude remarkably in farmers ( $p<0.001$ ), mildly in sedentary workers ( $p=0.09$ ) and insignificantly in nomads (table 5). That is the reason why the higher altitude range of 3000–3999 and 4500– (OR 2.18) kept significant association with hypertension after adjustment with age, occupation or dwelling area by the multivariate analysis, which also supports the effect of high altitude itself to hypertension.

The limitation of this paper is that it did not look into the genetic factors, as environmental and genetic factors may contribute to regional and racial variations of blood pressure and prevalence of hypertension. Genetic

evidence for high-altitude adaptation in Tibetan people was reported recently.<sup>36, 37</sup> A relatively lower prevalence of hypertension in spite of a higher one of overweight in Changthang Tibetan natives (hypertension/overweight; 19.7% vs 31.9%/39.5% vs 10.4%) compared with Changthang Ladakhi living at higher altitude (4000–4900 m) was observed in our report. The association between the hypoxic adaptation gene and hypertension should be studied further. The strength of this study is that it looked into most of the environmental factors known to influence hypertension in the population of different distinct geographical subdivisions of a high-altitude region. This study showed the influence of ageing, overweight, modernised sedentary occupations and rural-to-urban migration and dwelling in urban areas to hypertension as well as the effect of high altitude on hypertension by multivariate analysis.

The conclusion reached is that like everywhere else in the world, hypertension prevalence in a high-altitude population has multifactorial aetiology. Our study shows that age, gender, socioeconomic factors, culture, race and changing lifestyle play a big role with the effect of high altitude itself on the high prevalence of hypertension.

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## Prevalence of hypertension at high altitude: cross-sectional survey in Ladakh, Northern India 2007–2011

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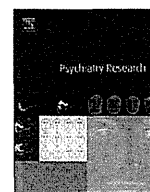
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## Association between risk perception, subjective knowledge, and depression in community-dwelling elderly people in Japan



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### ABSTRACT

Risk perception is one of the core factors in theories of health behavior promotion. However, the association between knowledge, risk perception, and depressed mood in depression is unknown. The aim of this study was to clarify the relationships between subjective knowledge, risk perception, and objective scores of depression in community-dwelling elderly people in Japan. A total of 747 elderly participants (mean age: 76.1, female: 59.8%) who completed the 15-item Geriatric Depression Scale (GDS-15) along with items assessing subjective knowledge and risk perception were included in the analysis. We assessed the correlation between subjective knowledge and risk perception, and then compare GDS-15 scores by level of subjective knowledge and risk perception. Subjective knowledge was weakly associated with risk perception and related to lower GDS-15 scores in a dose-response pattern, which did not change after adjusting for age, gender, basic activities of daily living (ADL), instrumental ADL, years of education and history of depression. There was no significant association between risk perception and GDS-15 scores. The relationship between knowledge, risk perception, and depressed mood in younger generations is unclear, but warrants examination.

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### 1. Introduction

Risk perception is a core factor in most theories of health behavior promotion, such as fear appeal theory, protection motivation theory, the health belief model, and the extended parallel process model. The basic concept across theories is that perception of high personal risk increases the likelihood of taking precautions and changing behavior; however, the factors that lead to modified behavior differ across the various theories (Weinstein and Nicolich, 1993). For example, in the extended parallel process model, precautionary behavior depends on two appraisals: threat and efficacy. If perceived threat or perceived efficacy is low, precautionary behavior will not be taken. Precautionary behavior is taken only when both perceived threat and perceived efficacy are high (Witte, 1992).

Several meta-analyses have shown that risk perception influences health behavior in empirical settings, although effect sizes have varied. For example, in a review of 34 studies with 15,988 participants about vaccination, risk likelihood ( $r=0.26$ ), susceptibility ( $r=0.24$ ,

and severity ( $r=0.16$ ) significantly predicted vaccination behavior (Brewer et al., 2007). Another review of 15 studies with 16,293 participants about protection motivation theory reported an effect size (as expressed by Cohen's  $d$ ) of threat vulnerability and severity of 0.54 (Floyd et al., 2000). Witte and Allen conducted a meta-analysis of fear appeal and reported the effect size of severity was  $r=0.13$  (16 studies,  $n=2528$ ) and susceptibility was  $r=0.14$  (11 studies,  $n=1797$ ) (Witte and Allen, 2000).

There is evidence that knowledge of depression affects attitudes and behavior. Indeed, "Blues-out," a depression awareness campaign targeting the gay/lesbian community in Switzerland, was found to significantly reduce the lifetime prevalence of suicidal ideation and suicide plans of studied participants (Wang et al., 2013). The campaign included brochure and website offering basic information on depression, a symptoms checklist, a list of gay-friendly providers and institutions for consultation, a hotline, and emergency cards. Furthermore, the "Defeat Depression Campaign" in the United Kingdom positively changed public attitudes toward depression, reported experiences of depression, attitudes toward antidepressants, and attitudes toward treatment from general practitioners, by about 5–10% (Paykel et al., 1998). In addition, 40.7% of general practitioners definitely or possibly made changes in practice as a result of the

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campaign (Rix et al., 1999). Thus, knowledge of depression may positively influence attitudes or behavior, however the relationship between knowledge and risk perception in depression remains unclear. Clarification of this relationship is important for effective health promotion regarding depression.

The relationship between knowledge, risk perception, and depressed mood in depression is another concern. Few studies have investigated the influence of risk perception on depressed mood. A study of patients with multiple sclerosis showed that a higher perception of short-term risk of wheelchair dependence was significantly related to higher levels of anxiety (regression coefficient  $B=0.78$ ,  $P < 0.001$ ) and depression ( $B=0.45$ ,  $P < 0.01$ ) (Janssens et al., 2004), whereas another study reported that knowledge of evidence-based patient information increased the accuracy of leukemia risk estimation without increasing concerns (Hofmann et al., 2013).

In summary, the relationship between knowledge, risk perception, and depressed mood remains unclear. Currently, no studies, to our knowledge, are examining this relationship in depression research. However, it would be important to clarify this relationship in the field of depression because if knowledge of depression increase depressed mood of people, the enlightenment campaign of depression could be good will with big side effect.

The depression in elderly population is especially important in the aging society and Japan is one of the most aged countries in the world. According to research on community-dwelling older adults, the proportion of individuals reporting depressive symptoms is 2.8–35% (Beekman et al., 1999). The natural course of laterlife depressive disorders is poor: a 6-year follow-up study showed that 76% of patients followed an unfavorable but fluctuating course or a severe chronic course of depression. A study in the United States found that the additional medical cost per one depressed older adult was USD 686 for 1 year and USD 5271 for 4 years (Unutzer et al., 1997).

Thus, the aim of this study was to clarify the relationship among subjective knowledge, risk perception, and objective scores for depression among community-dwelling elderly people in Japan.

## 2. Methods

### 2.1. Subjects

The study population consisted of 747 community-dwelling elderly people aged 65 years or older living in T town in Japan who completed a depression scale, a subjective knowledge item, and a risk perception item. T town is situated in the midpoint of Shikoku, Japan, and was studied in 2012. Its main industries are agriculture and forestry. The town had a population of 4245, and 1734 (40.8%) residents were aged 65 years or older. The local government distributed self-rating questionnaires to all the elderly people aged 65 years or older except for those who stayed in hospitals or elderly nursing home, and participants mailed their answers

to the local government. The total of 1615 questionnaires were distributed, 982 people responded (60.8%). Among them, 747 questionnaires had no missing data.

### 2.2. Outcome measures

#### 15-Item Geriatric Depression Scale (GDS-15)

The GDS-15 is a validated self-reported depression scale consisting of 15 items with dichotomous answers (yes or no). This scale was developed to exclude the effects of non-specific somatic symptoms such as anorexia and insomnia, which are frequently observed among elderly populations, (Yesavage et al., 1983). The highest possible score is 15, indicating severe depression. Using a cutoff point of 6, the GDS-15 has a sensitivity of 92% and a specificity of 81% to detect major depression as ascertained by the structured clinical interview for the diagnostic and statistical manual of mental disorders, third edition, revised (Lyness et al., 1997). We used the Japanese version of the GDS-15 (Niino et al., 1991). Its sensitivity and specificity using the cut-off point of 6 or more were reported to be 97.3% and 95.9%, respectively (Shreiner et al., 2003). The Cronbach's alpha of GDS-15 in the present study was 0.81.

#### Risk perception and subjective knowledge

Risk perception about depression was evaluated with the question "How do you feel about depression?" Answers were made on a 4-point scale: 4 (very afraid of), 3 (somewhat afraid of), 2 (rarely afraid of), or 1 (not afraid of at all). Subjective knowledge was evaluated with the question "How much do you know about depression?" This answer was also chosen from a 4-point scale: 4 (a lot), 3 (a little), 2 (hardly anything), or 1 (nothing at all).

#### Other variables

Other variables included gender, years of education, basic activities of daily living (BADL), instrumental activities of daily living (IADL), and history of major depression.

BADL was measured with seven aspects of daily functioning: walking, ascending and descending stairs, feeding, dressing, going to the toilet, bathing, and grooming. Each BADL item was evaluated using a 4-point rating scale from 0 (completely dependent) to 3 (completely independent). Scores on the seven BADL items were summed to obtain a total score ranging from 0 to 21. A score of 21 on the BADL indicated complete independence (Matsubayashi et al., 1996; Pace, 1989).

IADL was assessed using the instrumental ADL subscale of the Tokyo Metropolitan Institute of Gerontology Index of Competence rating scale (Koyano et al., 1991). It was composed of five items: the ability to use public transport, buy daily necessities, prepare a meal, pay bills, and handle banking matters. Each item is rated as "yes" or "no." The range of scores is from 0 to 5, with higher scores indicating better IADL.

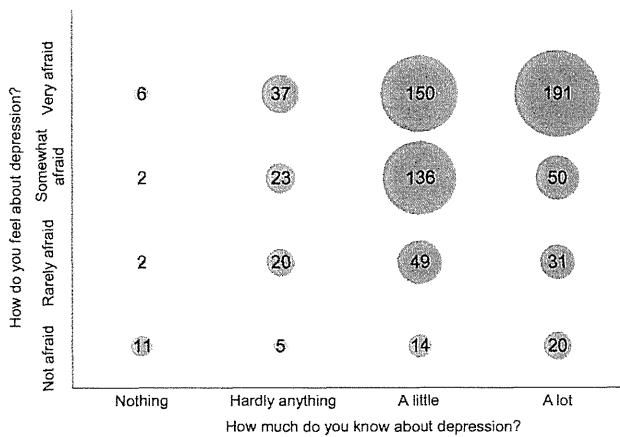
### 2.3. Analysis

Statistical analysis was performed using SPSS Statistics ver. 20.0 (IBM Inc., Armonk, NY). The correlation coefficient between risk perception and subjective knowledge was calculated using Spearman's rank correlations. Differences between variables among categories were examined using ANOVA (with Bonferroni post-hoc analysis when population variance was same and with Games-Howell post-hoc analysis when population variance was different) for continuous variables and chi-square tests for categorical variables. We used multivariate linear regression modeling to determine the adjusted association of GDS-15 scores with the level of subjective knowledge and risk perception, as well as age, gender, history of depression, BADL, and IADL. Predictors were included using the stepwise method in the multivariate regression model. Significance was set at 0.05 for all analyses.

**Table 1**  
Basic characteristics of participants according to level of subjective knowledge and risk perception.

	Total (n=747)	Risk perception				p	Subjective knowledge				p
		Very much (n=384)	Somewhat (n=211)	Rarely (n=102)	Not at all (n=50)		Very much (n=292)	A little (n=349)	Hardly (n=85)	Not at all (n=21)	
Age	76.1 (7.3)	76.2 (6.9)	75.7 (7.7)	76.1 (7.4)	76.4 (8.1)	n.s.	75.0 (6.5)	75.8 (7.5)	79.9 (7.0)	79.0 (8.5)	< 0.001
Female, %	59.8	63.5	60.2	53.9	42.0	0.02	41.2	46.8	50.6	52.4	0.045
GDS-15	5.1 (3.4)	5.3 (3.4)	5.2 (3.4)	5.2 (3.4)	4.7 (3.3)	n.s.	4.3 (3.1)	5.4 (3.4)	6.0 (3.7)	8.3 (3.9)	< 0.001
History of major depression, %	4.8	2.9	6.3	7.8	4.8	n.s.	4.3	5.9	2.5	0	n.s.
Years of education	9.8 (2.3)	9.6 (2.2)	10.0 (2.3)	10.3 (2.3)	9.8 (2.2)	n.s.	10.0 (2.3)	9.9 (2.3)	9.1 (1.6)	8.7 (1.9)	< 0.001
Basic ADL (0–21)	20.1 (2.3)	20.1 (2.2)	20.1 (2.4)	20.3 (2.3)	20.1 (3.0)	n.s.	20.6 (1.4)	20.1 (2.4)	19.1 (3.3)	18.8 (4.5)	< 0.001
Instrumental ADL (0–5)	4.4 (1.3)	4.4 (1.3)	4.5 (1.2)	4.5 (1.3)	4.4 (1.2)	n.s.	4.7 (0.9)	4.4 (1.3)	3.8 (1.8)	3.5 (2.0)	< 0.001

Note: Data are presented as mean (S.D.) unless otherwise noted. Chi-square test and ANOVA were used for categorical and continuous variables, respectively. ADL=activities of daily living.



**Fig. 1.** Relationship between risk perception and subjective knowledge of depression. The size of the bubble corresponds to the number of each category shown inside the bubble. Spearman's  $r=0.20$ ,  $p<0.001$ .

#### 2.4. Ethical approval

The study was approved by the Institutional Ethical Review Board of the Graduate School of Medicine, Kyoto University (E-18). All the participants provided written informed consent.

### 3. Results

Table 1 shows the basic characteristics of participants by level of subjective knowledge and risk perception. One-way independent ANOVAs were conducted to compare the differences in subjective knowledge and risk perception by each continuous variable. There was a significant effect of subjective knowledge on age, BADL score, and IADL score. Post-hoc test revealed that there are significant differences between "hardly anything" and "a little" ( $p<0.001$ ), "hardly anything" and "a lot" ( $p<0.001$ ) in age; "hardly anything" and "a lot" ( $p<0.005$ ), and "a little" and "a lot" ( $p<0.005$ ) in BADL; "hardly anything" and "a little" ( $p<0.05$ ), "hardly anything" and "a lot" ( $p<0.001$ ), and "hardly anything" and "a lot" ( $p<0.05$ ) in IADL. Both subjective knowledge and risk perception differed significantly by gender; however, there was no significant difference by a history of depression. There were no significant differences in level of risk perception by age, years of education, BADL score, and IADL score.

The correlation between risk perception and subjective knowledge was weak but significant ( $r=0.20$ ,  $p<0.001$ ) (Fig. 1). This indicates that the more participants felt they had knowledge of depression, the more they were afraid of depression.

Mean (SD) GDS-15 scores by level of risk perception were 4.7 (3.6) ( $n=50$ ) for "not at all," 4.4 (3.3) ( $n=102$ ) for "rarely," 5.2 (3.4) ( $n=211$ ) for "somewhat" and 5.3 (3.4) ( $n=384$ ) for "very much." There was no significant effect of risk perception on GDS-15 scores ( $F(3, 743)=2.06$ ,  $p=n.s.$ ) (Table 1). However, there was a significant effect of subjective knowledge on GDS-15 scores,  $F(3, 743)=15.4$ ,  $p<0.001$ ,  $\omega=0.23$  (Table 1). Mean GDS-15 scores by the level of subjective knowledge were 8.3 (3.9) ( $n=21$ ) in "not at all," 6.0 (3.7) ( $n=85$ ) in "hardly," 5.4 (3.4) ( $n=349$ ) in "a little" and 4.3 (3.1) ( $n=292$ ) in "a lot". The post-hoc analysis revealed that there were significant differences in GDS-15 scores between the groups of "not at all" and "hardly" ( $p=0.02$ ), "a little" ( $p=0.001$ ) and "a lot" ( $p<0.001$ ), "hardly" and "a lot" ( $p<0.001$ ), and "a little" and "a lot" ( $p<0.001$ ).

Table 2 shows the results of the multivariate linear regression analysis for variables predicting GDS-15 scores. Model 1 is a univariate linear regression with only subjective knowledge or risk perception. Then, we adjusted for gender and age (Model 2), and then gender, age, history of depression, BADL score, and IADL score (Model 3).

Univariate analysis revealed that both age and gender significantly predicted GDS-15 scores (age:  $\beta=0.20$ ,  $p<0.001$ ; female:  $\beta=0.09$ ,  $p=0.02$ ). Level of risk perception did not significantly predict GDS-15 scores in the univariate analysis or in the multivariate analysis adjusted for gender and age. In terms of subjective knowledge, there were significant associations between subjective knowledge and GDS-15 scores after adjusting for gender, age, history of depression, BADL score, IADL score, and years of education.

### 4. Discussion

Results of this study indicate that people with subjective knowledge of depression are more afraid of depression and less depressed, however that risk perception was not significantly related to depressed mood. A negative dose–response relationship was observed between subjective knowledge and depressed mood, and the results did not change after adjustment for age, gender, history of depression, BADL score, IADL score and years of education, which are known influencing factor on depressive mood (Djernes, 2006). These results are especially important for community assessment and prevention programs such as the enlightenment campaign. Although the present study could not explain cause and effect relationships as it was cross-sectional study, the present result show one possibility that increasing knowledge may prevent people from becoming depressed even if risk perception is increased.

Additionally, the present results reinforced the theories of health promotion behavior that message, namely knowledge, is the premise of risk perception. Because the present result showed that those who answered that they knew nothing about depression tend to feel less fear.

There are few studies on risk perception, knowledge, and anxious or depressed mood; those that have been conducted included subjects such as multiple sclerosis patients and staff reporting blood exposure incidents (Cockcroft et al., 1994; Hofmann et al., 2013; Janssens et al., 2004). The present study is the first to investigate these topics in relation to depression among community-dwelling elderly in the general population.

Thus far, three studies on the relationship among risk perception, knowledge, and depressed mood or anxiety have been conducted, and their results varied. One of the three studies concluded that knowledge increases risk estimation without increasing concerns (Hofmann et al., 2013), whereas the other two studies concluded that initial knowledge is not related to anxiety, but that increased risk perception is related to anxiety or depression (Cockcroft et al., 1994; Janssens et al., 2004). The present study supports the former result.

Although the full comparison of the results is difficult because the previous studies are about high risk subjects and the present study is about low risk community-dwelling subjects, possible explanations for the contradictory results are as follows. First, age may be related to the difference in results. The mean age of participants in the studies demonstrating increased anxiety with higher risk perception was relatively low (mean age=37.5, S.D.=9.5 (Janssens et al., 2004); median age: 27, range: 19–59 (Cockcroft et al., 1994), respectively); in contrast, the mean ages (S.D.) of participants in studies not demonstrating this relationship are 50.3 (9.8) (Hofmann et al., 2013) and 77.0 (7.2), respectively. A meta-analysis of age differences in risk taking suggests that elderly people take more risks than do younger people on a task where participants are unsure of the probability of risk and need to learn not to take a specific action (Mata et al., 2011). It is suggested that learning related to risk avoidance may become impaired with aging (Mata et al., 2011). This may be related to the results of previous studies and the present study that elderly people are less anxious thus less depressed in situations where the probability of a risk is unclear.

**Table 2**

The results of multivariate linear regression analysis for variables predicting GDS-15 scores.

		B	SE B	$\beta$			B	SE B	$\beta$
<b>Step 1</b>					<b>Step 1</b>				
Risk perception	Not at all	Reference			Subjective knowledge	Not at all	Reference		
	Rarely	-0.32	0.59	-0.03		Hardly anything	-2.37	0.81	-0.22*
	Somewhat	0.52	0.54	0.07		A little	-2.94	0.74	-0.43**
	Very much	0.55	0.51	0.08		A lot	-4.06	0.75	-0.58**
<b>Step 2</b>					<b>Step 2</b>				
Age		0.09	0.17	0.19**	Age		0.08	0.02	0.16**
Female		0.45	0.26	0.06	Female		0.62	0.25	0.09***
Risk perception	Not at all	Reference			Subjective knowledge	Not at all	Reference		
	Rarely	-0.35	0.60	-0.04		Hardly anything	-2.40	0.80	-0.22*
	Somewhat	0.64	0.56	0.08		A little	-2.77	0.74	-0.41**
	Very much	0.5	0.53	0.07		A lot	-3.85	0.74	-0.55**
<b>Step 3</b>					<b>Step 3</b>				
Age		0.08	0.02	0.02	Age		0.02	0.02	0.03
Female		0.39	0.25	0.06	Female		0.47	0.24	0.07
Risk perception	Not at all	Reference			Subjective knowledge	Not at all	Reference		
	Rarely	-0.32	0.57	-0.03		Hardly anything	-2.72	0.94	-0.26*
	Somewhat	0.68	0.53	0.09		A little	-2.41	0.90	-0.35*
	Very much	0.61	0.51	0.09		A lot	-3.12	0.90	-0.45*
No history of depression		-4.14	0.56	-0.27	No history of depression		-4.03	0.55	-0.26**
BADL		-0.19	0.07	-0.14*	BADL		-0.18	0.07	-0.13*
IADL		-0.73	0.13	-0.28**	IADL		-0.70	0.13	-0.27**
Years of education		-0.16	0.06	-0.10*	Years of education		-0.16	0.06	-0.10*

Note: Adjusted  $R^2$ : 0.004 in Step 1, 0.05 in step 2, and 0.28 in step 3 in the analysis including risk perception; 0.06 in Step 1, 0.08 in step 2, and 0.30 in Step 3 in the analysis including subjective knowledge.

BADL=basic activities of daily living; IADL=instrumental activities of daily living; GDS-15=15-item Geriatric Depression Scale.

\*  $p < 0.01$ .

\*\*  $p < 0.001$ .

\*\*\*  $p < 0.05$ .

and there is no specific choice of action to prevent the event. Studies focusing on elderly populations are becoming much more important as the aging population grows.

Second, studies evaluated different aspects of risk. Two of the studies evaluated the probability of risk (Cockcroft et al., 1994; Hofmann et al., 2013) and the other study evaluated probability and seriousness of risk (Janssens et al., 2004). A meta-analysis of the relationship between risk perception and vaccination behavior showed the effect size of prediction for vaccination behavior was different between risk likelihood ( $r=0.26$ ) and severity ( $r=0.16$ ) (Brewer et al., 2007). Based on this finding, probability and seriousness of risk may have different influences on mood and behavior, which leads to the different results among previous studies and the present study.

Third, the targeted diseases or disorders differ. Hepatitis B virus is acute infection, whereas multiple sclerosis and depression are chronic diseases. In a previous study, increased anxiety and depression was observed when participants perceived that events would happen in the short-term (2 years), while anxiety was not observed when they perceived that events would happen in the long-term (10 years) or lifetime (Janssens et al., 2004). These results imply that if an event is perceived to happen in the short-term (e.g., an acute infection), people seem to feel more anxiety or depression about the event.

The method of diagnosis also differed. The diagnosis of physical diseases such as HIV, hepatitis B virus and multiple sclerosis is more objective and can be visualized. However, the diagnosis of major depression is heavily dependent on symptoms and history, and there are no established diagnostic laboratory examinations. These differences in criteria for diseases or disorders is related to uncertainty, which can affect anxiety (Grupe and Nitschke, 2013).

This study has several limitations. First, we used a subjective knowledge scale, and subjective knowledge is not equal to actual knowledge. Nevertheless, the present study shows that subjective feelings that one knows about depression are important. Furthermore, subjective knowledge may reflect self-efficacy, which should be investigated in future studies. Additionally, the risk scale in the present study only measured the perceived seriousness of

depression. The perceived possibility of the risk may influence depression in a different way, as mentioned above. Finally, the population of this study was elderly people over 65 years old. Focusing on this population is important in an aging society like Japan; however, the relationship between perception of risk and depressed mood may be different among different age groups.

In conclusion, risk perception is related to subjective knowledge and subjective knowledge is associated with lower depressed mood in community-dwelling elderly people. Although the present study could not explain cause and effect relationships as it was cross-sectional study, there is possibility that increasing knowledge may prevent people from becoming depressed even if risk perception is increased. Information should be provided for elderly people to improve their confidence in their knowledge of depression. The relationship between knowledge, risk perception, and depressed mood in younger generations is unclear, but warrants examination.

### Contributors

H.I. and K.M. made substantial contribution to the conception and design of the study, were involved in drafting the manuscript and are responsible for the administration and direction of the study as well as the analysis and interpretation of data. K.O. and E.F. assisted with the negotiation with the local government and were responsible for the preparation of the study materials as well as the analysis and interpretation of data. Y.I., Y.K., W.C. and M.T. were responsible for data collection. T.W., R.S. and M.F. contributed to the conceptualization of the study and were responsible for data analysis and interpretation. All authors read and approved the final manuscript.

### Conflict of interest

The authors declare no conflict interests.



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## ラダーク高所農・牧民と市街移住者における、 うつと QOL の健康関連要因の比較

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キーワード：ラダーク、うつ、QOL

### 1. はじめに

高所住民は低所住民と比較して、うつが少なく、主観的 QOL が高いことが、高所プロのこれまでの研究より報告された<sup>1-3)</sup>。さらに、都市に住む近代的な生活を営む高所住民は、農村や牧畜地域の高所住民に比較して、生活習慣病が多く、生活機能や QOL の劣化、うつ症状の高いことも報告された<sup>4-12)</sup>。

今回は、うつが少なく、主観的 QOL が高いラダーク高所牧民と、市街部へ移住し職業の異なる市街在住者を比較し、うつや主観的 QOL の劣化に関連する要因を明らかにするために、高齢者の総合的健康指標を横断的に比較検討した。また、辺境の谷に暮らす農民の健康包括指標とも比較し、うつや QOL に関連する総合的健康指標の地域的な違いや共通点についても考察した。

### 2. 方法

#### 1) 対象

50 歳以上の、ドムカル在住者、レー市街在住者、チャンタン高原牧畜民の 3 地域住民を対象とした。以下に対象数、平均年齢、男女数、民族を示した。レーでは移住者の内訳を示した。

- ① ドムカル在住者 (2009 年)  
213 人 (63.1 歳 ± 9.3 歳、男 / 女 : 87/126) :  
全員 Ladakhi
- ② レー市街在住者 (2010 年)  
227 人 (64.4 歳 ± 9.8 歳、男 / 女 : 98/129)  
Tibetan 移住者 : 196 人  
Ladakhi 移住者 : 23 人  
Leh 在住 Ladakhi : 8 人
- ③ チャンタン高原牧畜民 (2011 年)  
133 人 (61.4 ± 9.0 歳、男 : 女 = 71 : 62)  
Tibetan 牧民 : 47 人  
Ladakhi 牧民 : 86 人

#### 2) 高齢者の総合的健康指標の評価

総合的な健康度は、医学的診察、身体計測とともに ADL、うつや主観的な QOL の評価を総合して行った。評価表を英語版から通訳を介して、チベット語あるいは、ラダーク語に翻訳し、各自に問診した。

##### a) 高血圧と耐糖能異常の診断

自動血圧計 (HEM、Omron 社製) を用いて座位により 2 回血圧測定を行い、平均値を求めた。また、早朝空腹時に、総コレステロール値、HDL

コレステロール値、中性脂肪を測定した。

耐糖能障害（ブドウ糖負荷テストによる75gOGTTによる空腹前と負荷後2時間後に血糖を測定し、糖尿病と境界群）を診断した（WHO基準）。

#### b) 日常生活動作（ADL）

基本的ADL評価については、歩行、階段昇降、食事摂取、着衣、トイレ動作、入浴、身だしなみなど7項目に関して自立度をもとに、介助を必要とするかどうかを評価した。完全に自立していれば3点、いくらか介助を要する2点、かなり介助を要すれば1点、全介助0点として3点から0点とした。それぞれの指標を合計して0点から21点で示し、点数が低ければ機能障害を意味している。21点満点の割合を自立率（%）として計算した<sup>13)</sup>。高次ADL能力指標として、東京都立老人医療センター作成老人指標を用いて、自立度を評価した。この指標は3部13項目で構成されている。手段的ADL（5項目、各種乗り物を利用して外出、日用品の購入、調理、お金の支払、銀行への預貯金も含めた財産の管理を、はい、いいえで回答）、知的活動能（4項目、書類の記入、新聞を読む、本や雑誌を読む、健康に関するニュースや番組に興味があるなど、はい、いいえで回答）、社会的役割（友人の訪問、親類や友達への助言、お見舞い、若い人に自分から話しかけるなど、はい、いいえで回答）である。それぞれ、満点が5点、4点、4点であり、満点の割合を自立率（%）として計算した<sup>14)</sup>。

#### c) うつと主観的QOL

英語で作成された老人うつ指標15問版（GDS-15）を現地語に翻訳して、うつのスクリーニングを行った<sup>15)</sup>。われわれは、GDS-15の6点以上をうつと定義し、6～9点を軽度うつ、10点以上を重度うつと定義した。主観的QOLは100mm線分visual analog scale（左端の0が最も悪く、右端の100が最も良い）を用いて、5項目、主観的健康度、主観的家族関係、主観的友人関係、主観的経済状態、主観的幸福度を評価し、被験者の示した点の左端よりの長さ（0 - 100）で示した<sup>16)</sup>。

#### d) 歩行・バランス能力

アップアンドゴーテストにより、椅子から立ち上がり、3mの距離を、通常の速さで歩いて、Uターンしてもどり、椅子に再び座るまでの時間

を測定して、歩行、バランス能力を調べた<sup>17)</sup>。

### 3) 解析方法

- ① 3地域（ドムカル、チャンタン、レー）の生業の比較：カイ二乗検定と分散分析
- ② 3地域の高齢者の総合的健康指標（Comprehensive geriatric function: CGF）の比較：カイ二乗検定と分散分析
- ③ 移住・民族の影響（チャンタンの牧民とレーへの移住者の比較）：カイ二乗検定と分散分析
- ④ 生業別の総合的健康指標の比較
- ⑤ 全地域に共通する、QOLやGDSへの関連要因（社会的要因とCGF）：ロジスティック多重解析
- ⑥ 各地域別の、QOLやGDSへの関連要因（社会的要因とCGF）の違いの比較：多変量解析：ロジスティック多重解析

参加者の職業は、8群に分類した。牧畜民、農民、主婦、日雇い肉体労働、僧侶、デスクワーク業、デスクワーク業の引退者、無職である。主婦は、専業主婦とともに農業と牧畜を兼ねる者も多く含まれる。デスクワーク業には、公務員、店舗業、運転手、オフィス業、観光業、教師などが含まれる。

本調査は、総合地球環境学研究所の倫理委員会の審査に適合し、検診への参加者からは、同意を署名にて得た。統計処理は、ANOVA、 $\chi^2$ 検定と、ロジスティック回帰分析を使用し、P値0.05未満を統計的有意とした。下記の1—6)を解析した。

### 3. 結果

#### 1) 3地域（ドムカル、チャンタン、レー）の生業の比較（表1）

ドムカルは、90.4%が農業または主婦、チャンタン高原では、98.5%が牧畜または主婦であった。一方、市街地のレーでは、無職28.4%、役所、サービス、運転手、観光などのデスクワーク（座業、非肉体労働）20.4%であった。

#### 2) 3地域の高齢者の総合的健康指標（Comprehensive geriatric function: CGF）の比較（表2）

レー市街住民対象者（64.4歳）は、チャンタン牧民対象者（61.4歳）に比較してやや高齢であった。チャンタン牧民は、やや男性が多く、他2群

ラダークうつと QOL の関連要因の比較 (奥宮清人ほか)

表 1 ラダーク：農業地域 (ドムカル)、牧畜地域 (チャンタン高原) と市街部 (レー) の生業の比較

ラダーク	ドムカル# (N=213)	レー (N=227)	チャンタン高原\$ (N=133)	p
年齢 (才)	63.1±9.3	64.4±9.8\$\$	61.4±9.0	0.014
男/女 (男 %)	87/126 (41)	98/129 (43)	71/62 (53)	0.062
生業 (%)				<0.0001
牧畜	0	0	89.4	
農業	38	1.3	0	
主婦	52.4	28.9	9.1	
日雇い肉体労働	0	14.2	0	
僧侶	1	4	1.5	
無職	0	28.4	0	
デスクワーク	4.3	20.4	0	
(役所, サービス, 運転手, 観光など)				
デスクワーク退職	4.3	2.7	0	

表 2 3 地域の高齢者の総合的健康指標 (Comprehensive geriatric function: CGF) の比較

	ドムカル# (N=213)	レー (N=227)	チャンタン高原\$ (N=133)	p
年齢 (才)	63.1±9.3	64.4±9.8\$\$	61.4±9.0	0.014
男/女 (男 %)	87/126 (41)	98/129 (43)	71/62 (53)	0.062
Body mass index (BMI)	22.2±3.2	24.0±4.4###,\$\$	22.5±3.3	<0.0001
体重の異常				
過体重 (BMI>25)(%)	19.3	41.2	17.3	<0.0001
低体重 (BMI<18.5)(%)	10.8	7.5	6.8	ns
収縮期血圧 (mmHg)	133.7±25.0	144.9±27.8***,\$\$\$	134.8±27.0	<0.0001
拡張期血圧 (mmHg)	86.5±13.9	90.5±14.8***,\$\$\$	81.0±12.9###	<0.0001
高血圧 (%)	44.1	56.4	39.1	0.0026
耐糖能異常				
糖尿病 (%)	11.3	5.3	8.6	0.008
境界群 (%)	29.7	27.1	16.4	
糖尿病/境界群 (%)	41.0	32.4	25.0	0.008
総コレステロール (mg/dL)	171.6±33.1	175.0±33.2\$	166.2±31.6	0.053
中性脂肪 (mg/dL)	95.6±37.5\$	91.5±41.4	85.7±44.8	0.096
HDL コレステロール (mg/dL)	60.3±14.4	49.2±9.1###	49.2±10.3###	<0.0001
ADL				
基本的生活機能 (0-21)	20.5±1.9	20.0±2.4#	20.3±2.1	0.068
% 自立率	82.9	68.5	80.9	0.0008
手段的高次活動能力 (0-5)	4.2±1.0	3.6±1.6###	3.5±1.4###	<0.0001
% 自立率 (p=0.07)	43.9	40.8	20.6	<0.0001
知的活動度 (0-4)	1.3±0.9	1.2±1.3\$\$\$	0.6±1.0###	<0.0001
% 自立率	5.4	10.7	3.8	0.023
社会的活動度 (0-4)	3.9±0.5	3.4±0.9###,\$\$\$	3.7±0.7	<0.0001
% 自立率	89.8	60.5	83.3	<0.0001
高次活動能力合計 (0-13)	9.3±1.7	8.3±3.0###	7.8±2.3###	<0.0001
情緒				
うつスケール (0-15)	5.6±2.8	5.8±3.1\$\$\$	3.4±2.7###	<0.0001
うつ状態				
% 軽度うつ症状: GDS 6-9	43.2	37.4	9.1	<0.0001
% 高度うつ症状: GDS≥10	7.8	12.3	5.3	
% うつ症状あり: GDS>6	50.9	49.8	14.4	<0.0001
歩行機能、転倒のリスク				
Up & Go test (秒)	11.2±3.6	13.3±5.3***,\$\$\$	11.3±3.3	<0.0001
Up & Go test >16.0秒	6.5	16.0	7.7	0.0037
主観的QOL (Quality of life)				
健康満足度	59.2±18.5	53.7±19.3###,\$	57.8±18.3	0.001
% 健康満足度低い: <52 (median)	43.1	55.3	50.0	0.047
家族関係	82.7±17.2	83.3±15.9\$\$	88.3±16.6##	0.007
% 家族関係低い: <87 (median)	47.7	60.0	34.1	<0.0001
友人関係	82.2±15.8\$	84.2±13.3	86.1±19.6#	0.09
% 友人関係低い: <86 (median)	50.8	52.5	36.6	0.01
経済満足度	61.9±17.8\$\$\$	41.4±18.4###,\$\$\$	53.5±16.3###	<0.0001
% 経済満足度低い: <50 (median)	9.3	70.4	21.1	<0.0001
生活満足度	74.1±16.5	66.7±20.0###,\$\$\$	73.7±19.3	<0.0001
% 生活満足度低い: <70 (median)	23.2	52.1	29.5	<0.0001
幸福度	75.3±17.6\$	67.4±18.6###	69.8±21.7#	0.0001
% 幸福度低い: <70 (median)	24.6	47.5	37.1	<0.0001

#,p<0.05, ##,p<0.01, ###,p<0.001: Fisher PLSD (ANOVA), ドムカルを対照

\$,p<0.05, \$\$,p<0.01, \$\$\$,p<0.001: Fisher PLSD (ANOVA), チャンタン高原を対照

†,p<0.05, ††,p<0.01, †††,p<0.001: カイニ乗テスト

は、女性が多い傾向にあった。

健康指標では、レー市街住民が、過体重や高血圧が他2者より高頻度で、総コレステロールの平均値がチャンタン牧民に比べてやや高値を示した。ドムカル農民の耐糖能異常者の頻度が高く、レーは中間で、チャンタン高原が少なかった。

基本的な生活機能 (ADL) の比較では、ドムカル農民やチャンタン牧民の基本的な ADL は高く完全自立の割合は 80% 以上あったが、レー市街住民の自立率は 70% 未満と低値であった。

高次の生活機能の比較においては、手段の高次活動能力ではドムカル農民が他2者より高く、知的活動度はチャンタン牧民が他2者より低く、社会的活動度はレー住民が他2者より低かった。

情緒の違いを、うつスケールの比較で示すと、チャンタン牧民が他2者よりうつ症状が少なかった。

歩行機能と転倒のリスクを、Up & Go test の結果より比較すると、レー住民が他2者より歩行機能の低下と転倒リスクの高値を示した。

主観的 QOL について、VAS (Visual analogue scale) の評価より比較すると、健康満足度、経済満足度、生活満足度ともに、レー住民が他2者より低値を示し、不満足の高割合が多かった。家族関係や友人関係の満足度においては、チャンタン牧民が他2者より高値を示し、不満足の高割合が少なかった。経済満足度と幸福度は、ドムカル農民が他2者より高かった。

表3 チャンタン高原牧畜民とレーへの移住者 (Ladakhy & Tibetan) の総合的健康指標の比較

	チャンタン高原		レー		p
	Tibetan* 47	Ladakhy# 86	Tibetan 196	Ladakhy 23	
年齢 (才)	60.9±10.0	61.5±8.7	64.0±9.6*	62.5±11.2	0.085
男 (%)	59.6	50	40.3	47.8	0.085
BMI > 25 (%)	34	8.1	41.5	30.4	<0.0001
高血圧 (%)	29.8	44.2	56.1	52.2	0.0082
糖尿病/境界群 (%)	23.9	25.6	31.4	34.8	ns
生業 (%)					<0.0001
牧畜	95.7	85.9	0	0	
農業	0	0	1.5	0	
主婦	4.3	11.8	30.9	21.7	
日雇い肉体労働	0	0	14.4	17.4	
僧侶	0	2.4	0.5	0	
無職	0	0	30.9	17.4	
デスクワーク	0	0	19.1	39.1	
所, サービス、運転手、観光など)					
デスクワーク退職	0	0	2.6	4.3	
B-ADL % 自立率	78.7	82.1	69.4	66.7	0.11
IADL % 自立率	17.4	22.4	41.6	42.9	0.0009
Int-ADL% 自立率	8.5	1.2	10.2	19.0	0.019
S-ADL% 自立率	83.0	83.5	62.0	57.1	0.0003
% うつ症状あり: GDS <sub>6</sub> ≥6	6.4	18.8	49.2	57.1	<0.0001
% Up & Go test >16.0秒	11.9	5.3	16.7	10.0	0.097
% 健康満足度低い: <52 (median)	48.9	50.6	56.0	52.6	ns
% 家族関係低い: <87 (median)	28.3	37.7	61.5	52.6	<0.0001
% 友人関係低い: <86 (median)	36.2	36.9	52.4	52.6	0.045
% 経済満足度低い: <50 (median)	6.5	29.3	71.6	68.4	<0.0001
% 生活満足度低い: <70 (median)	14.9	37.6	51.6	57.9	<0.0001
% 幸福度低い: <70 (median)	25.5	43.5	45.6	63.2	0.023

以上より、レー市街住民には、肥満や高血圧の増加、歩行機能や ADL の低下、うつ症状の増加、主観的 QOL の低下が認められ、ドムカル農民やチャンタン牧民はこれとは逆に、ほとんどの総合的健康指標は良好であった。ただ、ドムカル農民には、耐糖能異常の増加が問題であり、うつ症状もレーと同等に多かった。

次に、これらの違いの生じた背景を、移住・民族の違いから、分析した。

### 3) チャンタン高原牧民とレーへの移住者の総合的健康指標の比較 (表 3)

移住による健康への影響を調べるため、チャンタン高原牧民とレーへの移住者の総合的健康指標の比較を行った。肥満と高血圧の頻度は、移住者が牧畜民よりも高頻度であった。

Tibetan 移住者が、Tibetan 牧畜民よりも高齢であった。Tibetan 移住者における無職者が 30.9% と、Ladakhi 移住者の 17.4% に比べて約 2 倍多く、一方、デスクワーク従事者が 19.1% と、Ladakhi 移住者の 39.1% よりも少なかった。Tibetan、Ladakhi とともに、移住者の方が、牧畜民よりも、手段的 ADL、知的 ADL が高く、一方、社会的活動度は、牧畜民の方が高く保たれていた。

移住者の方が牧畜民よりも、うつ症状が多かった。

Tibetan、Ladakhi とともに、移住者の方が、牧畜民よりも、家族関係、友人関係、経済満足度、生活満足度、幸福度ともに低下していた。

以上、移住の影響により、手段的・知的活動度は上がる一方で、社会的活動度の低下やうつの多発、多くの主観的 QOL の低下をもたらしている可能性が示された。

### 4) 生業別の総合的健康指標の比較 (表 4)

3 地域住民の全対象者を生業別に総合的健康指標の比較を行った。牧畜民は、歩行機能、基本的 ADL や社会的活動度が優れており、うつ症状が少なく、すべての主観的 QOL が優れていた。農業者も同様に、それらに優れていた。一方、無職者は 71.4 歳と高齢であることもあるが、歩行機能低下者や基本的 ADL、社会的 ADL の低下の頻度が高く、多くの主観的 QOL の低下者が多かった。日雇いの肉体労働者は、55.4 歳と若く、歩行機能や基本的 ADL は保たれていたが、うつ症状や多くの主観的 QOL の低下者が多かった。デスクワーク業の従事者は、IADL においては最も優れていたが、家族関係や経済満足度の低下している割合が高かった。

以上、市街の職業従事者は、牧民に比べて、うつ症状は多発し、社会的活動度の低下やすべての主観的 QOL において低下者が高頻度にみられた。

表 4 生業別の総合的健康指標の比較

n	生業							p	
	牧畜	農業	主婦	日雇い肉体労働	僧侶	無職	デスクワーク		デスクワーク退職
年齢 (才)	60.7±9.2	65.8±9.8	62.7±9.0	55.4±6.1	68.8±7.9	71.4±7.0	58.3±7.6	62.3±7.2	<0.0001
男 (%)	57.6	76.8	100	50	100	64.1	58.2	100	<0.0001
BMI > 25 (%)	17.8	12.2	30.6	12.5	69.2	34.9	55.6	26.7	<0.0001
高血圧 (%)	35.6	54.9	44.6	21.9	76.9	62.5	56.4	60	<0.0001
糖尿病/境界群 (%)	25.7	48.8	32.6	15.6	53.8	42.9	20	53.3	0.0002
% Up & Go test >16.0秒	6.7	5.2	11.6	10	16.7	19.7	13	0	0.098
B-ADL % 自立率	81	81.7	75.4	93.8	53.8	58.7	82.7	80	0.001
IADL % 自立率	21.4	47.4	27.9	46.9	33.3	40.3	65.4	73.3	0.0009
Int-ADL % 自立率	3.4	7.7	3.4	6.9	0	9.7	17.3	33.3	<0.0001
S-ADL % 自立率	85.5	82.1	79.9	68.8	58.3	55	75	73.3	0.0004
% うつ症状あり : GDS <sub>6</sub>	13.7	46.2	53.9	50.0	33.3	52.4	43.4	26.7	<0.0001
% 健康満足度低い : <52 (median)	51.3	41.3	52	50	33.3	57.1	46	46.7	ns
% 家族関係低い : <87 (median)	31.5	54.1	53.5	59.4	45.5	60.0	59.2	26.7	<0.0001
% 友人関係低い : <86 (median)	32.8	58.1	51.1	62.5	41.7	54.0	46.0	33.3	0.0063
% 経済満足度低い : <50 (median)	20.4	11.0	33.9	75	33.3	64.5	62	40	<0.0001
% 生活満足度低い : <70 (median)	29.1	27	30.8	68.8	27.3	50.8	46	40	<0.0001
% 幸福度低い : <70 (median)	33.3	21.6	35.1	59.4	33.3	50.8	44	20	0.0014

## 5) 3地域全体における、うつ症状と主観的 QOL への関連因子 (表 5)

加齢とともに、うつ症状は増加し、家族関係と経済満足度の低下者が増加した。男性は女性よりも、健康満足度が高かった。

ロジスティック多重解析にて交絡因子 (年齢と性) の影響を調整し、下記の各因子のうつ傾向と主観的 QOL 低下に対するオッズ比を分析した。

過体重が経済満足度の低下のリスクであった。糖尿病や境界群を有することは、経済満足度、生活満足度や幸福度の低下には負のリスク (QOL が高かった) であった。基本的・高次 ADL の各項目で非自立であることや歩行機能の低下が、うつ傾向のリスクであった。IADL 非自立は、経済満足度低下の負のリスク (QOL が高かった) であった。社会的参加度の低い方が、すべての主観的 QOL の低下のリスクを示した。

歩行機能の低下 (Up & Go test > 16 秒) は、うつ傾向のリスクであった。

牧民に比べて、農業、主婦、日雇い肉体労働、

無職デスクワークの従事は、多くの主観的 QOL の低下のリスクを示した。

チャンタン牧民 Tibetan に比較して、レー移住民に属することは、うつ傾向と多くの主観的 QOL の低下のリスクを示した。

以上より、年齢、生活機能低下、社会的活動低下、運動能力低下、市街の職業従事、移住といった要因が、うつや主観的 QOL の低下のリスクであった (年齢と性の影響の調整済)。

## 6) 3地域別にうつ症状と主観的 QOL への関連因子の違いを検討 (表 6)

うつ症状と主観的 QOL への関連因子が、各 3 地域において、違いがあるかを検討するために、表 5 の各独立変数について、3 地域別にロジスティック多重解析 (年齢と性を補正) を行なった。生業と移住・民族の要因は、各地域の特徴と重複するために、表 6 での解析からは除外した。表 6 の各カラムには、ドムカル、レー、チャンタンにおける各独立変数のオッズ比を、D (オッズ比)、

表 5 3地域全体における、うつ症状と主観的 QOL への関連因子 (ロジスティック多重解析)

独立変数	従属変数						
	%うつ症状あり: GDS>6	健康満足度低い <52(median)	家族関係低い <87(median)	友人関係低い <86(median)	経済満足度低い <50(median)	生活満足度低い <70(median)	幸福度低い <70(median)
n							
年齢(才)	1.03**	1.01	1.03**	1.02#	1.02*		1.02#
男(%)	0.74#	0.66*					0.72#
BMI > 25 (%)					1.85**		
高血圧 (%)							
糖尿病/境界群(%)		0.65*				0.50***	0.56**
B-ADL 非自立	2.72****					0.64#	
IADL 非自立	1.60*		1.41#		0.64*	0.72#	1.93#
Int-ADL 非自立	2.80*		1.99#				
S-ADL 非自立	2.25**	1.53*	1.54*	2.0**	2.61***	1.80**	2.39***
Up & Go test > 16.0秒	2.79**						
<b>生業 (%)</b>							
牧畜	1.0 (Reference)	1.0	1.0	1.0	1.0	1.0	1.0
農業	4.60****		2.18*	2.73**	0.42#		0.53#
主婦	8.55****		2.51**	1.99*			
日雇い肉体労働	7.68****		3.74**	3.63**	14.0****	6.0***	3.25**
僧侶							
無職	5.36****		2.42*	2.12*	5.29****	2.09*	
デスクワーク	6.66****		3.37***		7.58****	2.31*	
デスクワーク退職							
<b>移住・民族</b>							
チャンタン牧民 Tibetan	1.0 (Reference)	1.0	1.0	1.0	1.0	1.0	1.0
チャンタン牧民 Ladakhy					5.82**	3.38**	
ドムカル 農民	14.4****		2.19*				
Tibetan 移住者	13.1****		3.79***		34.4****	5.77****	2.18*
Ladakhy 移住者	19.9****		2.81#		30.7****	7.65**	4.79**
Leh 在住者	10.1*		1.69		10.2*		4.05*

各因子を、ロジスティック多重解析にて、年齢、性で補正済み。

オッズ比#, オッズ比\*, オッズ比\*\*, オッズ比\*\*\*; 3地域全体の対象者の解析にて、#:p<0.1, \*:p<0.05, \*\*:p<0.01, \*\*\*:p<0.001で有意差を認めた。

表 6 3 地域別の、うつ症状と主観的 QOL への関連因子の違いの検討 (地域別ロジスティック多重解析)

独立変数	従属変数						
	%うつ症状あり: GDS>6	健康満足度低い <52(median)	家族関係低い <87(median)	友人関係低い <86(median)	経済満足度低い <50(median)	生活満足度低い <70(median)	幸福度低い <70(median)
n							
年齢(才)			C <sup>**</sup> (1.06)	C <sup>*</sup> (1.05)		C <sup>*</sup> (1.04)	C <sup>*</sup> (1.06)
男	L <sup>**</sup> (2.09), C <sup>*</sup> (0.25), D <sup>**</sup> (0.44)	C <sup>*</sup> (0.48), D <sup>**</sup> (0.45)		C <sup>*</sup> (0.45)		C <sup>***</sup> (0.19), L <sup>*</sup> (1.74)	C <sup>**</sup> (0.28)
BMI > 25						L <sup>*</sup> (1.74), C <sup>***</sup> (0.19)	
高血圧						L <sup>**</sup> (0.44)	L <sup>*</sup> (0.50)
糖尿病/境界群		D <sup>**</sup> (0.39)					
B-ADL 非自立	L <sup>***</sup> (3.41), D <sup>*</sup> (2.28)		L <sup>*</sup> (0.49)		C <sup>*</sup> (0.20)	L <sup>***</sup> (0.34)	D <sup>*</sup> (0.24)
IADL 非自立							
Int-ADL 非自立							
S-ADL 非自立							
Up & Go test >16.0秒							

各因子を、ロジスティック多重解析にて、年齢、性で補正済み。  
 オッズ比#, オッズ比\*, オッズ比\*\*, オッズ比\*\*\*: 3地域全体の対象者の解析にて、#: p<0.1, \*: p<0.05, \*\*: p<0.01, \*\*\*: p<0.001で有意差を認めた。  
 L#, L\*(オッズ比), L\*(オッズ比), L\*\*(オッズ比), L\*\*\* (オッズ比): Leh対象者の解析にて、#: p<0.1, \*: p<0.05, \*\*: p<0.01, \*\*\*: p<0.001で有意差を認めた。  
 D#, D\*(オッズ比), D\*(オッズ比), D\*\*(オッズ比), D\*\*\* (オッズ比): Domkhar対象者の解析にて、#: p<0.1, \*: p<0.05, \*\*: p<0.01, \*\*\*: p<0.001で有意差を認めた。  
 C#, C\*(オッズ比), C\*(オッズ比), C\*\*(オッズ比), C\*\*\* (オッズ比): Changthang対象者の解析にて、#: p<0.1, \*: p<0.05, \*\*: p<0.01, \*\*\*: p<0.001で有意差を認めた。

L (オッズ比)、C (オッズ比) として計算し、地域別のオッズ比が、p が 0.1 未満の傾向あるいは有意性のある場合のみ、そのオッズ比を表記した。3 地域全体の解析では、有意であったが、地域別の解析では、有意に至らなかった場合は、そのコラムは記載せず空白とした。

加齢が多くの主観的 QOL の低下のリスクとなること、チャンタン牧民においてのみ認められ、他の地域では有意差はなかった。

チャンタンとドムカルにおいては、男性がうつ傾向となるリスクは女性よりも少なかったが、レーでは逆に男性の方がリスクが高かった。チャンタンとドムカルでは、男性が健康満足度が高かった。チャンタンにおいてのみ、男性が友人関係と幸福度が高かった。チャンタンでは、男性が生活満足度が高かったが、レーでは低い傾向を示した。チャンタンでは、過体重者が生活満足度が高かったが、レーでは逆に低い傾向を示した。

レーでは、高血圧者は、生活満足度や幸福度が高かったが、他の地域では有意差はなかった。糖尿病・境界群は、ドムカルでは、健康満足度が高かったが、他の地域では有意差はなかった。

基本的 ADL 非自立者は、レーやドムカルでは、健康満足度が低かったが、チャンタンでは関連がなかった。基本的 ADL 非自立者はレーでは、家族関係や生活満足度が高かった。チャンタンでは、基本的 ADL 非自立者は、経済満足度が高かった。基本的 ADL 非自立者は、ドムカルでは、幸福度が高かった。

#### 4. 考察

総合的健康指標を 3 地域で比較すると、レー市街住民には、肥満や高血圧の増加、歩行機能や ADL の低下、うつ症状の増加、主観的 QOL の低下が認められ、ドムカル農民やチャンタン牧民はこれとは逆に、ほとんどの総合的健康指標は良好であった。ただ、ドムカル農民には、耐糖能異常の増加が問題であり、うつ症状もレーと同等に多かった。

レー市街移住者がチャンタン高原の牧民に比較して、社会活動度の低下やうつの増加、多くの主観的 QOL の低下をもたらしている頻度が高かった。チベット動乱以後、インドのチャンタン高原に移住した Tibetan は、気候変動による大雪で家畜を失ったり、その他の社会的理由により、1970 年代より、レー市街部に移住し、近代的なライフスタイルを有してきた。しかし、Tibetan 移住者の無職者の割合は Ladakhi 移住者の 2 倍近くあり、一方、市街部のデスクワーク従事者が Ladakhy 移住者の半分以下であったことより、レーでの就職状況は、Tibetan 移住者の方により厳しい状況であることを示していた。職業別に比較すると、市街部の職業従事者は、牧畜民に比べて、うつ症状は多発し、社会的活動度の低下やすべての主観的 QOL において低下者が高頻度にみられた。

高所住民のうつや QOL への関連要因を、3 地域の対象者全員について、年齢や性別の影響を補正して検討した。うつの関連因子は、年齢、生活機能低下、社会的活動低下、運動能力低下、市街



の職業従事、移住といった多くの要因に関連していた。チベット高所住民において、うつが、ADLや身体機能、QOLと密接な関連のあった結果は、日本の地域住民の結果と同様であった<sup>18)</sup>。

高所住民の主観的QOL低下の関連要因は、社会的活動低下、市街の職業従事、移住といった要因が関連し、身体的な活動能力や生活機能とはほとんど関連がなかった。一方、糖尿病・境界群はむしろQOLが高く、高血圧はまったく関連がなかった。日本の地域住民のQOL（主観的健康度）の低下には、ADLと歩行機能も関連していた点が<sup>19)</sup>、チベット高所住民とは異なった。しかし、日本の検討において、仕事や運動習慣とQOLが関連した点は<sup>19)</sup>、チベット高所住民における社会的活動と密接な関連がある結果と一致していた。さらに、高血圧や糖尿病がリスクとならないというチベット高所住民の結果は、日本の検討とも一致していた<sup>19)</sup>。

3地域別に、うつやQOL劣化に関連する要因を検討した。チャンタン牧民では、男性にうつが少なくQOLが高かった。しかし、チャンタン牧民では、年齢とともに、多くの主観的QOLが低下を示し、高所の厳しい自然環境の中で1年間に3か月毎の移牧（10回/年も移動する例もある）を行っている牧畜の生業は、高齢者には厳しいことが推察された。ドムカルでも、男性にうつが少なくQOLが高く、糖尿病・境界群も、むしろQOLが高かった。レーでは他の地域と異なり、男性がうつ症状が多く、生活満足度も低い傾向を示していた。これらは、牧畜や農村の仕事に比較して、男性のレー市街部の職業従事の厳しさを反映している可能性がある。レーでは、肥満者の生活満足度が低い傾向のある一方、高血圧者のQOL（生活満足度や幸福度）は高かった。

糖尿病や高血圧といった生活習慣病を有する方は、うつ症状と関連がなく、QOLが高いという一見矛盾する今回の結果の理由として、次のような要因が考えられた。生活習慣病を有する方は、経済状態が高くそれに伴い生活満足度も高い方が多いこと、生活習慣病の診断を初めて受けた方が殆どで合併症や症状を有している方が少ないこと、生活習慣病に関する健康教育の不足、などである。横断的な調査の限界であり、縦断的にみると、耐糖能異常がQOLに悪影響を及ぼしてくる

証拠を次に示す。

耐糖能異常とADL、うつ症状との関連について、高知県土佐町在住高齢者（60歳以上）の378人（正常群212人、境界群127人、糖尿病群39人）について調べた。ベースライン（2006年）において、各3群の正常群、境界群、糖尿病群における、基本的ADL非完全自立率は、13.8%、11.5%、20.3%（ $p < 0.0001$ ）、IADL非完全自立率（4点以下）は、9.0%、15.7%、30.8%（ $p=0.0008$ ）であり、耐糖能異常者におけるADLやIADLの障害者の頻度は多いことがわかった。しかし、うつ状態（GDS10点以上）については、ベースラインにおいて、各3群の正常群、境界群、糖尿病群において、11.3%、10.2%、7.7%（ns）と有意差を認めなかった。ベースラインにうつ状態のない者でかつ、5年後に問診票の回答の得られた294人について、5年後にうつ状態となった者の割合は、上記各3群において、4.3%、9.7%、13.3%（ $p=0.097$ ）であった。ロジスティック解析にて、ベースラインの年齢、性、ADL、IADL、うつ傾向の有無を調整して、「うつ状態の発生」を従属変数として多変量解析を行ない、正常群を対照群とするオッズ比を示すと、境界群3.2倍（ $p < 0.05$ ）、糖尿病群6.5倍（ $p < 0.05$ ）と高値であった<sup>20,21)</sup>。ドムカルにおいて調査時点では、糖尿病・境界群はうつと関連がなくQOLがむしろ高かったが、縦断的には、合併症を伴う者も現れ、土佐町と同様にうつの悪化やQOLが低下する可能性があり、耐糖能異常の予防はチベット高所住民においても必要と思われる。

ラダーク全域の2800人の住民の高血圧の頻度を調査した結果において、Tibetan牧畜民の高血圧が19.7%と最も少なく、レー市街へのTibetan移住者の高血圧の頻度が48.5%と最も高かった<sup>22)</sup>。移住による急速なライフスタイルの近代的な変化が、高血圧の増加をもたらしていた。今回の調査において、移住や市街部の職業従事は、うつやQOLの低下と関連していたが、高血圧については、横断的な関連を認めなかった。縦断的な検討が今後必要と思われた。

BADLの非自立は、レーやドムカルでうつ症状の多さと関連していたが、日本の地域住民とは対照的に、QOLはむしろ高かった（レー：家族関係、生活満足度、ドムカル：幸福度、チャンタン：経

済満足度)。さらに、すべての QOL 項目に、社会的活動度の高さが関連していた。ラダーク市街に住む移住民を直撃した豪雨土砂崩れ災害後の調査でも、従来の災害の報告に比べて PTSD は比較的少なかった<sup>23,24)</sup>。ラダーク住民は、敬虔なチベット仏教徒であるという精神的支えともあいまって、家族やコミュニティにおける社会的つながりの高さが保たれているために<sup>8)</sup>、自立度が低下したり、災害で家屋を失った高齢者に対しても、QOL が高く保たれる社会のしくみが機能していることが、今回の結果の背景にあるのかもしれない。

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## Summary

### Comparison of Health-related Associated Factors with Depressive Feelings and Subjective Quality of Life (QOL) among High-Altitude Farmers, Nomads and Migrants to Leh in Ladakh.

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More depressive feelings and lower subjective QOLs were shown in migrants to Leh compared with nomads in Changthang and farmers in Domkhar in Ladakh. The associated factors of depressive feelings were aging, walking dysfunction, lower basic ADLs, lower social activities, and urbanized occupation and migration. The associated factors with lower QOLs were lower social activities, urbanized occupation and migration. Hypertension and glucose intolerance were not the risk of depressive feelings or lower QOL.