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# Relationship between Lifestyle and Mental Health: A Population-Based Survey in Nagasaki Prefecture, Japan

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**Objective:** Mental health disorders among community dwelling Japanese people has not been well documented. The objective of the present study was to gain insights into the relationships between lifestyle factors and mental health in a community population.

**Methods:** Associations between lifestyle factors and mental health were investigated in Nagasaki prefecture with a self-administrated questionnaire including socio-demographic (age and sex), lifestyle (diet, exercise, sleep, smoking, alcohol drinking), and mental health factors.

**Results:** A total of 2,146 people (1,052 men and 1,094 women) responded fully to the 12-item version of the General Health Questionnaire (GHQ-12). High GHQ-12 scores (defined as a score of  $\geq 4$ , to indicate poor mental health) were more prevalent in women (18.9%) than in men (15.6%) ( $P=0.041$ ). Moreover, the proportion of high GHQ-12 score was higher in the younger age group (20 to 39 years), comparing to other age groups. As the result of multiple logistic regression analysis, four variables were selected as factors associated with a high GHQ-12 score: women (odds ratio (OR): 1.3, 95% confidence interval (95% CI): 1.0-1.6); 20 to 39 years (OR: 2.5, 95% CI: 1.7-3.6) and 40 to 64 years (OR: 1.4, 95% CI: 1.0-1.9), both with  $\geq 65$  years as reference; not eating meals regularly (OR: 1.7, 95% CI: 1.2-2.4); and not getting enough sleep (OR: 2.8, 95% CI: 2.1-3.6).

**Conclusion:** The findings indicate that the young and women are more likely to have poor mental health, and that lifestyle factors such as diet behavior and sleep are associated with mental health.

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**Keywords:** mental health; lifestyle factors; 12-item version of the General Health Questionnaire; population-based study

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## Introduction

The national health promotion in the 21st century (Healthy Japan 21) was introduced in 2000, in order to become a vigorous society in which all citizens can live in good health both physically and mentally.<sup>1</sup> Healthy Japan 21 has nine target areas (nutrition, exercise, leisure and mental health, smoking, alcohol, dental health, diabetes, circulatory disease, cancer). The aim is to extend the disabilities

adjusted life expectancy and to improve quality of life.

Mental health disorders have recently been recognized as a serious problem in the Japanese population. In industrialized societies, the prevalence of depression or anxiety disorders is associated with unemployment and suicide. Kawakami *et al.*<sup>2</sup> recently reported a prevalence of common mental disorders in Japan of 8.8% (17% of cases were severe and 47% were moderate) and stated that only 19% of the severe and moderate cases received medical treatment.

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A review explained that the overall prevalence of depressive disorders in Japan is much lower than in Western countries but Japanese women are more at risk than their Western counterparts.<sup>3</sup> Several studies have focused on mental health among industrial employees, and reported that employee's mental health is associated with working hours, job control, and job demands.<sup>4,5</sup> However, mental health disorders among community dwelling Japanese people has not been well documented.

Both mental health measures and improved lifestyle behaviors are important for health promotion in a community population. For lifestyle-related diseases, health promotion measures are developed in the following areas: diet, exercise, sleep/rest, smoking, and alcohol drinking.<sup>1</sup> Although getting less sleep has been associated with an increased risk of depression,<sup>6,7</sup> evidence of the relationship between mental health and other lifestyle factors is limited. In a small occupational health study, lifestyle factors were significantly associated with mental health, and good health practices appeared to be associated with good mental health.<sup>8</sup> Another study reported that poor psychological well-being in elderly workers is directly related to lifestyle factors such as lack of exercise, smoking, and stress.<sup>9</sup>

The objective of the present study was to gain insights into the relationships between lifestyle factors and mental health in a community population. A self-administered questionnaire survey of lifestyle factors and mental health was conducted in a prefecture-wide population.

## Subjects and Methods

Nagasaki Prefecture is located on the west coast of Japan with many islands and peninsulas and almost 1.4 million residents. A total of 48% of the population is concentrated in urban cities, while 10% lives in the island area. The proportion of the elderly population ( $\geq 65$  years) in the prefecture was 24.8% in 2007, higher than the national average (21.5%). Moreover, the proportion of elderly population exceeds 30% in the island area.<sup>10</sup>

The Nagasaki Prefectural government carried out a Nagasaki Health Study (investigation into lifestyle and health) in 2001. Among the participants of the study, 4,517 subjects from all areas of Nagasaki prefecture agreed to take part in a follow-up survey, the Nagasaki Health Study 2005. Subjects were requested to complete a self-administered questionnaire between March and April of 2005. The aim of the study was explained to the subjects, who were given the right to withdraw from the study without any disadvantage, and

returning the questionnaire was taken as consent for study participation. A total of 2,714 people returned the mailed questionnaires for a collection rate of 60.1%. The complete response rate for the 12-item version of the General Health Questionnaire (GHQ-12) was 79.1%, including 1,052 men (age,  $58.4 \pm 14.3$  years [mean  $\pm$  SD]) and 1,094 women (age  $55.3 \pm 14.7$  years [mean  $\pm$  SD]).

The self-administered questionnaire included questions concerning socio-demographics (age and sex) and lifestyle (diet, exercise, sleep, smoking, alcohol drinking) factors, and mental health. Subjects were examined about eating meals regularly (yes/no), regularly exercising (twice or more times a week: yes/no), and getting enough sleep (yes/no). Smoking was classified as never, past and current. Alcohol drinking was classified as non-drinking, sometimes (drinking several times a month), and almost every-day (drinking more than 4 days a week).

Mental health was assessed using the GHQ-12. The GHQ-12, devised as short version of the original GHQ-60, is a reliable and convenient self-rating questionnaire and is frequently used for screening minor psychiatric disorders.<sup>11-13</sup> In the present study, the GHQ method was applied (i.e. assigning a score of 0 to the first two answers and a score of 1 to the last two answers) and the overall score was calculated by summing up score for each item. Subjects with GHQ-12 score of 4 or more were classified as the high GHQ-12 score group (indicating poor mental health), and subjects with GHQ-12 score of 3 or less were classified as the low GHQ-12 score group.

## Statistical analysis

Large fluctuations were observed in the proportion of subjects with a high GHQ-12 score by age. To eliminate noise fluctuations, and to explore the age trend in the high GHQ-12 score by sex, the smoothing method of a moving average over five-year age was applied and the results were inspected graphically. Associations between lifestyle factors and having a high GHQ-12 score were analyzed using the chi-square test. Furthermore, simultaneous effects of demographic and lifestyle factors on high GHQ-12 score were analyzed using linear logistic regression model with sex, age, eating meals regularly, regularly exercising, getting enough sleep, smoking, and alcohol drinking as covariates. The stepwise method of variable selection based on the likelihood ratio was applied in order to determine the most appropriate model.

## Results

### Characteristics of Subjects

Significant differences between women and men were observed in eating meals regularly, smoking and alcohol drinking (Table 1). The proportion of eating meals regularly in women (90.6%) was higher than that in men (85.2%). Current smoking and alcohol drinking almost everyday were more prevalent in men than in women.

**Table 1.** Characteristics of study subjects

	Men(n=1052)		Women(n=1094)		P-value
	N	%	N	%	
Age (years)					
20-39	128	12.2	183	16.7	<0.001
40-64	519	49.3	586	53.6	
65-	405	38.5	325	29.7	
Eating meals regularly					
Yes	896	85.2	991	90.6	<0.001
No	151	14.4	97	8.9	
Unknown	5	0.5	6	0.5	
Regular exercise*					
Yes	296	28.1	313	28.6	0.747
No	752	75.1	771	70.5	
Unknown	4	0.4	10	0.9	
Getting enough sleep					
Yes	868	82.5	876	80.1	0.116
No	168	16.0	203	18.6	
Unknown	16	1.5	15	1.4	
Smoking					
Never	480	45.6	1010	92.3	<0.001
Past smoker	237	22.5	23	2.1	
Current smoker	325	30.9	52	4.8	
Unknown	10	1.0	9	0.8	
Alcohol drinking**					
Never	239	22.7	629	57.5	<0.001
Sometimes	356	33.8	370	33.8	
Almost everyday	452	43.0	83	7.6	
Unknown	5	0.5	12	1.1	

Chi-square test

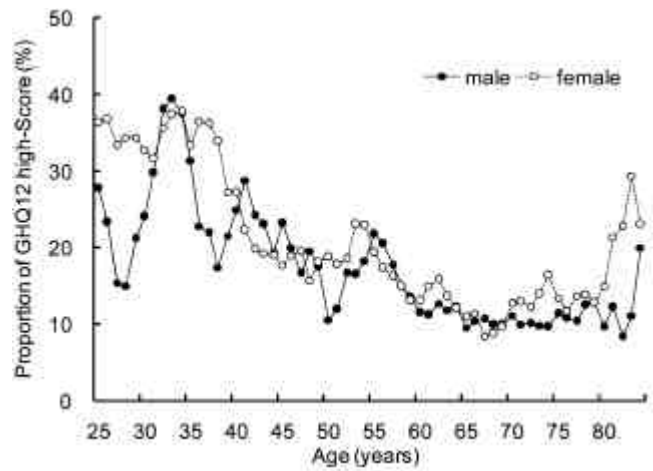
\*At least 30 min of exercise twice per week for over a year

\*\*Sometimes: drinking several times per month to several times per year; Almost everyday: drinking more than 4 days per week

### Age trend of high GHQ-12 score

The overall proportion of subjects with high GHQ-12 score was 15.6% in men and 18.9% in women ( $P=0.041$ ). Figure 1 displays the moving average over five-year age. In men, the peak proportion of high GHQ-12 score (40%) was observed at 33 years. Meanwhile, the highest proportion of high GHQ-12 score (about 35%) in women was observed from 25 to 39 years. In both sexes, the proportion of respondents with high GHQ-12 score decreased after 40 years.

and remained at a low level from 60 to 75 years.



**Fig. 1.** Proportion of high GHQ-12 score. The moving average over 5-year age of the proportion of high GHQ-12 score by sex.

### Association of age and lifestyle factors with GHQ-12 score

Associations of age and lifestyle factors with the GHQ-12 score are shown in Table 2. The proportion of subjects with high GHQ-12 score was significantly higher in age group of 20 to 39 years than other age groups in both sexes ( $P<0.001$ ). The proportion of subjects with high GHQ-12 score was higher among those who reported not eating meals regularly than those who reported eating regular meals in both sexes ( $P<0.001$ ). A higher proportion of men who reported no regular exercise had a high GHQ-12 score ( $P=0.001$ ), but the difference did not reach statistical significance in women ( $P=0.096$ ). A high GHQ-12 score was more prevalent in subjects who reported not getting enough sleep compared to subjects who reported getting enough sleep. A higher proportion of men who reported current smoking had a high GHQ-12 score compared to those who reported never and past smoking ( $P=0.052$ ). In women, past and current smoking had a higher proportion of high GHQ-12 scores compared to subjects who reported never smoking ( $P=0.01$ ). The proportion of high GHQ-12 score did not significantly associate with alcohol drinking.

The result of logistic regression analysis is shown in Table 3. On the basis of variable selection by step-wise method, four variables were selected as factors associated with a high GHQ-12 score: women (OR: 1.3, 95% CI: 1.0-1.6); age of 20 to 39 years (OR: 2.5, 95% CI: 1.7-3.6, with  $\geq 65$  years as reference) and age of 40 to 64 years (OR: 1.4, 95% CI: 1.0-1.9, with  $\geq 65$  years as reference); not eating

**Table 2.** Univariate analysis of the GHQ-12 score in relation to lifestyle factors

Variable	Men (n=1052)				P-value*	Women (n=1094)				
	High GHQ-12 score		Low GHQ-12 score			High GHQ-12 score		Low GHQ-12 score		P-value*
	N	%	N	%		N	%	N	%	
Age (years)										
20-39	33	25.8	95	74.2	<0.001	63	34.4	120	65.6	<0.001
40-64	88	17.0	431	83.0		105	17.9	481	82.1	
65-	43	10.6	362	89.4		39	12.0	286	88.0	
Eating meals regularly										
Yes	121	13.5	775	86.5	<0.001	175	17.7	816	82.3	<0.001
No	42	27.8	109	72.2		32	33.0	65	67.0	
Unknown	1		4			0		6		
Regular exercise										
Yes	29	9.8	267	90.2	0.001	50	16.0	263	84.0	0.096
No	134	17.8	618	82.2		157	20.4	614	79.6	
Unknown	1		3			0		10		
Getting enough sleep										
Yes	105	12.1	763	87.9	<0.001	132	15.5	744	84.9	<0.001
No	54	32.1	114	67.9		73	36.0	130	64.0	
Unknown	5		11			2		13		
Smoking										
Never	65	13.5	415	86.5	0.052	181	17.9	829	82.1	0.010
Past smoker	32	13.5	205	86.5		8	34.8	15	65.2	
Current smoker	63	19.4	262	80.6		16	30.8	36	69.2	
Unknown	4		6			2		7		
Alcohol drinking										
Never	41	17.2	198	82.8	0.643	109	17.3	520	82.7	0.207
Sometimes	51	14.3	305	85.7		81	21.9	269	78.1	
Almost everyday	71	15.7	381	84.3		16	19.3	67	80.7	
Unknown	1		4			1		11		

\*Chi-square test

**Table 3.** Logistic regression analysis of factors associated with high GHQ-12 score

Variable		Odds ratio	95% CI	P-value
Sex	Women /Men	1.3	1.0-1.6	0.04
Age (years)	40-64 /65- <40 /65-	1.4 2.5	1.0-1.9 1.7-3.6	0.03 <0.01
Eating meals regularly	No /Yes	1.7	1.2-2.4	<0.01
Getting enough sleep	No /Yes	2.8	2.1-3.6	<0.01

meals regularly (OR: 1.7, 95% CI: 1.2-2.4); and not getting enough sleep (OR: 2.8, 95% CI: 2.1-3.6).

## Discussion

The present study revealed that mental health condition was poor among women and in the age group of 20 to 39 years. It has been reported that the mental health of men is the worst at around 35 years due to heavy occupational

stress,<sup>14-17</sup> and that mental health of women is affected by life-cycles such as pregnancy and childbirth.<sup>18-21</sup> Moreover, Japanese working women had poor mental health and higher level of work-to-family conflict, because of traditional gender attitudes to domestic labour.<sup>22</sup> Therefore, these people are a potential target population in the community for mental health support.

In the present study, 85% of men and 91% of women ate meals regularly. According to the National Health and Nutrition Examination Survey 2007 in Japan,<sup>23</sup> 87% of men and 90% of women eat regular meals, which was similar to the present results. Not eating meals regularly was associated with poor mental health in the present study. Fuchino *et al.*<sup>24</sup> reported that not eating breakfast was associated with poor mental health status in 40- to 49-year-old women. Several studies of male Japanese factory workers also reported the relationship between not eating breakfast and poor mental health.<sup>8,25,26</sup>

Fuchino *et al.*<sup>24</sup> reported that getting less than 7 to 8 hours sleep was related to poor mental health among com-

munity-dwelling men and women. Kawakami *et al.*<sup>25</sup> reported that regularly sleeping less than 7 hours was significantly related to depression among female industrial workers. Another study by Ezoe and Morimoto<sup>26</sup> also reported that getting fewer hours of sleep was significantly associated with psychological distress among female workers. In the present study, not getting enough sleep was associated with poor mental health, suggesting that getting enough sleep may be an important target for improving mental health.

In the present study, regular exercise and smoking were associated with mental health on univariate analysis, but not in a multiple logistic regression analysis. Some studies have shown that smoking or low physical exercise are associated with poor mental health status,<sup>9,25,26</sup> while others have reported no correlation.<sup>8,24</sup> These differences may be explained in part by different backgrounds of the subjects, e.g. differences in age and sex, or by differences in the frequencies and intensities of health-related behaviors. Further study is needed to clarify the relationship of exercise and smoking with mental health.

Healthy Japan 21 included primary prevention through improvement of lifestyles (nutrition, exercise, leisure and mental health, smoking, and alcohol drinking).<sup>1,27</sup> However, each measure regarding lifestyle behavior change has been conducted independently. Some lifestyle behaviors seem to be mutually associated with mental health. For example, the effect of exercise on relieving stress and sleep quality are considered beneficial for good mental health. In public health policy, health promotion measures should be developed comprehensively to include the improvement of lifestyle factors and mental health.

There were some limitations to the present study. Because of the cross-sectional design, causal relationships could not be addressed. Socio-economic factors, such as education, occupation and income, were not investigated. On the other hand, since the study subjects were selected from a whole prefecture, and the sample size was relatively large, the findings in the present study well represent the characteristics and potential risk factors of mental health problems in the general Japanese population.

## Conclusions

The association between lifestyle factors and mental health in a community population in Nagasaki Prefecture were investigated by a self-administered questionnaire survey. The young and women were found to have poor mental health. Lifestyle factors such as eating meals regularly and getting

enough sleep were associated with mental health. More research on effective measures for improving mental health is required.

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