



ORIGINAL ARTICLE

The Relationship between Health Behavior and General Health Status: Based on 2011 Korea National Health and Nutrition Examination Survey

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Abstract

Objectives: The aim of the present study is to investigate the relationship between health behavior and general health status.

Methods: We used data from the 2011 Korea National Health and Nutrition Examination Survey. Mental health was measured by stress recognition and depression. Dietary habit was measured by mixed grain diet. Life pattern was measured by sleeping time and working pattern. Physical activity was measured by walking and exercise. We defined general health status as Euro Quality of Life-5 Dimension (EQ-5D_{index}), Euro Quality of Life Visual Analogue Scale (EQ-5D_{vas}), number of people experienced lying in a sickbed for the last one month, number of days lying in a sickbed for the last one month, and activity limitations.

Results: Mental health, dietary habit, life pattern, and physical activity have seven factors. Most of the factors have a significant correlation with EQ-5D_{index}, EQ-5D_{vas}, number of people experienced lying in a sickbed for the last one month, number of days lying in a sickbed for the last one month, and activity limitations.

Conclusion: Health behavior and general health status have a positive correlation.

1. Introduction

Improvement of medicine and public health reduced mortality drastically and prolonged average life

expectancy. Thus, people have become concerned not only about life expectancy but also about quality of life (QOL). As a result, the concept of health life expectancy, namely the disability-adjusted life expectancy (DALE), has

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emerged. In 2007, the average life span of the Koreans is 79.56 years and DALE is 71.00 years [1]. Korean's DALE is shorter than the healthy life expectancy of people in Japan (76 years), Switzerland (75 years), and Germany (73 years), which are major Organization of Economic Cooperation and Development countries [1].

Entering the 21st century, people have become more interested in the concept of wellbeing, for example, in lifestyle and value for improving the QOL.

In Korea, since 2000, the concept of wellbeing has spread rapidly by socioeconomic situation after being introduced via mass media. However, unlike Western culture where the phenomenon appears throughout the living, the well-being trend in Korea is characterized by purchasing product for wellbeing [2]. It is recommended to switch the social atmosphere of Korea from focusing on buying wellbeing products to pursuing the concept of wellbeing throughout general life. These days, many people have become interested in a healthy lifestyle as an important value for achieving high QOL and longevity. Furthermore, some studies have reported that lifestyle has a relation with health status. There is evidence that the lifestyle of the elderly and industrial employees has a significant relationship with health status [3,4].

Due to the recent increasing trend of interest in QOL, the present study investigated health related habits: health behavior and general health status. To be specific, we identified health behaviors that are known to be associated with QOL, and among them we analyzed and discussed indices that were surveyed in the fifth Korea National Health and Nutrition Examination Survey (KNHANES) [5].

2. Materials and methods

2.1. KNHANES

KNHANES is the national statistic about health and nutrition for evaluating the aim of a health plan and calculating the health index to provide it to international organizations such as the Organization of Economic Cooperation and Development and the World Health Organization (WHO) since 1998. In calculating the indices the following factors are assessed: smoking, alcohol consumption, health behavior such as physical activity, disease such as obesity, hypertension and diabetes, and food intake.

The present study is based on the fifth KNHANES V-2 performed in 2011 by the Korea Centers for Disease Control and Prevention. A total of 8518 individuals participated in this survey out of a total of 10,589 individuals who were sampled for the KNHANES V-2, with a response rate of 80.4% [6].

2.2. Health behavior

(1) Mental health. Stress is considered to induce illness and worsen QOL: there is a saying that “stress is an

origin of all illnesses” [7]. Anyone can experience depressed mood sometimes, but someone feeling depression continually will eventually receive some bad effects on health.

- (2) Dietary habit. Healthy eating habit is a very important factor to maintain health. In the present study we researched whether mixed grain diet affects QOL.
- (3) Life pattern. It is known that sleep is directly related to health: “deep sleep is better than restorative medicine” [8]. Sleep has two aspects of quantity and quality. In the present study we analyzed quantity of sleep by sleeping hours and quality of sleep by working patterns.
- (4) Physical activity. Due to the increasing incidence of chronic disease, regular physical activity has been emphasized as an essential element for health care. In the present study we used two variables to evaluate physical activity. First, the prevalence of moderate physical activity which was defined as at least 30 minutes of moderate-intensity activity, 5 days/week. Second, the prevalence of walking for at least 30 minutes, 5 days/week.

2.3. Health status

Many assessment tools for QOL have been developed and currently 765 tools are used all around the world [9]. From these, 95 tools have an official Korean version, and 17 tools are overall health-related QOL assessment tools [10].

The Euro QOL-5 Dimension (EQ-5D) is the most commonly used standardized instrument to measure health-related QOL by using five dimensions in the world [11]. KNHANES measures QOL using EQ-5D which was validated in the general Korean population through a two-step process. First, EQ-5D score was compared according to classification by demographic variables. Second, EQ-5D score was compared with a score of Short Form-36 version 2 (SF-36v2). Both studies showed statistically significant results ($p < 0.01$) [12].

In the present study we selected Euro Quality of Life-5 Dimension (EQ-5D_{index}), Euro Quality of Life Visual Analogue Scale (EQ-5D_{vas}), number of people experienced lying in a sickbed for the last one month, number of days lying in a sickbed for the last one month, and rate of activity limitations as an index for evaluating the general health status. EQ-5D_{index} evaluates QOL by questioning about mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. EQ-5D_{vas} records the respondent's self-rated health on a visual analogue scale. Respondents specify their level between 0 meaning “worst imaginable health state” and 100 meaning “best imaginable health state”.

2.4. Statistical analysis

A p value ≤ 0.05 was considered statistically significant. All analyses were performed using SPSS statistical software (version 20.0; IBM Corp, Armonk, NY, USA).

Table 1. Relationship between recognition of stress and health status

	Recognition of stress		
	High	Low	<i>p</i>
EQ-5D _{index}	0.92 ± 0.00	0.96 ± 0.00	<0.001
EQ-5D _{vas}	68.51 ± 0.55	76.72 ± 0.34	<0.001
Number of people experienced lying in a sickbed for the last one month	12.5 (1.1)	7.4 (0.6)	<0.001
Number of days lying in a sickbed for the last one month	5.89 ± 0.60	4.99 ± 0.44	0.181
Activity limitations	12.4 (1.1)	8.0 (0.5)	<0.001

Data are presented as mean ± SE or % (SE). Statistical significances were tested by *t* test and χ^2 test. SE = Standard Error.

Table 2. Relationship between depression and health status

	Depression for 2 weeks		
	Yes	No	<i>p</i>
EQ-5D _{index}	0.89 ± 0.00	0.96 ± 0.00	<0.001
EQ-5D _{vas}	66.18 ± 1.00	75.72 ± 0.33	<0.001
Number of people experienced lying in a sickbed for the last one month	17.8 (1.8)	7.4 (0.5)	<0.001
Number of days lying in a sickbed for the last one month	6.70 ± 0.77	4.84 ± 0.41	0.025
Activity limitations	20.6 (1.9)	7.4 (0.5)	<0.001

Data are presented as mean ± SE or % (SE). Statistical significances were tested by *t* test and χ^2 test. SE = Standard Error.

3. Results

3.1. Stress, depression, and health status

The analysis between recognition of stress and EQ-5D_{index}, EQ-5D_{vas}, lying in a sickbed for the last one month, and rate of activity limitations showed that the group recognizing stress reported a statistically significant low QOL and high rate of suffering from disease and activity limitations. Number of days lying in a sickbed did not quite reach a statistically significant level (Table 1).

Analysis between the rate of depression for the past 2 weeks and health status showed that the group experiencing depression reported a statistically significant low QOL, high probability of suffering from disease, and activity limitations (Table 2).

3.2. Dietary habit and health status

People who eat a mixed grain diet at least once a day had a shorter number of days lying in a sickbed than people

who did not eat much but this result was not statistically significant ($p = 0.061$). Other health status indices also did not show statistically significant results (Table 3).

3.3. Life pattern and health status

Sleeping hours are grouped by <6 hours, 6–9 hours, and >9 hours. People sleeping for 6–9 hours reported higher QOL, lower probability of suffering from disease, and activity limitations than people sleeping <6 hours or >9 hours (Table 4).

Working patterns related to sleeping time zone were also researched. The group working on a night shift showed a tendency of lower EQ-5D_{vas} than the group working on a day shift but the result was not statistically significant ($p = 0.084$). Other indices did not show significant differences (Table 5).

3.4. Physical activity and health status

The walking group reported a statistically significant higher EQ-5D_{index} and EQ-5D_{vas}, less number of days

Table 3. Relationship between mixed grain diet and health status

	Mixed grain diet		
	Less than once a day	More than once a day	<i>p</i>
EQ-5D _{index}	0.95 ± 0.00	0.95 ± 0.00	0.544
EQ-5D _{vas}	74.33 ± 0.50	74.81 ± 0.37	0.409
Number of people experienced lying in a sickbed for the last one month	8.5 (0.8)	8.1 (0.6)	0.671
Number of days lying in a sickbed for the last one month	5.83 ± 0.71	4.31 ± 0.37	0.061
Activity limitations	7.8 (0.8)	8.3 (0.5)	0.649

Data are presented as mean ± SE or % (SE). Statistical significances were tested by *t* test and χ^2 test. SE = Standard Error.

Table 4. Relationship between sleeping hours and health status

	Sleeping hours			<i>p</i>
	<6 h	6–9 h	≥9 h	
EQ-5D _{index}	0.9 ± 0.01	0.96 ± 0.00	0.92 ± 0.01	<0.001
EQ-5D _{vas}	70.48 ± 0.78	75.54 ± 0.32	70.33 ± 1.25	<0.001
Number of people experienced lying in a sickbed for the last one month	10.6 (1.3)	7.5 (0.5)	13.3 (2.0)	<0.001
Number of days lying in a sickbed for the last one month	7.45 ± 1.10	4.30 ± 0.30	6.53 ± 1.05	0.011
Activity limitations	15.7 (1.6)	6.7 (0.4)	13.9 (1.9)	<0.001

Data are presented as mean ± SE or % (SE). Statistical significances were tested by ANOVA and χ^2 test. SE = Standard Error.

Table 5. Relationship between working pattern and health status

	Working pattern		<i>p</i>
	Day time	Night time	
EQ-5D _{index}	0.96 ± 0.00	0.96 ± 0.01	0.819
EQ-5D _{vas}	75.30 ± 0.35	71.12 ± 2.40	0.084
Number of people experienced lying in a sickbed for the last one month	8.2 (0.7)	6.7 (2.8)	0.625
Number of days lying in a sickbed for the last one month	4.09 ± 0.41	4.85 ± 1.18	0.562
Activity limitations	7.0 (0.6)	9.5 (3.9)	0.473

Data are presented as mean ± SE or % (SE). Statistical significances were tested by *t* test and χ^2 test. SE = Standard Error.

lying in a sickbed, and low probability of activity limitations. The probability of lying in a sickbed also showed a lower tendency in the walking group ($p = 0.092$) but was not statistically significant (Table 6). Correlation analysis between exercise and health status did not show significant results (Table 7).

4. Discussion

In 1948, WHO defined health as “a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity” [1]. This means that we already changed our point of view on health 60 years ago from putting emphasis on whether disease exists to a holistic angle. The current trend of health focuses on health care, not disease. East Asian culture has emphasized health care from ancient times. The saying that “An outstanding doctor treats predisease” from *Huang Di Nei Jing*, a medical book of the Chin and Han dynasty in China, confirms this [13]. In Korea, China, and

Japan, preventive medicine was developed and the concept of treating predisease emerged along with a changed concept of treating disease.

Lifestyle is considered as an important factor for managing health as can be seen in the saying “Most disease is due to lifestyle not heredity” [14]. Emotional stability, good eating habits, adequate physical activity, no smoking, refraining from immoderate drinking, and enough rest are important lifestyles for health.

Emotional stability has become more important in our modern, complicated society. Research of stress causing all kinds of illnesses and depression showed that stress and depression are related to lower health status. The results are consistent with reports that stress correlates with lower QOL in cancer patients and depression in the elderly is associated with health status and reduced QOL [15–17].

Eating habits focused on a mixed grain diet did not have significant correlation with health status. Our results are different from those of Son et al [18], who reported that the index of nutritional quality was higher

Table 6. Relationship between walking and health status

	Walking		<i>p</i>
	Yes	No	
EQ-5D _{index}	0.96 ± 0.00	0.94 ± 0.00	<0.001
EQ-5D _{vas}	75.66 ± 0.44	73.66 ± 0.41	0.001
Number of people experienced lying in a sickbed for the last one month	7.9 (0.8)	9.4 (0.6)	0.092
Number of days lying in a sickbed for the last one month	3.46 ± 0.32	6.34 ± 0.54	<0.001
Activity limitations	7.6 (0.7)	10.2 (0.6)	0.003

Data are presented as mean ± SE or % (SE). Statistical significances were tested by *t* test and χ^2 test. SE = Standard Error.

Table 7. Relationship between exercise and health status

	Exercise		
	Yes	No	<i>p</i>
EQ-5D _{index}	0.95 ± 0.01	0.95 ± 0.00	0.780
EQ-5D _{vas}	75.75 ± 0.85	74.30 ± 0.33	0.109
Number of people experienced lying in a sickbed for the last one month	8.6 (1.6)	8.8 (0.6)	0.867
Number of days lying in a sickbed for the last one month	5.01 ± 1.36	5.38 ± 0.42	0.800
Activity limitations	10.1 (1.5)	9.1 (0.5)	0.524

Data are presented as mean ± SE or % (SE). Statistical significances were tested by *t* test and χ^2 test. SE = Standard Error.

in the group eating cooked rice mixed with multigrains and was also dissimilar to our previous study [19] where people who ate mixed grain more than once a day reported higher visual analogue scale score. However, the results are consistent with data that mixed grain diet is not associated with a higher risk for disease [18,19]. Therefore, we need to study further for confirmation.

Life pattern depending on sleeping hours was shown to be correlated with health status. People who sleep 6–9 hours reported a better health status than other groups. Results of the present study correspond with the results of earlier studies, which reported that excessive sleep duration was related to a lower QOL and insufficient sleep negatively effects on school adjustment in the youth [20,21]. Working patterns divided into day shift and night shift did not show a significant correlation with health status. Further study is needed about this relation because health may work as a confounding factor in deciding working pattern.

Walking and exercise indexes were analyzed to evaluate the correlation between physical activity and health status. Walking has a statistically significant correlation with health status. These results are consistent with the results of earlier studies that reported that physical activity and QOL have a positive correlation in university students and menopausal-aged women [22,23]. Exercise did not show a significant correlation with health status. More studies including other forms of physical activity variables are needed to confirm this relation.

Based on the above literature evidence, stress, depression, mixed grain diet, sleeping hours, working patterns, exercise, and walking indices were analyzed to evaluate the relation with health status such as EQ-5D_{index}, EQ-5D_{vas}, lying in a sickbed, and activity limitations. Most results showed significant correlation.

The present study researched some health behaviors known to have a relationship with health status. Several media recommend practicing healthy behavior; however, there is no exact criterion of it. In the present study, we made an effort to suggest objective criteria. Further studies focused on the standard of health behavior are needed.

The primary limitation of present study is that we were confined to using variables surveyed in KNHANES. Other sources should be used to further evaluate detail content. The secondary limitation is that

it is a cross-sectional study and therefore it is difficult to determine whether the outcome followed exposure in time or exposure resulted from the outcome. For example, recognition of stress has an association with number of days lying in a sickbed; however, we cannot clarify whether recognition of stress result in lengthening sick days or longer sick days result in more recognition of stress. In the present study, we analyzed sleeping pattern because this is judged as a factor affecting QOL. However, there is a report that asthma affects sleeping [24]. As above, a causality cannot be confirmed.

The present study shows that health behavior such as mental health, eating habits, lifestyle, and physical activity have a significant relationship with health status. Further studies with a larger sample size and cohort or clinical trial design are needed to overcome the limitations and popularize the standard of various health behaviors.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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