



Factors affecting Health-Related Quality of Life (HINT-8) according to the degree of frailty in the elderly in Korea

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Abstract

Background/Objectives: This study aimed to identify factors affecting in frailty of Korea National Health and Nutrition Examination Survey(KNHANES) 2019. The relationship between the health-related quality of life(HRQOL) in elderly and the degree of frailty with the HINT-8 tool, a Korean-style measure of frailty.

Methods/Statistical analysis: This study was analyzed with the KNHANES 2019 the 8110 people who participated in the KNHANES 2019, 1,735 people aged 65 and over were targeted.

Findings: In the frailty group, women accounted for 81.2%, those aged 80 years or older accounted for 32.5%, followed by those aged 75-79 with 28.7%. The household income was at a low level of 64.2% and the number of people living with two or more people was 69.3%.

Improvements/Applications: As frailty can be recovered or prevented, it is hoped that a follow-up study will be conducted based on the results of this study. It is suggested to develop management of frailty for Korean elderly.

Keywords: Frailty, National Health and Nutrition Survey, Korean, HINT-8, Elderly

1. Introduction

Frailty is a state in which the overall function is reduced due to aging and the response to external stimuli is reduced, so the possibility of being ill with various diseases is increased. expressed as a syndrome [1,2]. A fundamental aspect of frailty was defined as risk induced by instability, and a practical definition of activities of daily living (ADL) has been proposed for those who are dependent on others or who are highly likely to depend on others[3]. It is also defined as a state in which the ability to accept external stimuli is weak, which makes it prone to unfavorable–health conditions such as

disability and disease, hospitalization experience and death. In a cohort (Korean Frailty and Aging Cohort Study; KFACS) study that conducted longitudinal frailty in Korean elderly by applying the criteria for frailty based on Fried' s definition, the frailty of Korean elderly was 7.8% and pre- frailty was 47.0%. The trend was similar to that of the international trend[4], the incidence of frailty inclines to increase with age[2]. As such, senescence is a phenomenon observed only in some elderly people, and is not necessarily a result of aging. The major predictors of frailty include social status such as income and

education level, health behavior, mental health status, and physical health status[2,5]. The HINT-8 tool, which asks about stair climbing, pain, energy, working, sleep, happiness, depression and memory, is a Korean-style measure of frailty that measures health-related quality of life[6].

In Korea, where the rate of aging is rapidly increasing, the need to plan and implement health education for the elderly for the prevention of frailty is highlighted in consideration of the negative impact on medical expenses by identifying the relationship between the HRQOL in elderly and the degree of frailty. In Korea, where the rate of aging is rapidly increasing, it is necessary to understand the relationship between HRQOL in old age and the degree of frailty, and plan and implement health education for the elderly to prevent frailty in consideration of the negative impact on the increase in medical expenses. Therefore, this study aimed to analyze the factors affecting the degree of frailty and HRQOL in the elderly with the subject of KNHANES 2019.

2. Materials and Methods

2.1. Study subjects

The data were obtained from KNHANES, which was conducted by the Korea Centers for Disease Control and Prevention(KCDC) and the Korea Ministry of Health and Welfare. The KNHANES was conducted in 2019. We used the KNHANES 2019 data of adults aged 65 years or older. After excluding 6,375 subjects age younger than 65 years and 68 robust subjects, 1,667 individuals were included in the analysis. KNHANES 2019 include secondary data released to the public for scientific use

and do not contain private information, our study did not have to address ethical concerns.

2.2. Variables

2.2.1. Independent Variable of Main Interest: Frailty

We modified one of the most commonly used definitions, the Fried frailty phenotype that is an acceptable alternative in large research populations[7]. We constructed Fried's definition customized from KNHANES 2019 data to measure presence of frailty and pre-frailty.

Weakness: handgrip strength based on Asian Working Group for Sarcopenia 2014, <26 kg for men and <18 kg for women

Low physical activity: self-reported usual activities of Euro Quality of life 5-Dimensions, some problems, unable

Exhaustion: self-reported feelings of stress, very much, much

Slow walking speed: self-reported the sum of week's walk 1, <120 minutes

Weight loss: self-reported weight loss of ≥ 3 kg in the previous 1 year

Frail individuals demonstrated three or more criteria, prefrail individuals demonstrated one or two criteria, and robust individuals demonstrated zero criteria.

2.2.2. Covariates

Sex, Age, Household income, Education level, and Number of household members were included as sociodemographic factors in the analysis. Age groups included: 65–69, 70–74, 75–79, and over 80 years old. Household income was grouped in: high, middle, low. Education level was categorized into three groups: elementary school or lower, middle school, and high school or higher. Number of household members were classified as alone and

cohabitation.

Health status and behavior factors such as Subjective health status, Smoke, Hospitalizations, Outpatient visits, Chronic disease, Total cholesterol, HbA1c, SBP and Hb were included as covariates in our analyses. Subjective health status was assessed with the question, “How do you usually perceive your health?” (‘very good’, ‘good’, ‘normal’, ‘poor’, ‘very poor’). The responses ‘very good’ and ‘good’ were considered to indicate ‘good’, ‘normal’, and ‘poor’ and ‘very poor’ were considered to indicate ‘poor’. Smoking status was categorized into three groups: current smoker, former smoker, and never smoker. Hospital utilization (one or more hospitalizations in the previous 12 months); and outpatient healthcare utilization (visits to a health care provider in the previous 2 weeks). The “number of chronic disease(s)” variables included conditions such as high blood pressure, diabetes, stroke, myocardial infarction, and angina and was operationalized into four different categories depending on how many were present: 0, 1, or > 2. Total cholesterol <240mg/dl was classified as ‘Normal,’ ≥ 240 ‘Abnormal’. HbA1c <5.6 was classified as ‘Normal,’ ≥ 5.7 ‘Abnormal’. Systolic blood pressure <120mmHg was classified as ‘Normal,’ ≥ 120 ‘Abnormal’. Blood mercury (Hg) levels were analyzed by the gold-amalgam collection method using DMA-80.

2.2.3. Dependent Variables: HINT-8

The KNHANES has adopted the HINT-8 to evaluate HRQOL since 2019. The HINT-8 can be used to estimate utility weights using this value set in economic evaluations. The HINT-8 consists of 8 items (vitality, climbing stairs, pain, depression, working, happiness, memory, and sleep) and 4 levels

(from no problems to severe problems). The HINT-8 scores range from 0.132 (44444444, worst possible health state) to 1.000 (11111111, best possible health state).

2.3. Statistics Analysis

The SPSS 25.0 statistical software package was used for all statistical calculations. Data are analyzed using the method Complex sampling analysis and presented as the mean \pm standard deviation(SD) for continuous variables. Because KNHANES represents the total population of South Korea, population weights were used. Independent t-tests were used to compare continuous variables by level of frailty. The chi-square test was used to analyze the differences in level of frailty. The relationship between frailty and HINT-8 measurement was analyzed using Complex sample linear regression analysis. $P < 0.05$ was considered to be statistically significant.

3. Results and Discussion

The 1,667 study participants included 1,253 pre-frailty and 414 frailty. The average HINT-8 score was 0.80 in pre-frailty and 0.66 in frailty.

Table 1 presents the demographic characteristics of the study subjects. In general characteristics, there were significant differences between all groups in gender, age, education level, household income, and number of people living together. In the pre-frailty group, males accounted for 50.4%, being higher than females; and were relatively young 36.4% were between 65-69 years of age. As for the level of education, 45.7% were elementary school graduates or less, and the middle household income group was of 49.6%, accounting for

nearly half. In the case of living with two or more people, it was showed up 82.3%. In the frailty group, women accounted for 81.2%, those aged 80 years or older accounted for 32.5%, followed by those aged 75-79 with 28.7%. The household income was mostly at a low level, with 64.2%, and the number of people living with two or more people was 69.3%.

Insert table 1

Table 2 is shown as a result of analysis according to the degree of frailty, there were significant differences in subjective health status, smoking, hospitalization, outpatient visits, number of chronic diseases, and hemoglobin level. In the pre-frailty group, 82.8% of the subjects had a good or moderate health subjective status, and 56.8% were non-smokers. There was no hospitalization experience in 88.1% and no outpatient visit experience in 59.1% of the subjects. it was two or more chronic diseases 58.4 and normal hemoglobin levels had 92.4%. In the frailty group, 50.8% of the subjects perceived that their subjective health status was bad, 50.5% of them had outpatient visits and 83.7% of the cases had two or more chronic diseases.

Insert table 2

Complex sample linear regression analysis was performed to identify factors HRQOL according to the frailty's degree.

As shown in Table 3, in the pre-frailty group, gender, age, education level, subjective health status, and hospitalization experience were found to be significant influencing factors on HRQL, and their explanatory power was

26.4% ($F=19.984, p<.001$). Compared to men, women ($B=-0.028$), 65-69 years old compared to 75-79 years old ($B=-0.014$), and 82 years old and older ($B=-0.021$) had lower HRQOL. Subjects under elementary school education ($B=-0.022$), when subjective health status is perceived as normal ($B=-0.043$) or bad ($B=-0.106$), and those with hospitalization experience ($B=-0.016$) had lower HRQOL.

In the frailty group, education level, subjective health status, and hospitalization experience were found to be significant influencing factors on health-related quality of life, and their explanatory power was 21.5% ($F=10.788, p<.001$). High school graduates or higher compared to elementary school graduation ($B=-0.047$), where subjective health status was perceived as normal ($B=-0.057$) or bad ($B=-0.145$), and with hospitalization experience ($B=-0.038$) possessed health-related quality of life was even lower.

Insert table 3

This study is a secondary data analysis using data from the 1st year of KNHANES 2019 to identify the frailty of the Korean elderly and to identify factors affecting health-related quality of life.

In this study, the degree of frailty among the elderly in Korea was 23.86%, which was higher than that of 20.2% in previous studies analyzing the Korean Longitudinal Study of Aging[8], 13.5% in Japan[9] and 21.7% in South America[10]. Although it is difficult to make a direct comparison, if you look at the overall trend, it can see that the of the frailty elderly is gradually increasing worldwide.

The frailty of the elderly is defined as a decrease in body reserve functions such as disease, infection, and surgery, vulnerability to various stresses, and decreased recovery ability, and is a condition in which the risk of death increases[11]. Weakness, low physical activity, slow walking speed, exhaustion and weight were measured according to Fried' s criteria, and cases with 3 or more cases were classified as frailty, and cases with 1-2 cases were classified as pre-frailty[12]. In this study, the average HINT-8 score of the pre- frailty stage was 0.80, and the average HINT-8 score of the frailty stage was 0.66, indicating that the health-related quality of life score decreased. Early detection in the pre-frailty stage and application of preventive measures can prevent or delay the progression to frailty or a poor prognosis, so much attention is needed in the frailty of the elderly.

Factors that significantly affected health-related quality of life in the pre-frailty stage were gender, age, education level, subjective health status, and hospitalization experience. Among them, education level, subjective health status, and hospitalization experience were found to be significant influencing factors in both the pre- frailty stage and the frailty stage.

In this paper, a significant correlation was found with health-related quality of life (HINT-8) at low education levels, especially at the education level below elementary school. In Korean society, the degree of education affects an individual's socioeconomic status, such as employment status, wages, and promotion, which affects health-related quality of life throughout life. Education has an ultimate effect on the quality of

life of the elderly because it gives knowledge on how to access and utilize resources that solve various problems in old age, and these results can be easily found in various previous studies[8,13,14].

As a result of this study, subjective health status was a significant influencing factor on, and the higher the perceived health, the higher the quality of life. According to previous studies[15,16], subjective health status is a factor that has a great influence on the health-related quality of life in the elderly. Subjective health status and mental health have a very close relationship, which affects the perception and behavior of the elderly's own physical and mental health[16,17], subjective health status is considered as a major indicator of mortality in several studies[18]. In order to improve HRQOL, it is necessary to find an appropriate nursing intervention plan that can improve subjective health status.

Those with less than 1 year of hospitalization experience showed lower health-related quality of life. The degree of frailty among hospitalized elderly varies from 27.8% to 80%[19]. Hospitalized patients experience depression and ADL decline, which can lead to frailty[20].

As a result of this study, it was found that health-related quality of life was lowered in women and over 80 years of age in the pre-frailty stage. These results are the same as those of a study[16] that showed that women had a lower quality of life than men. In previous studies, it was reported that older women had lower quality of life than other groups, perceived subjective health status lower than men, and had a higher rate of chronic diseases[8]. The progress of

aging increases the discomfort in maintaining a normal life, and 30.8% of the elderly over 80 years of age have one or more limitations in daily living performance, which is a result consistent with previous studies. Considering that functional disability, fatigue, and sleep problems are factors that lower the quality of life of the elderly as the age increases, it is predicted that various problems appearing due to the increase in age may have affected the deterioration of HRQOL.

As a result, the lower the education level, the more perceived the subjective health status was, and the more elderly were hospitalized, there was more frailty in Korean elderly.

Frailty will become an increasingly important problem not only in Korea but also around the world, and nurses will take care of more and more frail elderly people.

4. Conclusion

Through the results of this study, when planning their health care intervention program, it is thought that HRQOL can be effectively improved if factors affecting are considered. In other words, it will be required to construct a health management program suitable for women, seniors, and educational level from the pre-frailty stage, intensive management of patients with hospitalization experience, and a mental intervention program to improve subjective health status.

As frailty can be recovered or prevented, it is hoped that a follow-up study will be conducted based on the results of this study. It is suggested to develop guidelines for the management of frailty for Korean elderly.

As this study is a cross-sectional study, it is a study that analyzes secondary data affecting health-related quality of life at the time of investigation, so there is a limitation in explaining the causal relationship.

Nevertheless, it is thought that the fact that it provided useful information by identifying the degree of senescence of large groups of elderly people and verifying HRQOL influencing factors is considered to be useful and valuable in the future

5. References

1. Kwang IK. Frailty: A core geriatric concept. *Journal of the Korean Geriatrics Society*. 2010 Mar;14(1):1-7.
2. Kojima G, Iliffe S, Taniguchi Y, Shimada H, Rakugi H, Walters K. Prevalence of frailty in Japan: a systematic review and meta-analysis. *Journal of Epidemiology*. 2017 Nov;27(8):347-53.
3. Rockwood K, Fox RA, Stolee P, Robertson D, Beattie BL. Frailty in elderly people: an evolving concept. *Canadian Medical Association Journal*. 1994 Feb;150(4):489-495.
4. Won CW, Lee S, Kim J, Chon D, Kim S, Kim C-O, et al. Korean frailty and aging cohort study (KFACS): cohort profile. *BMJ Open*. 2020 Mar;10(4): e035573. Available from: <https://bmjopen.bmj.com/content/bmjopen/10/4/e035573>
5. Ding YY, Kuha J, Murphy M. Multidimensional predictors of physical frailty in older people: identifying how and for whom they exert their effects. *Biogerontology*. 2017 Feb;18(2):237-52.
6. Hwang HS, Kwon IS, Park BJ, Cho B, Yoon JL, Won CW. The validity and reliability of Korean frailty index. *Journal of the Korean Geriatrics Society*. 2010

Dec;14(4):191-202.

7. Hanlon P, Nicholl BI, Jani BD, Lee D, McQueenie R, Mair FS. Frailty and pre-frailty in middle-aged and older adults and its association with multimorbidity and mortality: a prospective analysis of 493 737 UK Biobank participants. *The Lancet Public Health*. 2018 Jul;3(7): e323-e332. Available from: <https://www.sciencedirect.com/science/article/pii/S24682667183009144>

8. Ko Y, Choi KW. Prevalence of frailty and associated factors in Korean older women: The KLoSA study. *Journal of Women & Aging*. 2017 Jul;29(1):15-25.

9. Martins BA, Visvanathan R, Barrie H, Huang CH, Matsushita E, Okada K, et al. Frailty prevalence using Frailty Index, associated factors and level of agreement among frailty tools in a cohort of Japanese older adults. *Archives of Gerontology and Geriatrics*. 2019 Jul; 84:103908.

10. Coelho-Junior HJ, Marzetti E, Picca A, Calvani R, Cesari M, Uchida MC. Prevalence of prefrailty and frailty in South America: a systematic review of observational studies. *The Journal of Frailty & Aging*, 2020 Apr;9(4):197-213

11. Pereira AA, Borim FSA, Neri AL. Risk of death in elderly persons based on the frailty phenotype and the frailty index: a review study. *Revista Brasileira de Geriatria e Gerontologia*. 2017 Mar-Apr;20(02):273-285.

12. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*. 2021 Mar;56(3):146-157.

13. Murayama H, Kobayashi E, Okamoto S, Fukaya T, Ishizaki T, Liang, et al. National prevalence of frailty in the older Japanese population: Findings from a

nationally representative survey. *Archives of gerontology and geriatrics*. 2020 Aug;91:104220.

14. Park MJ, Choi SE. The effects of health behavior and health status on health-related quality of life in older people: Gender analysis by using the 2012 Korea health panel data. *Journal of Korean Academy of Community Health Nursing*, 2017 Jun;28(2):118-128.

15. Yu Y, Fong VW, Lau JT, Sum, RK, Leung EF, Mo PK. The associations between psychological needs, health-related quality of life and subjective well-being among Chinese older people: A cross-sectional study. *Health & Social Care in the Community*. 2022 Sep;30(2):570-578.

16. Ngamaba KH, Panagioti M, Armitage CJ. How strongly related are health status and subjective well-being? Systematic review and meta-analysis. *The European Journal of Public Health*. 2017 Jul;27(5):879-885.

17. Malicka B, Skośkiewicz-Malinowska K, Kaczmarek U. The impact of socioeconomic status, general health and oral health on health-related quality of life, oral health-related quality of life and mental health among polish older adults. *BMC Geriatrics*. 2022 Jan;2(1):1-15.

18. Haseli-Mashhadi N, Pan A, Ye X, Wang J, Qi Q, Liu Y, et al. Self-rated health in middle-aged and elderly Chinese: distribution, determinants and associations with cardio-metabolic risk factors. *BMC public health*. 2009 Sep;9(1):1-11.

19. Richards SJ, D'Souza J, Pascoe R, Falloon M, Frizelle FA. Prevalence of frailty in a tertiary hospital: A point prevalence observational study. *Plos one*. 2019 Jul;14(7): e0219083.

20. Lan X, Yi B, Chen X, Jin S, Chen Q, Wang Z. Prevalence of frailty and associated factors among hospitalized older

adults: A Cross-Sectional Study. Clinical Nursing Research. 2022 Mar;00(0): 1-8.

Table 1. Comparison of demographic factors to the degree of frailty

Variable	Categories	Pre-frail	Frail	$\chi^2/F(p)$
HINT-8 mean		0.80	0.66	
Sex	Man	631(50.4%)	82(18.8%)	131.204 (<.001)
	Female	622(49.6%)	322(81.2%)	
Age	65-69	442(36.4%)	73(17.2%)	87.714 (<.001)
	70-74	352(25.8%)	109(21.6%)	
	75-79	249(21.1%)	106(28.7%)	
	≥80	210(16.8%)	126(32.5%)	
Education level	≤Elementary school	538(45.7%)	300(75.7%)	124.235 (<.001)
	Middle school	195(17.6%)	55(13.3%)	
	≥High school	396(36.7%)	42(11.0%)	
Household income	High	115(10.1%)	23(5.3%)	71.164 (<.001)
	Middle	615(49.6%)	117(30.5%)	
	Low	515(40.3%)	272(64.2%)	
Number of household members	1	261(17.7%)	141(30.7%)	28.996 (<.001)
	≥2	992(82.3%)	273(69.3%)	

Table 2. Comparison of health- related factors to the degree of frailty

Variable	Categories	Pre-frail	Frail	$\chi^2/F(p)$
Subjective health status	Good	312(27.3%)	38(3.4%)	172.229 (<.001)
	Normal	629(55.5%)	148(39.8%)	
	Bad	197(17.2%)	214(50.8%)	
Smoke	Present smoker	135(11.6%)	27(6.1%)	58.666 (<.001)
	Past smoker	401(31.5%)	67(16.2%)	
	Non-smoker	704(56.8%)	318(77.6%)	
Hospitalizations	No	993(88.1%)	319(79.5%)	16.717 (.002)
	yes	140(11.9%)	79(20.5%)	
Outpatient visits	No	667(59.1%)	185(49.5%)	11.338 (0.004)
	yes	465(40.9%)	213(50.5%)	
Chronic disease	0	175(15.6%)	17(3.1%)	95.541 (.010)
	1	288(26.0%)	55(13.2%)	
	≥2	672(58.4%)	327(83.7%)	

Total cholesterol	>240	158(14.1%)	52(11.9%)	5.551
	≤240	1095(85.9%)	362(88.1%)	(.156)
HbA1c*	>5.6	900(71.9%)	315(77.0%)	5.147
	≤5.6	353(28.1%)	99(23.0%)	(.110)
Systolic Blood Pressure	>120	887(69.7%)	289(70.0%)	0.758
	≤120	336(30.3%)	125(30.0%)	(.787)
Hemoglobin	Man< 13, Female< 12	85(7.6%)	79(19.5%)	40.661
	Man≥ 13, Female≥12	1168(92.4%)	335(80.5%)	(<.001)

* HbA1c : Hemoglobin A1c

Table 3. Factors affecting health-related quality of life according to the degree of frailty

Variable	Categories	Pre-frail			Frail		
		B	t(p)		B	t(p)	
Sex (Ref. Man)	Female	-0.028	-3.793	<.001	-0.004	-0.165	0.869
Age (Ref. 65-69)	70-74	-0.004	-0.6	0.549	0.006	0.386	0.700
	75-79	-0.014	-1.804	0.073	-0.003	-0.152	0.879
	≥80	-0.021	-2.157	0.032	-0.018	-0.86	0.391
Education level (Ref. ≥High school)	≤Elementary school	-0.022	-3.434	0.001	-0.047	-2.761	0.006
	Middle school	-0.013	-1.775	0.078	-0.001	-0.044	0.965
Household income (Ref. High)	Low	-0.018	-1.942	0.054	-0.032	-1.005	0.316
	Middle	-0.008	-1.077	0.283	-0.048	-1.282	0.202
Number of household members (Ref. ≥2)	1	-0.008	-0.991	0.323	-0.016	-0.97	0.334
Subjective health status (Ref. Good)	Normal	-0.043	-7.28	<.001	-0.057	-2.816	0.005
	Bad	-0.106	-10.657	<.001	-0.145	-7.472	<.001
Smoke (Ref. Non-smoker)	Present smoker	-0.012	-1.074	0.284	-0.015	-0.616	0.539
	Past smoker	-0.002	-0.344	0.731	-0.01	-0.324	0.746
Hospitalizations (Ref. No)	yes	-0.016	-2.114	0.036	-0.038	-0.666	0.010
Outpatient visits (Ref. No)	yes	-0.003	-0.676	0.500	-0.014	-0.914	0.362

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Chronic disease (Ref. 0)	1	0.004	0.459	0.647	0.011	0.278	0.781
	≥ 2	0.001	0.163	0.871	-0.003	-0.073	0.942
Hemoglobin (Ref. Man < 13 Female < 12)	Man ≥ 13	0.009	1.684	0.094	-0.011	-0.666	0.506
	Female ≥ 12						
$R^2 = .264$ Wald F = 19.984 p < .001					$R^2 = .215$ Wald F = 10.788 p < .001		