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Analyzing the effect of body weight on mortality after hip fracture in South Korea

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INTRODUCTION

As the number of hip fractures is expected to continue to increase with the aging population, it is important to identify factors that influence the prognosis of patients with hip fractures.

OBJECTIVES

This study aims to investigate the effect of body weight on the risk of mortality in hip fracture patients in South Korea.

METHODS

This study was conducted using the sample cohort database of the National Health Insurance (NHI). The database was created by stratifying 2% of the Korean population by sex, age, enrollee classification, insurance premium quintile, and region for all Korean population in 2006. For 4,475 hip fracture patients aged 19 and above from 2003 through 2018 who did not experience a hip fracture in the past year and had weight data, we calculated mortality rates by weight group.

RESULT

The association between body weight and the risk of mortality could not be assessed in younger population aged 19 to 64 due to the rare incidence of hip fractures in this group. Among hip fracture patients aged 65 and older, 28.20% of those who were underweight (Body Mass Index (BMI): <18.5 kg/m²) died within one year following hip fracture, compared to 15.51%, 9.99%, and 6.48% of those with normal weight (BMI: 18.5-22.9 kg/m²), overweight (BMI: 23.0-24.9 kg/m²), and obesity (BMI: ≥25.0 kg/m²), respectively. This finding indicates a linear trend between body weight and the risk of mortality. The adjusted odds ratio (OR), calculated using the normal weight group as the reference and adjusted for gender and age, shows a significantly higher risk of one-year mortality in the underweight group compared to the normal weight group (OR: 1.605, 95% confidence interval (CI): 1.152-2.235). However, the one-year mortality risk among the overweight (OR: 0.830, 95% CI: 0.596-1.154) and obese group (OR: 0.774, 95% CI: 0.553-1.084) was lower, although the risk was not statistically significant.

Figure 1. Framework of study

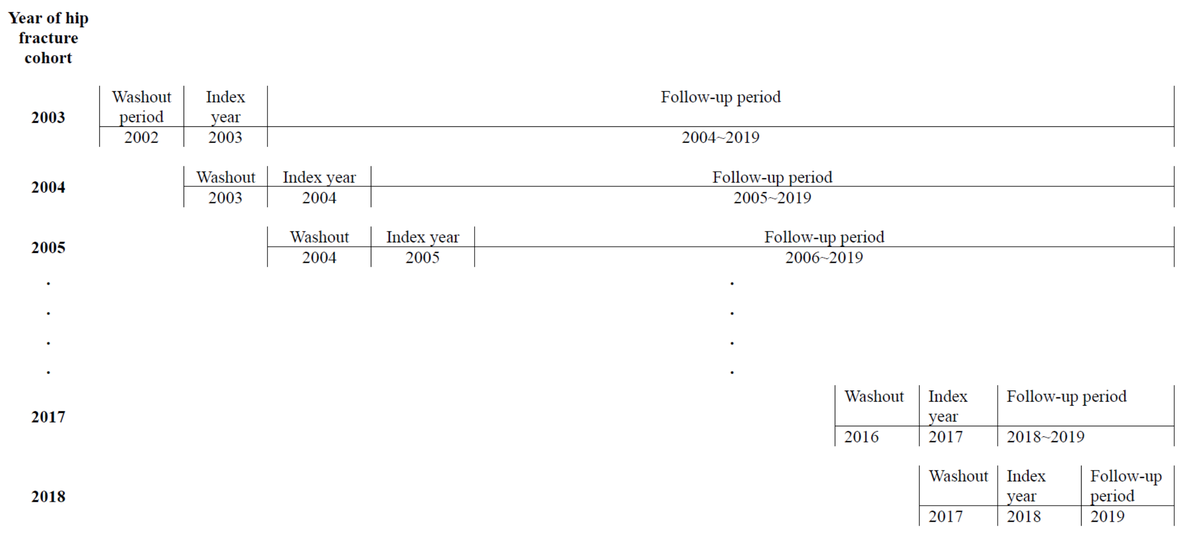
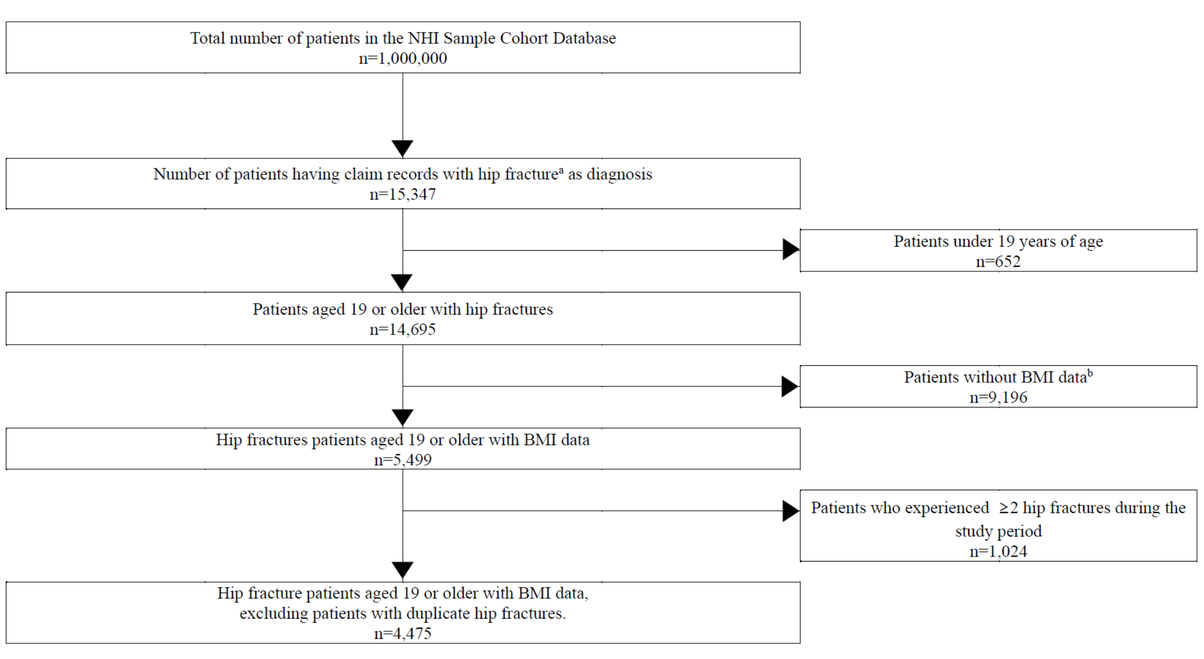


Figure 2. Flowchart for identifying the study subjects



BMI: body mass index, NHI: National Health Insurance.

a. ICD-10 codes for hip fracture: S72, S72.0, S72.080, S72.090, S72.121, S72.20, S72.3, S72.7, S72.91, S72.091, S72.1, S72.120, S72.191, S72.2, S72.21, S72.30, S72.4, S72.80, S72.81, S72.06, S72.060, S72.061, S72.08, S72.081, S72.09, S72.12, S72.19, S72.190, S72.31, S72.70, S72.71, S72.8, S72.9, S72.90

b. If a BMI is available for the year of diagnosis, it is used; if not, the previous year's BMI is used; if the previous year's BMI is not available, the two previous years' BMIs are used.

CONCLUSION

The finding of the increased risk of mortality in the underweight elderly hip fracture patients stresses the importance of preventing underweight conditions among the elderly to improve their health outcomes.

Table 1. Basic characteristics of the study subjects

Characteristics	No. patients (%)				
	Total	Under weight (BMI: <18.5kg/m²)	Normal weight (BMI: 18.5~22.9kg/m²)	Overweight (BMI: 23.0~24.9kg/m²)	Obesity (BMI: ≥25.0kg/m²)
No. patients (%)	4,475 (100)	378 (8.45)	1,741 (38.91)	979 (21.88)	1,377 (30.77)
Sex					
Male	1,764 (39.42)	154 (8.73)	741 (42.01)	395 (22.39)	474 (26.87)
Female	2,710 (60.56)	224 (8.27)	1,000 (36.90)	583 (21.51)	903 (33.32)
Missing	1 (0.02)				
Age (in years)					
20~29	70 (1.56)	6 (8.57)	37 (52.86)	14 (20.00)	13 (18.57)
30~39	122 (2.73)	6 (4.92)	45 (36.89)	28 (22.95)	43 (35.25)
40~49	266 (5.94)	16 (6.02)	112 (42.11)	62 (23.31)	76 (28.57)
50~59	489 (10.93)	25 (5.11)	180 (36.81)	119 (24.34)	165 (33.74)
60~69	826 (18.46)	39 (4.72)	280 (33.90)	196 (23.73)	311 (37.65)
70~79	1,478 (33.03)	106 (7.17)	548 (37.08)	312 (21.11)	512 (34.64)
80~89	1,098 (24.54)	153 (13.93)	474 (43.17)	227 (20.67)	244 (22.22)
≥90	126 (2.82)	27 (21.43)	65 (51.59)	21 (16.67)	13 (10.32)
Type of NHS program enrolled					
NHI	4,306 (96.22)	359 (8.34)	1,673 (38.35)	955 (22.18)	1,319 (30.63)
MA	168 (3.75)	19 (11.31)	68 (40.48)	23 (13.69)	58 (34.52)
Missing	1 (0.02)				
Income deciles					
0~2	812 (18.15)	75 (9.24)	316 (38.92)	173 (21.31)	248 (30.54)
3~5	931 (20.80)	67 (7.20)	391 (42.00)	208 (22.34)	265 (28.46)
6~8	1,184 (26.46)	94 (7.94)	442 (37.33)	272 (22.97)	376 (31.76)
9~10	1,431 (31.98)	134 (9.36)	546 (38.16)	299 (20.89)	452 (31.59)
Missing	117 (2.61)				
Place of residence					
Seoul	680 (15.20)	57 (8.38)	241 (35.44)	155 (22.79)	227 (33.38)
Metropolitan	1,009 (22.55)	71 (7.04)	409 (40.54)	219 (21.70)	310 (30.72)
Other areas	2,786 (62.26)	250 (8.97)	1,091 (39.16)	605 (21.72)	840 (30.15)

MA: Medical Aid, NHI: National Health Insurance, NHS: National Health Service

Table 2. Mortality by weight following hip fractures among patients aged 19 years or older

	Total No. patients	Total No. deaths (%)	Deaths within 30 days (%)	Deaths within 30 days through 1 year (%)	Deaths after 1 year (%)*
Under weight	378	220 (58.20)	23 (10.45)	68 (30.91)	129 (58.64)
Normal weight	1,741	733 (42.10)	47 (6.41)	160 (21.83)	526 (71.76)
Overweight	979	284 (29.01)	15 (5.28)	57 (20.07)	212 (74.65)
Obesity	1,377	326 (23.67)	15 (4.60)	52 (15.95)	259 (79.45)
Total	4,475	1,563 (34.93)	100 (6.40)	337 (21.56)	1,126 (72.04)

Table 3. Mortality by weight following hip fractures among patients aged 65 years or older

	Total No. patients	Total No. deaths (%)	Deaths within 30 days (%)	Deaths within 30 days through 1 year (%)	Deaths after 1 year (%)*
Under weight	305	204 (66.89)	22 (10.78)	64 (31.37)	118 (57.84)
Normal weight	1,264	674 (53.32)	42 (6.23)	154 (22.85)	478 (70.92)
Overweight	671	264 (39.34)	13 (4.92)	54 (20.45)	197 (74.62)
Obesity	941	298 (31.67)	15 (5.03)	46 (15.44)	237 (79.53)
Total	3,181	1,440 (45.27)	92 (6.39)	318 (22.08)	1,030 (71.53)

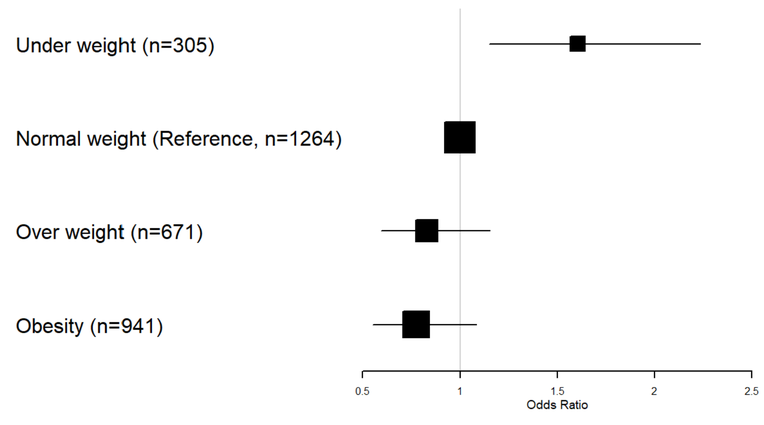
* The data is right-censored and covers for the observation period up to 2019.
The observation period varies for each patient, with a minimum of 1 year and a maximum of 15 years.

Table 4. One-year mortality by weight following hip fractures among patients aged 65 years or older

	Total No. patients	Deaths within 1 year (%)	Crude Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Under weight	305	86 (28.20)	1.777 (1.286, 2.457)	1.605 (1.152, 2.235)
Normal weight	1,264	196 (15.51)	Reference	Reference
Overweight	671	67 (9.99)	0.829 (0.600, 1.146)	0.830 (0.596, 1.154)
Obesity	941	61 (6.48)	0.628 (0.453, 0.870)	0.774 (0.553, 1.084)
Total	3,181	410 (12.89)	-	-

CI: confidence interval.
[a] Odds ratios were adjusted for sex and age

Figure 3. Adjusted odds ratios for 1-year mortality by weight following hip fractures among patients aged 65 years or older



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