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Predicted Body Composition Against COVID-19: A Potential Digital Health Strategy

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Abstract. This study focused on the associations between predicted lean body mass index (LBMI), appendicular skeletal muscle mass index (ASMI), and body fat mass index (BFMI) with the 2019 coronavirus disease (COVID-19). A nationwide population-based non-underweight cohort of 2,037,714 participants underwent two consecutive biennial health screening examinations, with changes in predicted body composition indices estimated using a multivariable-adjusted logistic regression model. Increased LBMI and ASMI were associated with a lower COVID-19 risk among men who became obese. In COVID-19 patients, increased LBMI, ASMI, and BFMI were associated with a higher risk of extracorporeal membrane oxygenation among obese men.

Keywords. Lean body mass, appendicular skeletal muscle mass, body fat mass, COVID-19, SARS-CoV-2

1. Introduction

There are some accurate methods to distinguish muscle and fat mass, such as dual-energy X-ray absorptiometry (DXA) [1]. A previous study developed a robust prediction equation to calculate the predicted lean body mass index (LBMI), appendicular skeletal muscle mass index (ASMI), and body fat mass index (BFMI) [2]. This study sought to determine the association of predicted body composition with risk of COVID-19 to testify the effectiveness of body composition management against COVID-19.

2. Methods

This study used the Korea Disease Control and Prevention Agency (KDCA) and the National Health Insurance Service (NHIS) database for policy and academic research

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(KDCA-NHIS-2022-1-573). The study population consisted of participants who underwent biennial health screening in both the 2017-2018 and 2019-2020 periods. All participants were followed up until December 31, 2021. Logistic regression was used to evaluate the association of predicted body composition with the risk of COVID-19.

3. Results

Table 1 shows the association of changes in predicted body composition between two biennial health screening periods with COVID-19 after stratification by sex and body mass index.

Table 1. Association of changes in predicted LBMI, ASMI, and BFMI between two biennial health screening periods (2017 to 2018 and 2019 to 2020) with risk of SARS-CoV-2 infection.

BMI, kg/m^2	Event/total	aOR (95% CI) for SARS-CoV-2 infection per 1 kg increase in each predicted index		
		LBMI	ASMI	BFMI
Men				
Overall	92,800/1,078,589	1.01 (1.00-1.01)[c]	1.01 (1.00-1.02)	1.00 (1.00-1.01)
18.5-22.9	19,060/245,349	1.02 (1.01-1.07)[e]	1.03 (1.01-1.06)[c]	1.02 (1.01-1.03)[d]
23.0-24.9	24,336/286,166	1.00 (0.99-1.01)	0.99 (0.97-1.01)	1.00 (0.99-1.01)
≥25.0	49,514/547,074	1.00 (0.99-1.01)	1.00 (0.99-1.01)	1.00 (0.99-1.00)
Women				
Overall	85,074/959,125	0.99 (0.98-1.00)[e]	0.98 (0.97-0.99)[d]	0.99 (0.98-0.99)[e]
18.5-22.9	35,264/415,558	1.00 (0.99-1.01)	1.00 (0.99-1.02)	0.99 (0.98-1.00)[e]
23.0-24.9	19,925/224,265	0.99 (0.98-1.00)	0.99 (0.97-1.01)	0.99 (0.98-0.99)[d]
≥25.0	29,885/319,302	0.98 (0.97-0.99)[e]	0.96 (0.95-0.98)[e]	0.98 (0.98-0.99)[e]

aOR calculated using logistic regression after adjustments for age, household income, hypertension, diabetes, dyslipidemia, Charlson comorbidity index, the dose of SARS-CoV-2 vaccination, and the baseline predicted index. Acronyms: LBMI, lean body mass index; ASMI, appendicular skeletal muscle mass index; BFMI, body fat mass index; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; aOR, adjusted odds ratio; CI, confidence interval; BMI, body mass index. [c]P<0.05. [d]P<0.01. [e]P<0.001.

4. Conclusions

The adjusted model revealed that an increase in LBMI, ASMI, and BFMI was associated with an elevated risk of COVID-19 in normal-weight men. In contrast, increased BFMI was associated with a reduced risk of COVID-19 in women regardless of weight. In addition, increased ASMI was associated with a reduced risk of COVID-19 among obese women.

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