

Low Intake of Vitamin C is Significantly Associated with Chronic Obstructive Pulmonary Disease

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Background: Vitamin C, as an antioxidant, has been recently suggested to be associated with chronic obstructive pulmonary disease (COPD). Large cohort study about the association of vitamin C with COPD independent of smoking history is needed. **Methods:** We analyzed the data of 5,592 subjects who answered to questions about smoking history, with stratification variables and sampling weight designated by the Korea 2012 National Health and Nutrition Examination Survey. **Results:** Heavier smoking history was associated with male, old age, Eup/Myun residence, general type of residence, low household income, low level of education, and occupation. The concentration of Pb and Hg was significantly higher in heavy smokers (3.6 and 6.6, respectively) than that in never smokers (2.2 and 4.0, respectively) ($p < 0.001$ in both of them). In COPD subjects, amount of food, kalium, vitamin, carotene, and retinol intake was significantly lower than that in non-COPD subjects. The amount of vitamin C intake (mg) was significantly lower in COPD (93.2 ± 3.9) than that in non-COPD (122.1 ± 4.0) ($p < 0.001$). In multivariate analysis, sex, age, smoking history, and amount of vitamin C intake was independent and significant risk factors for COPD. In heavy smoker, prevalence of COPD in lowers quartile of vitamin C intake (63.0%) was significantly higher than that in upper middle quartile of vitamin C intake (29.5%) ($p = 0.015$), (Fig. 1). **Conclusions:** Low intake of vitamin C is a significant risk factor for COPD independent of smoking history.

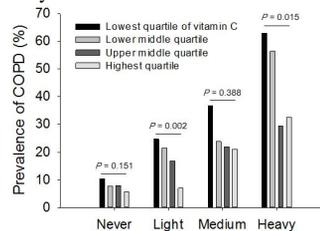


Fig. 1.

C-reactive protein levels in severe acute exacerbation of chronic obstructive pulmonary disease

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Introduction: Acute exacerbations of chronic obstructive pulmonary disease (AECOPD) are important causes of hospital admission and mortality. We investigated the clinical features of hospitalized patients with severe AECOPD and evaluated prognostic factors associated the readmission or mortality due to re-exacerbation of COPD within 6 months. **Methods:** The prospective study was enrolled 314 patients who hospitalized with severe AECOPD. And we collected demographic, clinical and laboratory findings at admission. Lung function was evaluated using the COPD assessment test (CAT) questionnaire, the modified Medical Research Council (mMRC) dyspnea scale, and spirometry in the stable state. **Results:** The mean age was 72.2 ± 9.4 years (76.4% of male), and the rate of readmission within 6 months was 45.2% and mortality rate was 16.6%. When multivariate analysis was performed by using the significant variables, age ($p < 0.001$), CAT score ($p < 0.001$), initial PaO₂ ($p = 0.026$), hemoglobin ($p = 0.009$), albumin ($p = 0.005$) and CRP at discharge ($p < 0.001$) were significantly associated with mortality. And also CAT score ($p < 0.001$) and CRP at discharge ($p = 0.004$) were significantly associated with readmission. In receiver operating characteristic curves, CRP at discharge than CAT score showed a good accuracy to predict the mortality. But CAT score showed good accuracy to predict readmission due to severe AECOPD. **Conclusions:** CRP at discharge as well as CAT score was significantly associated with both mortality and readmission due to AECOPD.

Table Cox proportional hazard regression analysis of prognostic factors associated with readmission

Variables	Univariate (readmission)			Multivariate (readmission)		
	95% CI	HR	P-value	95% CI	HR	P-value
Demographic						
CAT score	1.115, 1.176	1.145	< 0.001	1.087, 1.211	1.147	< 0.001*
mMRC scale, (≤ 2 , ≥ 3)	2.408, 4.773	3.390	< 0.001	0.862, 3.212	1.664	0.129
Smoking amounts, py	1.007, 1.025	1.016	0.001	0.989, 1.015	1.002	0.762
Clinical & laboratory						
PaO ₂ , mmHg	0.959, 0.980	0.970	< 0.001	0.946, 1.001	0.973	0.058
Albumin, g/dl	0.345, 0.738	0.505	< 0.001	0.478, 1.549	0.861	0.617
CRP at discharge, mg/dl	1.061, 1.103	1.081	< 0.001	1.015, 1.083	1.049	0.004*
initial BUN, mg/dl	1.014, 1.034	1.024	< 0.001	0.969, 1.017	0.993	0.556
initial Creatinine	1.119, 1.894	1.456	0.005	0.935, 3.731	1.867	0.077
BNP, pg/mL	1.000, 1.001	1.001	< 0.001	1.000, 1.001	1.000	0.366
Functional spirometry, %						
initial FEV1	0.977, 0.993	0.985	< 0.001	0.979, 1.007	0.993	0.347
initial FVC	0.977, 0.994	0.986	0.001	0.987, 1.015	1.001	0.901

*Indicates significance in multivariate analysis ($P < 0.05$)

BNP = B-type natriuretic peptide; BUN = blood urea nitrogen; CAT = Chronic obstructive pulmonary disease assessment test; CI = confidence interval; CRP = C-reactive protein; FEV₁ = forced expiratory volume in 1 second; FVC = forced vital capacity; HR = hazard ratio; mMRC = modified Medical Research Council; PaCO₂ = arterial carbon dioxide partial pressure; PaO₂ = arterial oxygen partial pressure; PCT = procalcitonin; PR = pulse rate; py = pack-year; RR = respiratory rate