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# Relative risk factors for Low Physical activity in COPD

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## BACKGROUND

Chronic obstructive pulmonary disease (COPD) is characterized by progressive and largely irreversible airflow limitation. Non-pharmacological treatment such as pulmonary rehabilitation also emerged as essential management besides pharmacological treatment. Previous studies revealed that physical activity (PA) level is an important clinical parameter related to mortality and hospitalization. The GOLD guidelines recommend regular PA for all patients with COPD. This study aimed to analyze factors that affect low PA in individuals with COPD.

## METHOD

Korean National Health and Nutrition Examination Survey data from 2014 to 2019 were used in this study. The study population included adults aged 40 to 79 years with COPD. COPD was defined as FEV1/FVC<0.7 according to the Global Initiative for GOLD guideline. PA was assessed using the Korean version of the Global Physical Activity Questionnaire (GPAQ) and classified into high, moderate, and low PA levels based on the WHO guideline. The statistical analysis reflected the complex sampling design of the KNHANES. First, we conducted a univariate regression analysis and then selected variables that showed significance with p<0.05 to perform a stepwise multivariate analysis.

## RESULT

2,336 participants were finally included. Classified by the PA level, there were 190 (8.13%) with high PA, 880 (37.67%) with moderate PA, and 1,266 (54.20%) with low PA. The mean age was 65.13±9.16 years. Characteristics according to the PA level were summarized in Table 1. In univariable analysis, low activities in COPD showed a correlation with age (OR 1.013), male (OR 0.792), abdominal obesity (OR 1.181), urban living (OR 0.654), high education level (OR 0.599), high income (OR 0.759), living alone (OR 1.461), Ex-smoker (OR 0.832), FVC (OR 0.993), high grip strength (OR 0.974), EQ-5D index (OR 0.157), hypertension (OR 1.186), diabetes (OR 1.215), chronic kidney disease (CKD)(OR 1.624), and arthritis (OR 1.301). In multivariable analysis, variables associated with low activities were urban living (OR 0.626), high education level (OR 0.693), current smoking (OR 1.524), FVC (OR 0.994), high grip strength (OR 0.975), EQ-5D index (OR 0.328), and CKD (OR 1.421).

**Table 1** Participants' characteristics according to physical activity level (n=2,366, N=4,247,044)

| | *Low PA (N=2,301,552)* | *Moderate-high PA (N=1,945,492)* | p-value |
|---|---|---|---|
| Age (years) | 61.00 (0.25) | 59.63 (0.29) | <0.001* |
| Sex, Male (%) | 64.92 | 70.03 | 0.001* |
| BMI, kg/m² | 24.88 (0.08) | 24.78 (0.09) | 0.383 |
| Abdominal obesity (%) | 52.29 | 48.13 | 0.015* |
| Socio-economic status (%) | | | |
| Region, Urban | 41.49 | 52.01 | <0.001* |
| Education, High | 52.42 | 64.78 | <0.001* |
| Income, High | 48.18 | 55.07 | <0.001* |
| Working state: Work | 61.44 | 64.79 | 0.052 |
| Living alone | 12.49 | 8.90 | <0.001* |
| Heavy drinking (%) | 16.13 | 14.38 | 0.195 |
| Smoking (%) | | | 0.023* |
| Non-smoker | 1.41 | 39.50 | |
| Ex-smoker | 31.17 | 35.73 | |
| Current smoker | 27.42 | 24.77 | |
| Chronic cough over 3 months | 3.83 | 4.43 | 0.370 |
| Chronic sputum over 3 months | 8.50 | 7.99 | 0.567 |
| FVC (% Reference) | 80.76 (0.32) | 82.12 (0.36) | 0.003* |
| FEV1 (% Reference) | 76.29 (0.29) | 76.96 (0.29) | 0.108 |
| Grip strength, high (%) | 92.01 | 95.41 | <0.001* |
| EQ-5D | 0.93 (0.00) | 0.95 (0.00) | <0.001* |
| Comorbidities (%) | | | |
| Hypertension | 48.65 | 44.42 | 0.018* |
| Diabetes | 25.19 | 21.69 | 0.024* |
| Dyslipidemia | 68.94 | 67.64 | 0.428 |
| Chronic kidney disease | 6.06 | 3.82 | 0.002* |
| Anemia | 7.31 | 6.07 | 0.128 |
| Cancer diagnosed | 7.02 | 5.64 | 0.099 |
| Stroke | 3.18 | 2.52 | 0.226 |
| Cardiovascular disease | 4.98 | 4.00 | 0.144 |
| Arthritis | 16.62 | 13.28 | 0.006* |
| Depression | 5.37 | 4.09 | 0.087 |

* n = the number of participants recruited, N = the number of participants recruited with weights applied.
* Grip strength was measured using a digital hand dynamometer. It was defined as the maximal measured grip strength of the dominant hand. According to the reference, it was defined as weak when it was below the mean-2SD based on age and gender. The others were defined as a high group.
Reference) Yoo JI et al. (Korean Med Sci. 2017)
* Chronic kidney disease was defined as an eGFR calculated by the CKD-EPI formula that was equal to or below 60.

**Table 2** Logistic regression analyses predicting relative risk for Low activities in COPD_Weight

| | *Univariate analysis* | | | *Multivariate analysis* | | |
|---|---|---|---|---|---|---|
| | *OR* | *95% C.I.* | *p-value* | *OR* | *95% C.I.* | *p-value* |
| Age, years | 1.013 | 1.006, 1.020 | <0.001* | | | |
| Sex: Male | 0.792 | 0.687, 0.913 | 0.001* | | | |
| BMI, kg/m² | 1.009 | 0.989, 1.030 | 0.384 | | | |
| Abdominal obesity | 1.181 | 1.032, 1.352 | 0.015* | | | |
| Region: Urban | 0.654 | 0.566, 0.757 | <0.001* | 0.626 | 0.538, 0.729 | <0.001* |
| Education: High | 0.599 | 0.516, 0.696 | <0.001* | 0.693 | 0.589, 0.815 | <0.001* |
| Income: High | 0.759 | 0.657, 0.877 | <0.001* | | | |
| Working status: Work | 0.866 | 0.749, 1.001 | 0.051 | | | |
| Living alone: Yes | 1.461 | 1.205, 1.771 | <0.001* | | | |
| Heavy drinking | 1.145 | 0.932, 1.407 | 0.196 | | | |
| Smoking: Ex-smoker (ref. Non-smoker) | 0.832 | 0.709, 0.977 | 0.025* | 1.117 | 0.922, 1.353 | 0.260 |
| Smoking: Current smoker (ref. Non-smoker) | 1.056 | 0.880, 1.267 | 0.555 | 1.524 | 1.227, 1.894 | 0.001* |
| Chronic cough over 3 months | 0.859 | 0.617, 1.196 | 0.369 | | | |
| Chronic sputum over 3 months | 0.859 | 0.617, 1.196 | 0.369 | | | |
| FVC (% Reference) | 0.993 | 0.988, 0.998 | 0.003* | 0.994 | 0.989, 0.999 | 0.025* |
| FEV1 (% Reference) | 0.995 | 0.990, 1.001 | 0.110 | | | |
| Grip strength, High | 0.974 | 0.967, 0.981 | <0.001* | 0.975 | 0.965, 0.984 | <0.001* |
| EQ-5D index | 0.157 | 0.084, 0.292 | <0.001* | 0.328 | 0.166, 0.646 | 0.001* |
| Hypertension | 1.186 | 1.029, 1.367 | 0.019* | | | |
| Diabetes | 1.215 | 1.026, 1.440 | 0.024* | | | |
| Dyslipidemia | 1.062 | 0.915, 1.233 | 0.429 | | | |
| Chronic kidney disease | 1.624 | 1.197, 2.205 | 0.002* | 1.421 | 1.026, 1.967 | 0.034* |
| Anemia | 1.220 | 0.944, 1.577 | 0.128 | | | |
| Cancer diagnosed | 1.264 | 0.956, 1.672 | 0.100 | | | |
| Stroke | 1.270 | 0.862, 1.872 | 0.227 | | | |
| Cardiovascular disease | 1.259 | 0.924, 1.716 | 0.144 | | | |
| Arthritis | 1.301 | 1.078, 1.571 | 0.006* | | | |
| Depression | 1.330 | 0.958, 1.847 | 0.089 | | | |

## CONCLUSION

This study identified several factors associated with low physical activity. These findings can be used to develop strategies to improve PA levels in individuals with COPD and ultimately improve their quality of life.