Significantly higher comorbidity between asthma-COPD overlapping syndrome (ACOS) and sleep apnea: a meta-analysis study

Yen-Wen Chen [a], Ping-Tao Tseng [b], Kuan-Ching Wang [c], Pao-Yen Lin [d,e], Meng-Ni Wu [f], Chung-Yao Hsu [g,h], Mao-Chang Su [i]

[a] Prospect clinic for otorhinolaryngology & neurology

[b] Department of Psychiatry, Tsyr-Huey Mental Hospital, Kaohsiung Jen-Ai's Home, Taiwan

[c] Department of otorhinolaryngology, Cheng Ching Hospital, Taichung

[d] Department of Psychiatry, Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Kaohsiung, Taiwan

[e] Center for Translational Research in Biomedical Sciences, Kaohsiung Chang Gung Memorial Hospital

[f] Department of Neurology, Kaohsiung Medical University Hospital

[g] Department of Neurology, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan

[h] Department of Neurology, Faculty of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan

[i] Sleep center, Division of pulmonary and critical care medicine, Kaohsiung Chang Gung Memorial Hospital

Abstract:

Introduction

Asthma and chronic obstructive pulmonary disease (COPD) were two distinct diseases and frequently taken together as overlapping syndrome (ACOS). Some researchers mentioned the high prevalence of sleep apnea in patients with ACOS but the others did not. The aim of current study was to summarized the current evidence of association between the ACOS and sleep apnea.

Method and Materials

We used the guideline of meta-analysis of observational studies in epidemiology (MOOSE) guideline for current observational meta-analysis. The literatures search in current meta-analysis was performed by two well-trained authors on the platform of PubMed, ScienceDirect, and ClinicalTrials.gov. The predetermined inclusion criteria were as below: published articles investigating the comorbidity between asthma/COPD and sleep apnea, and articles that were conducted in human trials. Based upon the presumed potential heterogeneity among this topic, we used random-effects meta-analysis models to calculate the recruited data. The primary outcome measure was the prevalence rate of (i) asthma/COPD in patients with sleep apnea or without sleep apnea, or (ii) the prevalence of sleep apnea or difference of apnea-hypopnea index (AHI) in patients with asthma/COPD or without asthma/COPD. The AHI was defined as apnea-hypopnea happened at sleep (AH/hour), which was recorded by polysomnography. The Q statistic and corresponding p value was used to evaluate the potential heterogeneity. Publication bias was evaluated via visual inspection of funnel plots and Egger's regression tests.

In situation of evidence of heterogeneity, we perform meta-regression and subgroup meta-analyses to find out the potential sources of heterogeneity.

Result

After excluding fifty-seven articles, we included twelve articles in current study. Among them, four articles provide the comorbidity data of asthma in patients with sleep apnea (patients with sleep apnea = 954, mean age=14.8, mean female proportion=52.7%; controls without sleep apnea = 21345, mean age=20.6, mean female proportion=39.0%), three articles discussing differences of AHI in patients with asthma and those in controls (patients with asthma = 2910, mean age=45.7, mean female proportion=57.0%; controls without asthma = 5246, mean age=43.1, mean female proportion=49.9%). On the other hand, four articles provided the comorbidity data of COPD in patients with sleep apnea (patients with sleep apnea = 8380, mean age=62.5, mean female proportion=27.5%; controls without sleep apnea = 8432, mean age=60.3, mean female proportion=41.4%), three articles discussing differences of AHI in patients with COPD and those in controls (patients with COPD = 1286, mean age=66.3, mean female proportion=42.0%; controls without COPD = 6055, mean age=62.1, mean female proportion=54.9%). To be specifically, the meta-analysis results revealed that there were significantly higher comorbidity rates of asthma in patients with sleep apnea than those in controls without sleep apnea (Odds ratio = 2.386, 95% CI =1.812 to 3.141, *P*< 0.001) and significantly higher AHI and prevalence of sleep apnea in patients with asthma than those in controls without asthma (Odds ratio= 2.758, 95% CI =1.387 to 5.485, *P* =0.004). On the other hand, the meta-analysis results revealed that there was no any significantly different comorbidity rates of COPD in patients with sleep apnea and those in controls without

sleep apnea (Odds ratio = 0.987, 95% CI =0.745 to 1.307, *P* =0.925) or any

significantly different AHI or prevalence of sleep apnea in patients with COPD than

those in controls without COPD (Odds ratio= 1.133, 95% CI =0.842 to 1.526, *P*

=0.409).

Conclusion:

Our meta-analysis suggested that, although frequently taken together as overlapping

syndrome, only the asthma had significantly higher comorbidity rate with sleep

apnea but not COPD. Further studies were encouraged to discover the potential

benefit of treatment of asthma on sleep apnea.