Allergy Asthma Immunol Res. 2023 May;15(3):276-278
https://doi.org/10.4168/aair.2023.15.3.276
pISSN 2092-7355·eISSN 2092-7363

Allergy, Asthma & Immunology Research AAIR

Editorial

A New Simpler and More Accurate Approach to the Diagnosis of Sleep Apnea

Hyun Jun Kim *

Department of Otorhinolaryngology, Ajou University School of Medicine, Suwon, Korea

▸ See the article "Surface Active Salivary Metabolites Indicate Oxidative Stress and Inflammation in Obstructive Sleep Apnea" in volume 15 on page 316.

Received: Apr 20, 2023
Revised: Apr 23, 2023
Accepted: Apr 25, 2023
Published online: May 4, 2023

Correspondence to
Hyun Jun Kim, MD, PhD
Department of Otorhinolaryngology, Ajou University School of Medicine, 164 World cup-ro, Yeongtong-gu, Suwon 16499, Korea.
Tel: +82-31-219-5267
Fax: +82-31-219-5264
Email: entkhj@ajou.ac.kr

ORCID iDs
Hyun Jun Kim
https://orcid.org/0000-0002-3134-0142

Disclosure
There are no financial or other issues that might lead to a conflict of interest.

The prevalence of sleep apnea varies according to the study and the country, and it has generally increased with age. However, research has consistently reported that the prevalence has increased due to obesity and aging. Moreover, since the incidence of sleep apnea has been increasing during the coronavirus disease 2019 era, it is important to recognize and treat it.[1-4] Recently, there has been growing interest in sleep apnea as a systemic inflammatory disease.[5,6] Inflammation is an important mechanism by which sleep apnea leads to serious complications, including hypertension, arrhythmia, and stroke. In addition, sleep apnea induces local inflammation in the airway by inhibiting ciliary beating and activating inflammatory genes.[7] Moreover, sleep apnea and other inflammatory diseases of the airway, such as asthma and allergic rhinitis, are closely related in several ways. Sleep apnea and asthma have the same target organ (*i.e.*, the airway) and risk factors. Also, sleep apnea aggravates asthma symptoms by causing inflammation, whereas asthma worsens sleep apnea by triggering airway obstruction. Therefore, some researchers have considered sleep apnea and airway inflammatory disease as one disease.[8,9]

Polysomnography is essential for diagnosing sleep apnea, but its use is limited by the time and cost required. Consequently, various screening tools have been developed.[10,11] For example, formulas have been devised to predict sleep apnea using patient characteristics such as height, body weight, tonsil size, tongue position, and history. Questionnaires, such as Berlin and STOP-BANG, have also been used. Recently, wearable devices, such as Galaxy and Apple watches and Fitbits, have been used to diagnose sleep apnea. These devices apply actigraphy principles and heart rate variability for sleep analysis. A wearable device collects and analyzes movements and heart rate data, which determines the wearer's sleep status. However, none of these methods can accurately diagnose sleep apnea. Therefore, a new tool to screen for sleep apnea is needed. Kim *et al.*[12] identified salivary metabolites as a screening tool for sleep apnea. This method is easy, noninvasive, inexpensive, and highly accurate. Moreover, these metabolites can be used as biomarkers for disease severity and treatment outcomes. Many researchers have attempted to find out biomarkers for sleep apnea, most of which require blood sampling or heart rate monitoring during a certain period. In this regard, saliva is a useful sample type that addresses the limitations of existing screening methods.[13-17]

The mechanism of sleep apnea involves blockage of the airway due to the collapse of structures such as the palate, tonsils, and tongue. However, saliva is also an important component of the airway and can play an essential role in sleep apnea.[18] This study by Kim *et al.*[12] shows that saliva is a new frontier in sleep apnea research and can be used not only for measuring biomarkers but also as a therapeutic target. This innovative approach can be applied to various aspects of sleep apnea research and can provide valuable insights.

However, the study by Kim *et al.*[12] has some limitations. First, although the sensitivity, specificity, area under the curve, positive predictive value, and negative predictive value were satisfactory, the sample size was too small to test the usefulness of the screening tool. Considering that the accuracy of the screening tool is critical, future studies using a larger number of participants are necessary. Secondly, as the authors described, many factors influencing the study results should be considered. For example, salivary metabolites can be affected by various conditions such as age, sex, food intake, oral metabolic/neurodegenerative diseases, and malignancies.[19,20] Thirdly, the feasibility of the method for collecting saliva used in the study has limitations, because mouth dryness is a common symptom of sleep apnea. If insufficient saliva is collected, the analysis of salivary metabolites may yield inaccurate results.

Sleep apnea is also common in children; therefore, further pediatric studies are required. If the accuracy of the method is validated, salivary metabolites could also be used to screen for sleep apnea in children.

REFERENCES

1. Mashaqi S, Kallamadi R, Matta A, Quan SF, Patel SI, Combs D, et al. Obstructive sleep apnea as a risk factor for COVID-19 severity-the gut microbiome as a common player mediating systemic inflammation via gut barrier dysfunction. Cells 2022;11:1569.
PUBMED | CROSSREF
2. Maas MB, Kim M, Malkani RG, Abbott SM, Zee PC. Obstructive sleep apnea and risk of COVID-19 infection, hospitalization and respiratory failure. Sleep Breath 2021;25:1155-7.
PUBMED | CROSSREF
3. Strausz S, Kiiskinen T, Broberg M, Ruotsalainen S, Koskela J, Bachour A, et al.; FinnGen. Sleep apnoea is a risk factor for severe COVID-19. BMJ Open Respir Res 2021;8:e000845.
PUBMED | CROSSREF
4. Chung F, Waseem R, Pham C, Penzel T, Han F, Bjorvatn B, et al. The association between high risk of sleep apnea, comorbidities, and risk of COVID-19: a population-based international harmonized study. Sleep Breath 2021;25:849-60.
PUBMED | CROSSREF
5. Orrù G, Storari M, Scano A, Piras V, Taibi R, Viscuso D. Obstructive sleep apnea, oxidative stress, inflammation and endothelial dysfunction-an overview of predictive laboratory biomarkers. Eur Rev Med Pharmacol Sci 2020;24:6939-48.
PUBMED | CROSSREF
6. Kheirandish-Gozal L, Gozal D. Obstructive sleep apnea and inflammation: proof of concept based on two illustrative cytokines. Int J Mol Sci 2019;20:459.
PUBMED | CROSSREF
7. In SM, Park DY, Lee KI, Gu G, Kim HJ. The effects of intermittent hypoxia on human nasal mucosa. Sleep Breath 2021;25:1453-60.
PUBMED | CROSSREF
8. Prasad B, Nyenhuis SM, Imayama I, Siddiqi A, Teodorescu M. Asthma and obstructive sleep apnea overlap: what has the evidence taught us? Am J Respir Crit Care Med 2020;201:1345-57.
PUBMED | CROSSREF

9. Inancli HM, Enoz M. Obstructive sleep apnea syndrome and upper airway inflammation. Recent Pat Inflamm Allergy Drug Discov 2010;4:54-7.
PUBMED | CROSSREF
10. Jonas DE, Amick HR, Feltner C, Weber RP, Arvanitis M, Stine A, et al. Screening for obstructive sleep apnea in adults: evidence report and systematic review for the US Preventive Services Task Force. JAMA 2017;317:415-33.
PUBMED | CROSSREF
11. Kim K, Park DY, Song YJ, Han S, Kim HJ. Consumer-grade sleep trackers are still not up to par compared to polysomnography. Sleep Breath 2022;26:1573-82.
PUBMED | CROSSREF
12. Kim J, An S, Kim Y, Yoon DW, Son SA, Park JW, et al. Surface active salivary metabolites indicate oxidative stress and inflammation in obstructive sleep apnea. Allergy Asthma Immunol Res 2023;15:316-35.
PUBMED | CROSSREF
13. Mohit , Tomar MS, Sharma D, Nandan S, Pateriya A, Shrivastava A, et al. Emerging role of metabolomics for biomarker discovery in obstructive sleep apnea. Sleep Breath. Forthcoming 2022.
PUBMED | CROSSREF
14. Koike S, Sudo H, Turudome S, Ueyama M, Tanaka Y, Kimura H, et al. Hyperoxidized peroxiredoxin 2 is a possible biomarker for the diagnosis of obstructive sleep apnea. Antioxidants 2022;11:2486.
PUBMED | CROSSREF
15. Maniaci A, Iannella G, Cocuzza S, Vicini C, Magliulo G, Ferlito S, et al. Oxidative stress and inflammation biomarker expression in obstructive sleep apnea patients. J Clin Med 2021;10:277.
PUBMED | CROSSREF
16. Martín-Montero A, Gutiérrez-Tobal GC, Kheirandish-Gozal L, Vaquerizo-Villar F, Álvarez D, Del Campo F, et al. Heart rate variability as a potential biomarker of pediatric obstructive sleep apnea resolution. Sleep 2022;45:zsab214.
PUBMED | CROSSREF
17. Thomas RJ, Wood C, Bianchi MT. Cardiopulmonary coupling spectrogram as an ambulatory clinical biomarker of sleep stability and quality in health, sleep apnea, and insomnia. Sleep 2018;41:zsx196.
PUBMED | CROSSREF
18. Lam JC, Kairaitis K, Verma M, Wheatley JR, Amis TC. Saliva production and surface tension: influences on patency of the passive upper airway. J Physiol 2008;586:5537-47.
PUBMED | CROSSREF
19. Dziurkowska E, Wesołowski M. Effects of age, drug dose, and sampling time on salivary levels of olanzapine, quetiapine, and their metabolites. J Clin Med 2020;9:3288.
PUBMED | CROSSREF
20. Hyvärinen E, Savolainen M, Mikkonen JJ, Kullaa AM. Salivary metabolomics for diagnosis and monitoring diseases: challenges and possibilities. Metabolites 2021;11:587.
PUBMED | CROSSREF