medicina

MDPI

Editorial

Obstructive Sleep Apnea: A View from the Back Door

Silvano Dragonieri [1,*] and Andras Bikov [2,3,*]

[1] Department of Respiratory Diseases, University of Bari, 70124 Bari, Italy
[2] North West Lung Centre, Manchester University NHS Foundation Trust, Manchester M239LT, UK
[3] Division of Infection, Immunity and Respiratory Medicine, University of Manchester, Manchester M239LT, UK
* Correspondence: silvano.dragonieri@uniba.it (S.D.); andras.bikov@gmail.com (A.B.)

Received: 22 April 2020; Accepted: 23 April 2020; Published: 25 April 2020

Abstract: Obstructive sleep apnea (OSA) is a common disease that may affect up to 50% of the adult population and whose incidence continues to rise, as well as its health and socio-economic burden. OSA is a well-known risk factor for motor vehicles accidents and decline in work performance and it is frequently accompanied by cardiovascular diseases. The aim of this Special Issue is to focus on the characteristics of OSA in special populations which are less frequently investigated. In this regard, seven groups of experts in the field of sleep medicine gave their contribution in the realization of noteworthy manuscripts which will support all physicians in improving their understanding of OSA with the latest knowledge about its epidemiology, pathophysiology and comorbidities in special populations, which will serve as a basis for future research.

Keywords: obstructive sleep apnea; sleep disordered breathing; cardiovascular comorbidities; biomarkers; inflammation; volatile organic compounds; accident risk; non-communicable diseases; risk assessment

Introduction

Obstructive sleep apnea (OSA) is a common disease that may affect up to 50% of the adult population [1]. These percentages are comparable to arterial hypertension [2], and even higher than in diabetes mellitus [3]. Although the exact prevalence in different communities is still unknown, the incidence of OSA continues to rise, as well as its health and socio-economic burden [4]. This Special Issue focuses on the characteristics of OSA in special populations which are less frequently investigated.

OSA is a well-known risk factor for motor vehicles accidents and decline in work performance [5,6]. Alexandropolou et al. concluded that OSA affects around 20% of the Greek nurses and 8% of the nurses have OSA with excessive daytime sleepiness [7]. Celikhisar et al. studied 965 heavy equipment operators in Turkey and found that around 7% of them had OSA [8]. More importantly, the severity of OSA was directly related to the number of work-related accidents [8].

Despite the increasing awareness of OSA and its consequences, most of the patients with OSA remain undiagnosed and untreated [9]. Data on OSA prevalence mainly originate from high-income countries with good healthcare access [4]. In contrast, low- or middle-income countries are less-represented in epidemiological studies. Mathiyalagen et al. screened a population of patients attending non-communicable disease clinics in a rural health training center in South India and reported a 25.8% incidence of OSA [10].

Cardiovascular diseases frequently accompany OSA [11]. Chronic intermittent hypoxia in OSA leads to airway inflammation [12] which can be analyzed in exhaled breath samples [13]. In this issue, Finamore et al. provide a comprehensive summary on the current knowledge of exhaled breath analysis in OSA [14]. Airway inflammation, together with intermittent hypoxia and surges in the sympathetic activity, induce systemic inflammation [15] which could be a potential link to

cardiovascular diseases in OSA. The soluble urokinase type plasminogen activator receptor (suPAR) is a promising biomarker of cardiovascular disease [16]. However, Bocskei et al. reported unaltered suPAR levels in OSA [17]. Despite the relationship between cardiovascular disease and OSA, little is known about the characteristics of obstructive sleep apnea in special subgroups of patients. Ardelean et al. studied 143 patients with heart failure and OSA [18]. They concluded that patients with mid-range ejection fraction (40%–49%) are characterized by a different profile of comorbidities compared to low and preserved ejection fraction subgroups [18]. Finally, in their excellent study, Zota el al. concluded that OSA is related to exercise limitation which is improved after continuous positive airway treatment [19].

Taken together, these studies will support all physicians in improving their understanding of OSA with the latest knowledge about its epidemiology, pathophysiology and comorbidities in special populations, which will serve as a basis for future research.

Acknowledgments: Andras Bikov is supported by the NIHR Manchester BRC.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Heinzer, R.; Vat, S.; Marques-Vidal, P.; Marti-Soler, H.; Andries, D.; Tobback, N.; Mooser, V.; Preisig, M.; Malhotra, A.; Waeber, G.; et al. Prevalence of sleep-disordered breathing in the general population: The HypnoLaus study. *Lancet Respir. Med.* **2015**, *3*, 310–318. [CrossRef]
2. Whelton, P.K.; Carey, R.M.; Aronow, W.S.; Casey, D.E., Jr.; Collins, K.J.; Dennison Himmelfarb, C.; DePalma, S.M.; Gidding, S.; Jamerson, K.A.; Jones, D.W.; et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension* **2018**, *71*, 1269–1324. [PubMed]
3. Pinchevsky, Y.; Butkow, N.; Raal, F.J.; Chirwa, T.; Rothberg, A. Demographic and Clinical Factors Associated with Development of Type 2 Diabetes: A Review of the Literature. *Int. J. Gen. Med.* **2020**, *13*, 121–129. [CrossRef] [PubMed]
4. Senaratna, C.V.; Perret, J.L.; Lodge, C.J.; Lowe, A.J.; Campbell, B.E.; Matheson, M.C.; Hamilton, G.S.; Dharmage, S.C. Prevalence of obstructive sleep apnea in the general population: A systematic review. *Sleep Med. Rev.* **2017**, *34*, 70–81. [CrossRef] [PubMed]
5. Garbarino, S.; Guglielmi, O.; Sanna, A.; Mancardi, G.L.; Magnavita, N. Risk of Occupational Accidents in Workers with Obstructive Sleep Apnea: Systematic Review and Meta-analysis. *Sleep* **2016**, *39*, 1211–1218. [CrossRef] [PubMed]
6. Garbarino, S.; Pitidis, A.; Giustini, M.; Taggi, F.; Sanna, A. Motor vehicle accidents and obstructive sleep apnea syndrome: A methodology to calculate the related burden of injuries. *Chronic Respir. Dis.* **2015**, *12*, 320–328. [CrossRef] [PubMed]
7. Alexandropoulou, A.; Vavougios, G.D.; Hatzoglou, C.; Gourgoulianis, K.I.; Zarogiannis, S.G. Risk Assessment for Self Reported Obstructive Sleep Apnea and Excessive Daytime Sleepiness in a Greek Nursing Staff Population. *Medicina* **2019**, *55*, 468. [CrossRef] [PubMed]
8. Celikhisar, H.; Dasdemir Ilkhan, G. The Association of Obstructive Sleep Apnea Syndrome and Accident Risk in Heavy Equipment Operators. *Medicina* **2019**, *55*, E599. [CrossRef] [PubMed]
9. Simpson, L.; Hillman, D.R.; Cooper, M.N.; Ward, K.L.; Hunter, M.; Cullen, S.; James, A.; Palmer, L.J.; Mukherjee, S.; Eastwood, P. High prevalence of undiagnosed obstructive sleep apnoea in the general population and methods for screening for representative controls. *Sleep Breath.* **2013**, *17*, 967–973. [CrossRef] [PubMed]
10. Mathiyalagen, P.; Govindasamy, V.; Rajagopal, A.; Vasudevan, K.; Gunasekaran, K.; Yadav, D. Magnitude and Determinants of Patients at Risk of Developing Obstructive Sleep Apnea in a Non-Communicable Disease Clinic. *Medicina* **2019**, *55*, E391. [CrossRef] [PubMed]
11. Drager, L.F.; Togeiro, S.M.; Polotsky, V.Y.; Lorenzi-Filho, G. Obstructive sleep apnea: A cardiometabolic risk in obesity and the metabolic syndrome. *J. Am. Coll. Cardiol.* **2013**, *62*, 569–576. [CrossRef] [PubMed]

12. Bikov, A.; Hull, J.H.; Kunos, L. Exhaled breath analysis, a simple tool to study the pathophysiology of obstructive sleep apnoea. *Sleep Med. Rev.* **2016**, *27*, 1–8. [CrossRef] [PubMed]
13. Dragonieri, S.; Porcelli, F.; Longobardi, F.; Carratu, P.; Aliani, M.; Ventura, V.A.; Tutino, M.; Quaranta, V.N.; Resta, O.; De Gennaro, G. An electronic nose in the discrimination of obese patients with and without obstructive sleep apnoea. *J. Breath Res.* **2015**, *9*, 026005. [CrossRef] [PubMed]
14. Finamore, P.; Scarlata, S.; Cardaci, V.; Incalzi, R.A. Exhaled Breath Analysis in Obstructive Sleep Apnea Syndrome: A Review of the Literature. *Medicina* **2019**, *55*, E538. [CrossRef] [PubMed]
15. Unnikrishnan, D.; Jun, J.; Polotsky, V. Inflammation in sleep apnea: An update. *Rev. Endocr. Metab. Disord.* **2015**, *16*, 25–34. [CrossRef] [PubMed]
16. Eapen, D.J.; Manocha, P.; Ghasemzadeh, N.; Patel, R.S.; Al Kassem, H.; Hammadah, M.; Veledar, E.; Le, N.A.; Pielak, T.; Thorball, C.W.; et al. Soluble urokinase plasminogen activator receptor level is an independent predictor of the presence and severity of coronary artery disease and of future adverse events. *J. Am. Heart Assoc.* **2014**, *3*, e001118. [CrossRef] [PubMed]
17. Bocskei, R.M.; Meszaros, M.; Tarnoki, A.D.; Tarnoki, D.L.; Kunos, L.; Lazar, Z.; Bikov, A. Circulating Soluble Urokinase-Type Plasminogen Activator Receptor in Obstructive Sleep Apnoea. *Medicina* **2020**, *56*, E77. [CrossRef] [PubMed]
18. Ardelean, C.L.; Pescariu, S.; Lighezan, D.F.; Pleava, R.; Ursoniu, S.; Nadasan, V.; Mihaicuta, S. Particularities of Older Patients with Obstructive Sleep Apnea and Heart Failure with Mid-Range Ejection Fraction. *Medicina* **2019**, *55*, E449. [CrossRef] [PubMed]
19. Zota, I.M.; Statescu, C.; Sascau, R.A.; Roca, M.; Gavril, R.S.; Vasilcu, T.F.; Boisteanu, D.; Mastaleru, A.; Jitaru, A.; Leon Constantin, M.M.; et al. CPAP Effect on Cardiopulmonary Exercise Testing Performance in Patients with Moderate-Severe OSA and Cardiometabolic Comorbidities. *Medicina* **2020**, *56*, E80. [CrossRef] [PubMed]