

Editorial

State of the Art in Comorbidities and Complications Associated with Sleep-Related Breathing Disorders

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Abstract: The term “sleep-related breathing disorders” (SRDB) comprehends a spectrum of pathologic conditions characterized by abnormal respiration during sleep, that can affect both adults and growing subjects. The expanding knowledge on this topic has revealed that impaired sleeping and breathing have profound effects on many systemic functions, therefore a modern approach requires the collaboration of different professionals like the otorhinolaryngologist, pneumologist, neurologist, cardiologist, psychologist, dentist, and many others. The real prevalence of such conditions is unknown, especially in children, even though a growing awareness can be found among Governments, researchers, and public opinion, especially for the social implications that SRDB can have. Moreover, recent studies have raised attention on comorbidities that can be associated with SRDB, influencing each other. Regarding the current international situation, it would be interesting to evaluate the progress of COVID-19 disease in SRDB patients. Defining the state-of-the-art knowledge on all the conditions orbiting around SRDB, from all points of view—aetiology, diagnosis, clinical management, interdisciplinarity, public health management—would be of great interest and impact to improve future research and the quality of life of SRDB patients.



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1. Introduction

Sleep-Related Breathing Disorders (SRBD) are a group of respiratory diseases characterized by recurrent episodes of obstruction and collapse of the upper airways during sleep. This condition leads to frequent arousals from sleep, which may be associated with or without oxygen desaturation [1]. The airway obstruction during sleep may be complete (apnea) or partial (hypopnea), with an interruption or reduction of airflow respectively [2]. The consequences of SRBD mainly concern two different aspects: sleep time quality modification and respiratory gas exchange alteration [3,4]. The first aspect is due to continuous night arousals that reduce the physiologic sleep cycle [5]. The other consequences of SRBD are due to the alterations in gas exchange during sleep [6]. The oxygen saturation in SRBD patients is lower than in healthy patients [7], and this factor can lead to cardiovascular effects in both the short and the long term [8]. The purpose of this Special Issue is to provide an overview of recent advances in SRBD monitoring and assessment, including: the design, development and application of advanced evaluation methods; and treatment based on cutting edge scientific knowledges.

2. Special Issue Evidence

This Special Issue received 10 papers and, of these, 8 were published. Authors of the accepted articles are from Italy, Denmark, Korea and Taiwan. The papers evaluated many aspects of comorbidities and complications associated with SRBD. The papers were

published over the period of 2020–2021. Five papers focuses on adult problems regarding the SRDB, while three articles focused on the aspects of SRDB that affect children.

The first published paper was a review article about the protocols around obtaining an orthodontic virtual patient through the superimposition of three-dimensional data. This review summarized current knowledge about the superimposition of three-dimensional (3D) diagnostic records to realize an orthodontic virtual patient. The aim of this study was to analyze the accuracy of the state-of-the-art digital workflow. The authors evaluated how a comparison between patients' digital and conventional planning would allow for an understanding of the effectiveness of the digital technology in the short- (e.g., short chair-side time, fewer controls and less patient discomfort) and long-term (e.g., stability of the results, incidence of relapse) treatment outcomes [9].

Through the use of a postoperative apnea-hypopnea index (AHI) qualifying the surgical success, Huang et al. evaluated how in patients suffering from very severe obstructive sleep apnea (OSA) with a confined framework, reducing volume is difficult to achieve. The authors compared the pre- and post-operative postoperative polysomnographies (PSGs) and showed how increasing hypopnea in AHI reduces both the frequency (by desaturation index (events/h)) and severity of desaturation (by mean SpO₂ desaturation (%)); conversely improving the mean SpO₂ after a one-stage multilevel surgery in very severe OSA patients and demonstrating how the improvement can be seen in classical non-surgical success patients. The authors suggested that, besides AHI reduction, the multilevel surgery in this study increased hypopnea in AHI from 29.1% to 77.3%, and improved postoperative O₂ saturation by reducing the desaturation frequency and level in very severe OSA patients [10].

Huang et al. demonstrated another important aspect regarding the surgical treatment of OSA patients. In the paper, the authors found that multilevel surgery works as an alternative treatment to CPAP and can reduce the mean heart rate during sleep. The authors showed the correlation between changes in the mean heart rate and essential sleep parameters. The paper indicated how a non-framework surgery reduced the mean heart rate from 68.6 to 62.7 beats/min with a mean heart rate reduction of 5.9 beats/min.

This finding may help to reduce the risk of consequences and mortality associated with an elevated mean heart rate [11].

The modification of respiratory and cardiovascular parameters in patients treated with Mandibular Advancement Device (MAD) were evaluated by Ciavarella et al.

The aim of this retrospective cohort study was to evaluate the effects of MAD therapy, with a particular fully customizable appliance on respiratory (Apnea/Hypopnea Index AHI, Oxygen Desaturation Index ODI) and cardiovascular parameters (i.e., Heart Rate) in an adult population with OSA.

The authors demonstrated that MAD therapy with a fully customizable appliance was effective in improving AHI, ODI and HR in an adult population with mild to severe OSA. In particular, a decrease in the maximum HR and an increase in the minimum HR were observed, suggesting a reduction in HR variability [12].

Kim et al. evaluated the oral parafunctions (i.e., Sleep Bruxism (SB)) in OSA patients. The authors compared subjects with and without SB episodes among patients with OSAS, rather than healthy controls, in order to consider the influences of factors that might affect the combination of OSAS and SB. The authors evaluated whether a single overnight in-laboratory PSG session would be suitable for assessing SB episodes in patients with OSAS.

The authors showed that a greater proportion of stage N2 sleep, a longer sleep time in a supine position, a lower AHI, and a higher oxygen saturation were associated with SB episodes in patients with OSAS.

A longer sleep time in a supine position (especially lasting for a duration of over 280 min) might be strongly associated with SB episodes in such patients [13].

Niu et al. evaluated the modification of a Complications Associated SRDB (i.e., nocturnal enuresis) in children treated with the rapid maxillary expansion (RME). Nocturnal enuresis (NE) is the involuntary loss of urine during sleep. This condition affects between

7% and 10% of all 7-year-olds and between 0.5% and 2% of young adults. This randomized controlled clinical trial (RCT) was designed to evaluate whether RME could reduce the frequency of NE and improve quality of life in children, after ruling out a placebo effect, in order to investigate whether the effects of RME on NE are related to the morphology of the nasal and pharyngeal airway. The hypothesis was that RME treatment would lead to a reduction in nocturnal urine production as a result of improved breathing obtained by enlarging the nasal and pharyngeal airway. The authors suggested that RME reduces the frequency of NE and that there might be an association between the amount of expansion and the reduction in night urine volume [14].

Colonna et al. evaluated the association of oral parafunctions (i.e., SB) in young adults. The authors evaluated SB behaviors in a sample of healthy young adults using a portable EMG/ECG device. They showed that during sleep time, Masticatory Muscles activities (sMMA) events associated with heart-rate increase are quite frequent. The average SB index over the four nights that were recorded was 3.6 ± 1.2 [15].

Panzarella et al. presented a paper regarding the Pediatric Sleep Questionnaire (PSQ). They assessed the accuracy of specific items added to the original PSQ, particularly related to the patient's anamnestic history and the quality of sleep, for the screening of OSAS in a paediatric population. The authors highlighted how the investigation of sleep quality can be an important parameter in order to more effectively identify potential pediatric subjects at risk of OSAS. The assumption of bizarre or abnormal positions during sleep (e.g., hyperextending the neck or sitting), especially if present with other determinants that alter sleep quality, should be considered an alarm bell for the investigation of possible obstructive sleep apnoea [16].

3. Conclusions

This Special Issue about comorbidities and complications associated with SRBD sparked great interest among the scientific community. The health quality of life conditions and comorbidities related to SRDB were investigated in the present special issue. New important aspects about SRDB complications, evaluation and treatment were described, increasing the knowledge of clinicians involved in its management.

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Institutional Review Board Statement: All the procedures described in the present research protocol adhered to the Declaration of Helsinki (1975) (and the subsequent revisions) and were approved by the Ethical Committee of the University of Foggia (Approval no. 43/CE/2019).

Conflicts of Interest: The authors declare that they have no conflict of interest.

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