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Research Paper

Publication trends in obstructive sleep apnea: Evidence of need for more evidence☆

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Bibliometric analysis

Abstract *Objective:* Published research in obstructive sleep apnea (OSA) appears limited despite OSA being a highly prevalent adult and pediatric disease leading to many adverse outcomes if left untreated. We aimed to quantify the deficit in OSA scientific literature in order to provide a novel way of identifying gaps in knowledge and a need for further research inquiry.
Methods: This was a Bibliometric analysis study. Using Ovid Medline database we analyzed and compared research output (medical and surgical) between adult OSA and similarly prevalent chronic conditions (Type II diabetes (T2DM), coronary artery disease (CAD) and osteoarthritis (OA)) from December 2016 up to fifty years prior. Linear graphs were utilized to trend collected data. Utilizing same strategy, we compared publication trends for pediatric OSA to asthma and gastroesophageal reflux (GER).
Results: Adult OSA publications ($n = 9314$) were significantly underrepresented when compared to T2DM ($n = 66{,}023$), CAD ($n = 31{,}526$) and OA ($n = 34{,}123$). Linear plots demonstrated that despite increasing number of publications this disparity persisted annually. Surgical literature composed 10.4% ($n = 972$) of adult OSA publications and reached a plateau in the last ten years. Pediatric OSA ($n = 2994$) had less research output when compared to asthma ($n = 47{,}442$) and GER ($n = 6705$). However, over past five years pediatric OSA surpassed GER in annual number of publications. Surgical literature represented 23.1% ($n = 693$) of pediatric OSA publications and continued increasing over past ten years. Study methodologies for both adult and pediatric OSA showed a lack of randomized controlled trials and meta-analyses in comparison to other diseases.
Conclusion: Our review shows substantial deficit in total, annual and surgical adult OSA published research compared to similarly prevalent diseases. This trend is not entirely observed in pediatric OSA literature.

☆ Confirmation of original material: This material has never been published and is not currently under evaluation in any other peer-reviewed publication.

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Introduction

Obstructive sleep apnea (OSA) is a common disorder, affecting up to 7% of North American adults. OSA is characterized by partial or complete upper airway collapse during sleep. Cessation of airflow leads to disruption of gas exchange and thus causes sympathetically driven recurrent arousal from sleep.[1] Affected individuals frequently manifest excessive daytime sleepiness, cognitive dysfunction as well as decreased health-related quality of life.[2] Classical OSA symptoms include snoring and intermittent breathing pauses during sleep leading to frequent arousal, yet many patients are unaware of these symptoms and disease onset is insidious.[1,2] The long-term effects of sleep fragmentation and intermittent hypoxia on health are numerous leading to systemic hypertension, impaired glucose metabolism and cardiovascular disease,[1] as well as societal effects such as increased car accidents. First line therapy for adult OSA has been in the past continuous positive airway pressure (CPAP), with surgery gradually taking on a more prominent role as evidence demonstrates benefit at or superior to CPAP in anatomically favorable patients.[3]

Despite sharing a common mechanism of upper airway obstruction and end pathway leading to pulmonary hypertension, OSA presents differently in pediatric population.[4] OSA affects 0.8%—5.7% of children with peak age of 2—8 years. Prevalence of 12 and 24% has been described when ambulatory monitoring is used instead of formal polysomnogram.[5] Cardinal symptoms of nocturnal snoring, breathing pauses may be accompanied by enuresis, impairment to cognitive development and hyperactivity.[4,5] With an exception of children with syndromes, pediatric OSA is most commonly due to lymphoid hypertrophy of Waldeyer's ring. Therefore, childhood OSA tends to be a surgical disease, addressed with tonsillectomy or adenotonsillectomy.[6]

North American population prevalence of coronary artery disease (CAD) is 6.2% whereas prevalence of type II diabetes (T2DM) is estimated to be 9.9%.[7] In osteoarthritis (OA) literature, prevalence is often overestimated because many studies use older age groups. Prevalence of OA is also joint-dependent with knee being the most commonly affected joint. Overall, symptomatic knee osteoarthritis affects up to 6% of North Americans.[8] These diseases have similar prevalence to OSA, with comparable effect on quality of life. Similarly, in the pediatric population asthma is common with prevalence estimates as high as 9.5%[9] and an estimated prevalence of gastroesophageal reflux (GER) is 5.2%.[10,11]

Over the past fifty years, research in the aforementioned similarly prevalent adult and pediatric diseases has continued to improve survival and disease specific quality of life.[7–11] However, evidence-based treatment strategies and management algorithms are limited with respect to OSA, and there continues to be a significant lag in quantity as well as quality of research to guide clinical practice for this disease. With this study we aim to characterize and analyze trends of OSA publications and compare them to existing trends in similarly prevalent diseases in order to help inform researchers and consequently funding agencies about existing need for research prioritization.

Materials and methods

A literature search was performed using Ovid Medline and Embase databases (1965—2016) in December of 2016 to define existing volume of publications in OSA, T2DM, OA and CAD in the adult literature. First mention of OSA in research journals was made in 1965, therefore we used it as the start year for our analysis. For pediatric comparison, we have performed searches for asthma and GER in addition to OSA. Initial search results in Ovid Medline yielded similar search results to Embase database confirming internal validity. For the rest of the analysis Ovid Medline database was used.

Using Ovid Medline database, we then characterized overall and annual publication output for adult and pediatric research. The following key terms were used to retrieve data for OSA (term "obstructive sleep apnea"), T2DM (term "diabetes mellitus, type 2"), OA (term "osteoarthritis"), CAD (term "coronary artery disease"), asthma (term "asthma") and GER (term "gastroesophageal reflux"). For each search age limits were set as follows "19 and above" for adult and "all child 0—18" for pediatric search. To identify surgical literature Medline search subheading for surgery ("/su") was utilized prior to applying age limits. Ovid Medline tool "explode" was used to capture all available variations of key terms for every search. Likewise, using "AND" feature main terms were paired with"randomized controlled trial" and "meta-analysis" while using same age limits to define proportion of high quality evidence in each group.

Search results were then presented as linear graphs showing number of publications per year as well as mean number of publications calculated in five year intervals for each search term from 1965 through 2015. Standard deviations were derived for five-year interval data and presented in linear plots. Finally, Chi-square test was then used to determine differences in proportion of randomized controlled trials and meta-analyses using contingency tables.

Results

Ovid Medline literature search shown that there is a disparity in publication volumes over the past fifty years. Adult OSA publications (n = 9314) from 1965 through December 2016 were underrepresented when compared to T2DM (n = 66,023), CAD (n = 31,526) and OA (n = 34,123). Linear plots showed that despite increasing number of