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Assessing the Impact of Obstructive Sleep Apnea (OSA) Management on Quality of Life (QoL) in Pediatric Patients: A Cross-Sectional Study

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Abstract

Objective: The study aims to assess the impact of obstructive sleep apnea on quality of life in pediatric patients along with their management approaches.

Methodology: The study has applied a cross-sectional design to recruit children, visiting ENT clinics with the suggestion of obstructive sleep apnea. History and OSA assessment were collected for these children from the hospital. Besides this, OSA-18 questionnaire was used to collect the data, translated into Arabic language for respondents' feasibility.

Results: A total of 24 patients (40%) were able to cure with medical treatment, whereas 36 patients (60%) were provided with surgical treatment. There were significant association between medical management and parental smoking (p-value=0.011), OSA score (p-value-0.003) and the size of adenoid (p-value=0.008). A significant association was also shown between size of adenoid and severity of OSA-18 (p-value=0.031). No significant difference was shown between parental smoking, allergic rhinitis and severity of OSA.

Conclusion: Although the surgical management is still the main modality in treating OSA, medical treatment plays an important role especially in cases with mild OSA, small adenoids and indoor smoking.

Keywords: Allergic; General Surgery; Obstructive; Quality of Life; Rhinitis; Sleep Apnea; Therapeutics

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Introduction

A sleep-disordered breathing constitutes of various issues of upper airway from primary snoring (PS) to obstructive sleep apnea (OSA) [1]. The obstructive result emerges when the air flow is blocked in the upper airway during the sleeping hours of an individual. The upper airway periodic obstructions impact the normal process of airway exchange, which later causes sleep disruptions. Obstructive sleep apnea (OSA) in children has emerged as a relatively prevalent condition, ranging from 0.7% to 10.3% [2]. This imposes a large array of morbidities, some of which may have long- term implications in adulthood. Major consequences of pediatric OSA involve neurobehavioral, cardiovascular, endocrine, and metabolic systems [2].

Children's health is widely affected by the negative sleep-related problems, such as OSA. Lack of understanding related to the given problem at a community and parental level provide open condition to the disease that creates an adverse effect over child's health. This leads to the poor assessment of the problem when outcomes are discussed with a physician. Major risk factors associated with OSA include the adenotonsillar hypertrophy and obesity [3].

OSA has been associated with various neurobehavioral deficits and dysfunctional capacity. Kaditis AG, et al. (2016) reported that the occurrence of the neurobehavioral disturbance among students impacts their learning capabilities, increases hyperactivity, and aggressive behaviour among children [4]. Marcus CL, et al. (2012) also highlighted neurobehavioral disturbances such as sleepiness during the days, problems in behaviour, difficulty in concentrating, and low quality of life among individuals with OSA [5].

Quality of life (QoL) is increasingly recognized as an important health outcome measure in clinical medicine [6]. The idea is related to the definition provided by World Health Organization, according to which "the state of complete physical, mental, and social well-being and not merely the absence of disease". The prevalence of OSA in children

has a significant impact on their overall well-being demands.

OSA-18 is reliable to assess the quality of life in patients with OSA; although, it cannot replace polysomnography to diagnose OSA [7,8]. These studies have shown that patients with obstructive sleep apnea and negative polysomnography benefit from treatment with respect to the quality of life. Garetz SL, et al. (2014) demonstrated that children with OSA are presented with low scores in terms of QoL as compared to the healthy individuals [9]. Few cases of OSA pediatric patients were detected and provided timely treatment; although, problems were faced in validation of effects in terms of their growth, development, cardiopulmonary, or metabolic systems. Previous studies have identified the detrimental effects, which occur as a result of sleep disorder, yet only few of them have evaluated sleep disorders in a comprehensive manner [10]. Parental smoking also serves as a crucial factor regarding the prevalence of OSA disease among children. Among various Australian children, parental smoking is responsible in providing increased risks of OSA [11].

Previously, the impact of the surgical intervention (adenoidectomy or adenotonsillectomy) has been examined with the quality of life, with success rate below 100% [12]. However, lack of attention to the role of medical management has documented allergic rhinitis to sleep related problems [13]. The use of intranasal steroids can improve the sleep patterns [14].

OSA is usually the Achilles heel of analgesic and pediatric sedation programs; therefore, it is essential that pediatric dentists and paediatricians should be able to identify a child who might be at risk for OSA. Currently, lack of screening tool available to pediatric dentists creates difficulty in identifying OSA throughout the preoperative appointment or to assist direct specialty consultation for patients experiencing minimal and moderate oral conscious sedation. OSA has a significant impact on QoL of the affected patients, which cannot be examined in the sleep laboratory apart from these apparent clinical outcomes. The broad impact of this disorder on human life has not been measured due to lack of symptomatic measures and polysomnographic parameters such as sleep fragmentation and AHI. Symptoms are often a subset of overall QoL of patients, which is essential for measuring the overall effect on QoL. Thus, the study aims to evaluate the impact of OSA among children in terms of their quality of life. It further explores and assesses the role of medical and surgical management in treating the adverse effects of the given problem.

Material and Methods

A cross-sectional study design was applied to evaluate the impact of OSA among children with respect to their quality of life. The study was conducted in the ENT Clinic at Al-Karak Hospital, Jordan from May 2017 to May 2018. A total of 60 pediatric children were recruited from the hospital after taking consent for their participation in the study. Children were included following the inclusion criteria: (1) time from surgery to OSA of >6 months, (2) healthy children confirmed diagnosis of moderate-to-severe OSA (apnea-hypopnea index, AHI > 5), and (3) time from PSG to PSQ of >17 months. Exclusion criteria include (1) children who experienced a repeated ENT surgery and (2) children with underlying medical issues such as cardiac, pulmonary, or neurological diseases, and craniofacial anomalies. Data was collected at the time of assessment for OSA.

Children who were presented to the ENT clinic with symptoms of sleep apnea were considered as a part of this study. Demographic information of patients includes age i.e. patients between 1-6 years, sex (Male=48, Female=12), history of chronic medical illness, history of allergy (atopy, eczema, allergic rhinitis, and bronchial asthma), past surgical history, and indoor smoking was recorded. ENT examination was undertaken to examine signs of allergic rhinitis and to check the size of the tonsils (grade 1-4).

A standard overnight polysomnography (PSG) was conducted on all children in the pediatric sleep laboratory with respect to the American Thoracic Society guidelines. Standard techniques were used to assess the sleep architecture. The American Sleep Disorders Association Task Force defines arousals using the 3-second rule. Moderate-severe OSA was explained as AHI > 5 per hour of sleep. Information on tonsils size was collected for each child and estimated using the 0-to-4 grade scale. Two experienced pediatric sleep physicians evaluated the tonsil size.

The study further provided information related to the management of the given disease. It further involves two variables, where; obstructive sleep apnea acts as a dependent variable while independent variables include patients' quality of life and its management. Moreover, prick test was undertaken to confirm the diagnosis of allergy among OSA patients. Postnasal space X-ray was undertaken to assess the size of adenoids (small or large). Questionnaire was presented to the parents as an interview was conducted by a well-trained doctor.

Patients with allergic rhinitis confirmed by skin prick test were started on medical treatment for allergy (systemic antihistamine plus intranasal antihistamine or steroids) for four weeks then re-evaluated with another OSA-18 questionnaire. Based on the OSA-18 score, patients were divided into the mild, moderate, and severe impact of OSA on the quality of life with a ratio of 0-60, 61-80, and above 81, respectively. Those without a history of allergy and those who did not respond to medical treatment were scheduled for surgery (tonsillectomy and/or adenoidectomy) and re-evaluated with another OSA-18 questionnaire after four weeks postoperatively.

The apnea-hypopnea index (AHI) of a patient was used to diagnose OSA. The average number of apnea and hypopneas per hour of sleep refers to the AHI. More than one obstructive apnea event of any length per hour of sleep is considered abnormal in pediatric OSA, which has the similar occurrence in boys and girls. Apnea was classified as: severe (AHI > 15), moderate (AHI > 5), mild (AHI > 1.5), and none (AHI ≤ 1.5).

The data was analysed using the Statistical Package of Social Sciences (SPSS) version 20.0. The statistical techniques include descriptive and inferential statistics. Chi-square statistics was used to explore the association present among the obstructive sleep apnea in pediatric patients with quality of life and management of OSA.

Results

A total of 60 pediatric patients were evaluated with a mean age of 4.1 years (range 1-12 years). The below table presents the management of OSA in pediatric patients (Table 1). Overall, 24 patients (40%) were cured with medical treatment and 36 patients (60%) cured with surgical treatment. The criteria for scheduling patients for surgery is already mentioned in the previous section. Out of 48 male patients, 27 (56.25%) male patients underwent surgery while 21 male patients underwent medical management. Furthermore, 9 female patients underwent surgery while 3 patients underwent medical management of OSA. No significant correlation was found between sex and management of OSA in pediatric patients (p-value=0.236). A total of 27 patients underwent surgical intervention who were suffering from smaller size of adenoid whereas 24 patients, suffering from smaller size of adenoid,

Table 1: Management of OSA in Pediatric Patients.

Patients variable		Management		P value
		Surgical N (%)	Medical N (%)	
Age Mean ± SD	4.13 ± 2.135	4.47 ± 2.16	3.63 ± 2.04	0.137
Total	-	36 (60%)	24 (40%)	-
Sex				0.236
Male N (%)	48 (80%)	27 (75%)	21 (87.5%)	-
Female N (%)	12 (20%)	9 (25%)	3 (12.5%)	-
Grade of tonsils				0.12
I N (%)	15 (25%)	9 (25%)	6 (25%)	-
II N (%)	18 (30%)	9 (25%)	9 (37.5%)	-
III N (%)	21 (35%)	12 (33.33%)	9 (37.5%)	
IV N (%)	6 (10%)	6 (16.67%)	0 (0%)	-
Adenoid				0.008
Small N (%)	51 (85%)	27 (75%)	24 (100%)	-
Large N (%)	9 (15%)	9 (25%)	0 (0%)	-
Parental Smoking				0.011
YES (%)	33 (55%)	15 (41.67%)	18 (75%)	-
NO (%)	27 (45%)	21 (58.33%)	6 (25%)	-
OSA Score				0.003
Mild N (%)	3 (5%)	0 (0%)	3 (12.5%)	-
Moderate N (%)	36 (60%)	18 (50%)	18 (75%)	-
Severe N (%)	21 (35%)	18 (50%))	3 (12.5%)	-

underwent medical intervention. Only 9 patients were suffering from larger size of adenoid who underwent surgical intervention. A positive and significant correlation between size of adenoid and an overall OSA management was found in pediatric patients (p-value=0.008). Similarly, parental smoking (p-value=0.011) and OSA score (p-value=0.003) were significantly correlated with the overall management of OSA in pediatric patients.

The below table shows severity of OSA-18 in pediatric patients. The findings have indicated an insignificant correlation between sex and severity of OSA-18 in pediatric patients where 15 male and 6 female patients were having severe OSA (Table 2). Furthermore, a significant correlation was found between grade of tonsils and severity of OSA in pediatric patients. A total of 15 patients having smaller size of adenoid and 6 patients having larger size of adenoid were suffering with severe OSA. A significant correlation was also shown between size of adenoid and severity of OSA-18 (p-value=0.031). No significant difference was shown between parental smoking, allergic rhinitis, and severity of OSA.

Table 2: Severity of OSA-18 in Pediatric Patients.

OSA 18				
	Mild N (%)	Moderate N (%)	Severe N (%)	P value
Sex				0.223
M	3 (100%)	30 (83.33%)	15 (71.42%)	-
F	0 (0%)	6 (16.67%)	6 (28.57%)	-
Age				0.018
2-Jan	0 (0%)	3 (8.3%)	8 (38.1%)	-
5-Mar	3 (100%)	25 (69.4%)	7 (33.3%)	-
12-Jun	0 (0%)	8 (22.2%)	6 (28.6%)	-
Grade of tonsils				0.003
1	0 (0%)	12 (33.33%)	3 (14.28 %)	-
2	3 (100%)	12 (33.33%)	3 (14.28%)	-
3	0 (0%)	9 (25%)	12 (57.14%)	-
4	0 (0%)	3 (8.33%)	3 (12.28%)	-
Adenoid				0.031
Small	3 (100%)	33 (91.67%)	15 (71.43%)	-
Large	0 (0%)	3 (8.33%)	6 (28.57%)	-
Parental Smoking				0.807
Yes	0 (0%)	21 (58.33%)	12 (57.14%)	-
No	3 (100%)	15 (41.67%)	9 (42.86%)	
Allergic rhinitis				0.639
Yes	3 (100%)	27 (75%)	15 (71.14%)	-
No	0 (0%)	9 (25%)	6 (28.57%)	-

Discussion

The study has assessed the impact of OSA among children in terms of their QoL. The findings have shown no difference between sex and severity of OSA. Zhao LP, et al. (2014) provided similar results who studied the effects of gender on OSA prevalence among patients with coronary artery disease (CAD) [15]. However, Assal HH, et al. (2016) contradicted the finding of the study, stating that OSA is more severe in males as compared to females [16]. The correlation between OSA severity and age is found to be 0.018, which is significant at 5% level of significance. In addition, a total of 8 patients aged 1-2 years were diagnosed with severe OSA, while 7 patients aged 3-5 years were diagnosed with moderate OSA, and 6 patients aged 6-12 years were diagnosed with mild OSA. The age group with severe effects ranged from 1 to 2 years. Similar results were reported by Nachalon Y, et al. (2014) who investigated the mechanisms of growth processes in young children diagnosed with OSA [17]. Moreover, findings of this study are aligned with those proposed by Borgstrom A (2017) indicating that the OSA severity was mostly reported among younger children aged between 1 to 3 years [18].

Besides this, the tonsil grade was also evaluated indicating the high correlation of the OSA with the severity (p=0.018). Baker M, et al. (2016) also obtained similar results on the individuals with OSA [19]. Borgström18 showed that the incidence of tonsil procedures has increased as a result to sleep-disordered breathing i.e. OSA. A significant impact of the size of adenoid on the OSA severity was reported. The given findings were supported by Kang KT, et al. (2013) who indicated a positive relationship between adenoid size and OSA in obese and non-obese children [20]. Brooks LJ, et al. (1998) opposed the findings of this study, highlighting that the severity of OSA was led

by the increased size of adenoid [21]. The size of adenoid thus serves as a crucial factor in ENT consideration in relation to the performance of adenotonsillectomy or tonsillectomy. The increased size of the adenoid increases the probability of tonsillectomy performance by physicians [22].

The results of the present study are divergent from one of the previous studies, where the severity was positively related for-rhinitis allergy. Dziekanski M, et al. (2017) contradicted the findings of this paper while evaluating the quality of life of the pediatric patients with OSA in Brazil [23]. The study of Castro TM, et al. (2013) is considerable here which evaluated indoor smoking among patients with respect to the OSA severity [24]. The present study also revealed that smoking is correlated with the type of management (p=0.011). Results also suggested that the smoking indoor was more common in those responded to medical treatment (18/24) as compared to the surgical group (15/36). Findings of the study are crucial as they provide important information related to the type of treatment associated with the level of disease. As illustrated above, patients suffering from mild to moderate effects of OSA were treated through medical treatments. Whereas, surgical treatments were referred to patients undergoing the severe signs of OSA. Medical experts can highly benefit from this study, as it provides concrete data related to the given problem. Sample size of this paper limits the results of this paper, providing an opportunity for future researchers to conduct the study by involving a larger sample size.

Conclusion

The study has concluded that the medical treatment plays an important role in treating OSA; however, the use of surgical procedure was also effective. The study highlighted that the children belonging to the given age group i.e., 1- 2 and 3-5 were the main recipient of OSA disorder. Considering the severity of OSA, a positive relationship was observed where all mild cases were in the medical group and most medical group patients were of moderate severity. The present study found a negative effect of the sex and tonsils on the management of the quality of life among the OSA patients. Whereas, the adenoid was positively correlated with the management of the pediatric patients, those responding to medical treatment all had small adenoids. Adenoid can be surgically removed for the enhancement of the individual life and overcoming the difficulties associated with it.

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