

Health Related Quality of Life in Adult Obstructive Sleep Apnea

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Abstract

Objective: To review the literature on Obstructive Sleep Apnea (OSA) and Health Related Quality of Life (HRQoL).

Method: We conducted systematic review of the literature on HRQoL and OSA.

Summary: Our review of published literature on quality of life in adult OSA suggest that there is significant impairment of HRQoL in obstructive sleep apnea but the magnitude of QoL impairment is not proportional to the severity of OSA as determined by AHI. There is paucity of data over effect of treatment on quality of life but the available data suggest that there is improvement in QoL with CPAP treatment at least in moderate and severe OSA patients. Effect of other treatment modalities is unclear yet.

Keywords: Health; Quality of life; Obstructive sleep apnea; Adult

Introduction

OSA is the most common form of sleep-disordered breathing (SDB) which is characterized by recurrent episodes of upper airway obstructions during sleep, resulting in reduction or cessation of airflow which leads to recurrent arousals, nocturnal desaturation and sleep fragmentation. When the obstructive sleep apnea is accompanied by daytime sleepiness it is referred to as obstructive sleep apnea syndrome (OSAS) [1]. Patients of OSA usually presents with excessive daytime sleepiness or insomnia, morning headache, nocturia, letharginess, poor concentration and memory impairment.

Studies done across various ethnic groups and geographical regions shows high prevalence of OSA. Winconsin sleep cohort [2] is one of the extensive study on prevalence of OSA using in-laboratory polysomnography and found prevalence of OSA (AHI \geq 5) 9% in females and 24% in males. OSA syndrome (AHI \geq 5 and daytime sleepiness) was present in 2% in females and 4% in males. Diagnosis of OSA is made on night time polysomnography if number of apneas and hypoapneas per hour of sleep (called as Apnea Hypopnea Index or AHI) is more than 5.

There are several risk factors that have been implicated for OSA but amongst them, obesity is one of the strongest risk factor. Others are male gender, ageing, craniofacial abnormalities, genetic predisposition, alcohol, and ethnicity [3].

Significant clinical consequences of OSA cover a wide spectrum of conditions including daytime hypersomnolence, neurocognitive dysfunction, cardiovascular disease (Hypertension, Coronary artery disease, Heart failure, Stroke, Atrial fibrillation), metabolic dysfunction (Obesity, Type 2 Diabetes, Dyslipidemia), Respiratory failure and cor-pulmonale. Sleep apnea has also been linked to an increased risk of road traffic accidents [4].

Apart from these obvious clinical consequences, OSA has significant impact on QoL of the affected patients which cannot be explored in the sleep laboratory. Symptomatic measures and polysomnographic parameter like AHI and sleep fragmentation [5,6] have failed to adequately measure the rather broad impact of this disorder on human life. Symptoms are usually a subset of overall QoL of patients thus it is more important to measure the overall impact on QoL.

Materials and Methods

This study was a systematic review of literature from 1990 to 2015. We used pubmed database for our search. We used search terms “Obstructive Sleep Apnea” and “Quality of Life” and their commonly used synonyms and acronyms. We reviewed all the abstracts for inclusion in the study. We excluded the articles involving paediatric population.

Why do we need to measure QoL in OSA?

Generally AHI and other polysomnography indices are laboratory parameters which are used to gauge the severity and symptomatology of the patient. But there is lack of association between these polysomnography indices and real world clinical outcomes like QoL, patient perception of disease or survival [7].

Further the criteria used to define apneas, hypopneas and AHI threshold for severity are all arbitrary values without any objective physiological basis behind them [6]. Understandably the parameters derived from them may not be true representative of real effect of disease on the life of patient. Two recent large scale multi institutional studies on CPAP recognized these issues and used QoL measures and functional status as primary outcome for their assessment rather than AHI [8,9].

Concept of quality of life (QoL) and health related quality of life (HRQoL)

QoL has become a very important health outcome in clinical research. The concept of QoL represents the human desire to live a happy, productive, and meaningful and disease free life. When we

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discuss QoL in relation to a disease, it represents desire not just to be free of symptoms of the disease but being free of any impact of disease or its treatment on happiness, productivity and meaningful life. It has become a frequently used tool to evaluate the burden of disease and to evaluate medical treatment. Only improvement in symptoms or increased life span is no longer sufficient for a successful treatment.

Although the term QoL was coined and defined much later but the concept and its importance has been duly addressed importance in the history of mankind. Renowned philosopher Aristotle (384-322 BC) not only described the importance of good life but talks about ultimate good being eudaimonia- a good life [10] In 1946 World Health Organisation (WHO) constitution declared health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”[11]. After this WHO definition the importance of concept of QoL again came into prominence as it was totally in sync with the new definition of health.

The concept of QoL has different meaning for different individuals, populations and societies so it is very difficult to reach a consensus definition. World Health Organisation Quality of Life (WHOQOL) group defined QoL as “an individual’s perception of their position in life, in context of the culture and values in which they live and in relation to their goals, expectations, standards and concerns” [12] QoL has several domains like functional competence, health related complaints, psychological and social functioning etc. HRQoL is an integral domain of QoL. When QoL is discussed in relation with health or diseases, it almost always means HRQoL unless specified otherwise. HRQoL is evaluated subjectively with the help of Questionnaires. These Questionnaires have multiple domains representing different aspects of life.

Quality of life instruments for obstructive sleep apnea (OSA)

There are two broad categories of QoL instruments which can be used to measure QoL in patients of OSA: Generic and OSA specific instruments. Generic instruments can be used to measure QoL in all kind of clinical conditions including OSA. Some of these generic QoL instruments have been widely used and validated in OSA. SF-36, a generic instrument is the most commonly used instrument in QoL studies in OSA, OSA Specific instruments are specifically designed for OSA and can be used to determine QoL in OSA patients only.

QoL instruments may also classified on the basis population they are used upon e.g. OSA-18 is an OSA specific QoL Instrument used in pediatric patients only.

Measuring tools

Details of OSA specific QoL instruments and frequently used generic instruments are listed in Table 1.

Which type of instrument should be used for measuring QoL

Generic and the OSA specific instruments have their own positives and negatives (Table 2). The structure of Generic instruments is more comprehensive as they cater to wide range of clinical conditions. They allow comparison to be made between studies, populations, or diseases but they may have some domains which are not related to OSA. Thus they may be lesser sensitive as compared to the disease specific instruments. In case person is suffering from more than one disease, Generic Instruments are more appropriate. Generic Instruments may have questions unrelated to the condition of the patient so may have less acceptability [27].

OSA specific instruments are specifically made for OSA patients

so all their content is relevant to OSA. This makes them more sensitive to detect subtle changes in QoL for OSA. Their contents are related to patient’s clinical condition so they tend to have higher acceptability and completion rates. This feature makes them more suitable for clinical use, due to their use being restricted to single disease, OSA specific instruments doesn’t allow inter disease comparisons.

Thus, the choice of Instrument should be based on research question. If the researcher wants to compare QoL among two conditions then obviously only generic Instruments can be used. Otherwise the recent trend is towards use of OSA specific Instruments because of their better acceptability and completion rates (Table 2).

Assessment of QoL in OSA; role in clinical practice

Initially QoL (QoL) Instruments were developed as a research tool to study QoL impairment in OSA patients. They were not intended to be used in each and every patient for clinical assessment but as the researches showed that physiological parameters like Apnea-Hypopnea Index (AHI), sleep fragmentation and other parameters recorded in sleep laboratory are inadequate to capture the complete spectrum of human suffering caused by OSA, importance of QoL assessment is increasingly being recognized and used in clinical care. It can be used to assess patient’s health status before treatment; a significantly impaired QoL may itself be an indication to start CPAP therapy in mild OSA. They may also be used after treatment to evaluate the response of the treatment and if found inadequate, may help in modifying treatment decision.

OSA specific Instruments are more suitable for clinical use as inter-disease comparisons are not required. An ideal Instrument for use in clinical practise should be self- administered, easy to understand and short. Most of the present day instruments are too long to be used in clinical cases. SAQLI is long as well as interviewer administered so not suitable for clinical use. A short QoL Instrument may hasten the routine assessment of QoL in all OSA patients (Table 3).

Discussion

Our present review discusses various studies conducted on assessment of QoL in untreated and treated OSA patients. Our study also illustrates variety of HRQoL instruments used to measure QoL in OSA.

The choice of QoL instrument depends upon the purpose of its use and the setting in which they are being used. For clinical purpose, OSA specific instrument tend to perform better owing to their higher sensitivity, acceptability and completion rates. A short instrument which can be filled by the patient himself and doesn’t take too long to answer is likely to be more acceptable for clinical use [14]. For research purpose choice of instrument depends on the research question being answered. If the researcher wants to do inter-disease comparison of QoL, only generic instrument can be used. For general purpose use of at least one generic and one OSA specific instrument is likely to be advantageous [27]. We feel that all the present instruments for measuring quality of life in OSA have one shortcoming or the other. A short questionnaire covering all important domains which can be answered in short time is still required.

A recent systematic review of measurement properties of patient reported outcome measures (PROM) used in OSA observed that most of the generic instruments with the exception of PGI (in which the patient himself write down and score the area of life which he feels is the most affected by the disease) have poor content validity for the

Instruments	Year	Domains	Items (No.)	Comments
Generic Instruments				
Short Form 36 (SF-36) [13]	1992	Physical functioning Role limitations because of physical health problems Bodily pain Social functioning General mental health Role limitations because of emotional problems Vitality General health perceptions	36	Poor content validity Mental health component and specifically it's vitality domain is probably best generic QoL instrument for OSA (14)
Nottingham Health Profile (NHP) [14]	1985	Paid employment Jobs around the house Social life Personal relationships Sex life Hobbies and interests Holidays	7	Allow only yes/No answers, so not likely to provide sensitive scores. Not frequently used, so less suitable to compare scores across diseases.
Sickness Impact Profile (SIP) [15] Functional Limitations Profile (FLP), 1981 [16] *FLP is the British version of SIP	1976	Ambulation, Body care and movement Mobility Household management Recreation and pastimes Social interaction Emotional behaviour Alertness behaviour Sleep and rest Eating Communication Work	136	Too large number of items Not frequently used, so less suitable to compare scores across diseases.
EuroQoL (EQ-5D) [17]	1990	Mobility Self-care Usual activities Pain/discomfort Anxiety/depression + Global indication of health status	5 + 1	Studies suggest poor correlation with SF-36 and PGI(18)
Patient-generated index (PGI) [18]	1994	Patient select 5 affected areas in life	19	Good content validity as patient choose his own areas. Difficult to compare scores across diseases as no uniformity in areas chosen by patients.
Munich Life Quality Dimension List (MLQDL) [19]	1998	Physical condition Psyche Social life Everyday life	19	
MSE-P (Minor Symptom Evaluation- Profile) [20]	1999	Vitality (5 items) Contentment (7items) Sleep (3 items) Miscellaneous (9 items)	24	
Specific Instruments				
Functional Outcomes of Sleep Questionnaire (FOSQ) [21]	1997	Activity level Vigilance Intimate and sexual relationships General productivity Social outcome	30	Measures the impact of sleepiness on functional status.
Obstructive Sleep Apnea Patient-Oriented Severity Index (OSAPOS) [22]	1998	Sleep problems Awake problems Medical problems Emotional and personal problems Occupational impact	32	Covered some domains not covered in other instruments (eg. Occupational impact like loss of job) Not publicly available (14)
Sleep Apnea Quality Of Life Index (SAQLI) [23]	1998	Daily functioning Social interactions Emotional functioning Symptoms + Treatment related symptoms	56 + 28 Treatment related symptoms	Good content validity Good pool of quality evidence Large number of items Interviewer administered
Quebec Sleep Questionnaire (QSQ) [24]	2004	Sleepiness Diurnal symptoms Nocturnal symptoms Emotions Social interactions	32	Original questionnaire in French Good content validity
Functional Outcomes Of Sleep Questionnaire-10 (FOSQ-10 -shorter version of the FOSQ) [25]	2009	Activity level Vigilance Intimate and sexual relationships General productivity Social outcome	10	Paucity of data
Maugeri Obstructive Sleep Apnea Syndrome (MOSAS) questionnaire [26]	2011	Sleep apnea psychological Impact Sleep apnea physical Impact Discomfort and nuisance caused by CPAP	16 + 7, CPAP related	Shorter Self-administered No questions on nocturnal symptoms (14)

Table 1: Details of OSA specific QoL instruments and frequently used generic instruments.

Generic QoL instruments	OSA Specific QoL instruments
Poor content validity. Some domains might be unrelated to OSA.	Good content validity, as they are more specific for OSA
Lower acceptability and completion rates.	Higher acceptability and completion rates
More comprehensive allow interdisease comparisons.	Doesn't allow interdisease comparisons.
More suitable for research studies	Better suitable for clinical use
Less sensitive	More sensitive to detect subtle changes in QoL

Table 2: Comparison of generic and OSA specific QoL instruments.

Study	Sample size	AHI	Instrument used	Setting	Observation
Gall et al. [28]	42 OSA patients (All Males)	RDI \geq 20	SF-36	Untreated	Mild OSA patients had impairment in Social Functioning, Role limitations-Physical and Emotional, lowered mental health and well-being.
Fornas et al. [29]	103 OSA Patients and 40 healthy controls	38 \pm 27	NHP	Untreated	SAHS patients showed a deterioration of general health status parameters in comparison with healthy subjects, these parameters do not correlate with the physiological disturbances of SAHS, expressed as the number of respiratory events per hour
Jenkinson et al. [30]	108 Patients of OSA		SF-36, FLP and EQ-5D (This study used 3 QoL measures)	Before and after 5 months of nasal CPAP therapy	SF-36 an FLP showed that there was significant baseline impairment of QoL in the patients and post CPAP QoL improved significantly. Surprisingly EuroQoL scores were higher at baseline indicating apparently good health and showed very little change. This study shows lack of correlation among the eneric questionnaire. nCPAP therapy returns patients to a QoL similar to the normal population.
Bolitschek et al. [19]	21 untreated OSA patients (QoL of 16 patients was evaluated) 67 patients with AHI > 20 and using CPAP more than 3 months 113 healthy controls	47.08/49.94 (Treated/Untreated)	MLQDL	Untreated versus treated	QoL was impaired in untreated patients there were no difference in QoL among nCPAP patients and healthy controls
Jenkinson et al. [31]	n = 89 for PGI and EuroQoL, n= 86 for SF-36		PGI, EuroQoL SF-36	Before and after 3 months CPAP	It was done to compare the 3 QoL instruments. After CPAP, QoL was improved on PGI, normalized with SF-36 but there was no/little improvement on EuroQoL.
Piccirillo et al. [32]	119 OSA patients- 71 given CPAP, 48 underwent surgery	Mean= 40.0	SF-36, OSAPOS	Before and after CPAP/Surgery	Scores on the role-physical, vitality, and emotional wellbeing subscales of the SF-36 increased significantly. OSAPOS awake and sleep subscales and total instrument score increased
Flemons et al. [33]	SAQLI was tested in 24 OSA patients.	N.A.	SAQLI SF-36	Before starting and 4 week after CPAP	SAQLI had a high correlation with SF-36 among patients successfully completing CPAP
Bennett et al. [34]	51 OSA patients (46 M and 5 F)	Median apnea/hypopnea index [AHI] 25, 90% central range: 1 to 98	SF-36	Before and after 4 week CPAP	In OSA patients SF-36 subscale scores for role-physical and vitality were impaired prior to CPAP as compared to normal population, which improved to normal levels after CPAP therapy.
D'Ambrosio et al. [35]	OSA patients (AHI > 15) = 29 (23 M, 6 F)	77 \pm 9	SF-36	Before and after 8 weeks of CPAP therapy	All domains of SF were impaired as compared to control. Post treatment QoL improved significantly in vitality, social functioning and mental health domains
Engleman et al. [36]	34 OSA patients (AHI 5-15 + daytime sleepiness) Cross over trial- patients on 4 weeks of CPAP and 4 weeks of oral placebo therapy alternatively	NA	NHP, SF-36	Before and after 4 week CPAP or oral placebo	In OSA patients SF-36 scores were impaired on most subscales (except general health perceptions). After CPAP treatment, significant improvements were seen in most of the subscales as compared to placebo. There was no change in QoL after CPAP therapy on NHP for health and functional status.
Jokic et al. [37]	13 positional OSA patients (12 M, 1 F) cross over trial- patients on 2 weeks of CPAP and 2 weeks of Positional therapy	17 \pm 8	NHP	Before and after each 2 week treatment limb	No significant difference in overall QoL between CPAP and positional therapy. (Energy level scores on the NHP were slightly better with CPAP).

Yang et al. [38]	Patients without OSA (AHI < 5)- 46 Mild OSA patients (AHI 5-15)- 16 Moderate to severe OSA (AHI > 15)- 21	NA	SF-36		
Stepnowsky et al. [39]	n = 69 (29 M, 40 F)	22 ± 19	MOS QWB	Untreated	OSA patients with AHI < 15 had significant impairment in general physical functioning and mental health functioning (not those with AHI > 15).
Walker - Engstrom et al. [20]	84 OSA patients- 41 in oral appliance group 43 in UPPP group (4 patients from oral appliances group stopped using appliances after 6 months and excluded from study)		MSE-P	Before and 1 year after UPPP or dental Device	The mean values for the three dimensions vitality, contentment and sleep improved significantly 1 year after intervention in the dental appliance and UPPP groups. One year after intervention the UPPP group showed significantly more contentment than the dental appliance group. In contrast, vitality and sleep dimensions did not differ between the two treatment groups. No significant correlations were observed between the QOL scores and somnographic values.
Baldwin et al. [40]	2398 OSA patients 5-14 AHI=1473, 15 + = 916	NA	SF-36	Untreated	Sleep disturbances are associated with worse physical and better mental HR-QOL than the U.S. norm.
Akashiba et al. [44]	60 OSAS patients (AHI > 20 + EDS) and arterial oxygen desaturation (SpO ₂ < 80%), 34 healthy controls	51.6 ± 26.6	SF-36	Untreated	Six of eight domains and the total score on the SF-36 were significantly lower than those in the control subjects.
Lacasse [42]	OSA patients n=100 (82 male)	41 + 24	Self constructed 33 items questionnaire	Untreated	OSA significantly contributes to the impairment of all domains of what is usually referred to as "health-related QoL"
Parish and lyng [43]	54 patients and their bed partners	48.4 + 33.3	SF-36 and SAQLI	Before and 6 weeks after CPAP therapy	OSA results in impaired QOL in both the patients and their bed partners. Treatment with CPAP improves QOL of both the groups
Pichel et al. [44]	42 in 6 months CPAP group, 42 in 18 months CPAP group and 84 control	NA	SF-36	One group Treated with 6 month CPAP therapy and other with 18 months CPAP therapy	6 months group showed improvement in the vitality dimension while 18 months group showed improvement in four out of the eight SF-36 dimensions (physical function, role physical, vitality and general health perception). This study shows that QoL improves with long term use of CPAP
Mulgrew et al. [45]	68 Patients (35 in PSG group and 33 in ambulatory group)	(Median RDI) 31 in PSG group, 27 in ambulatory group	SAQLI	Before and after 3 months of CPAP therapy	This study was done to test utility of diagnostic algorithm with ambulatory CPAP titration without PSG. In ambulatory group no PSG was done before starting treatment. SAQLI score improved in all patients
Ye et al. [46]	176 OSA patients (152 male, 24 female)	63.9 ± 29.4	FOSQ	Before and after 3 months of CPAP treatment	women showed a greater improvement in the overall functional status compared to men
Weaver et al. [8]	239 OSA patients with AHI 5-30 were randomized to active CPAP (n=121) and sham CPAP (n=118, CPAP pressure < 1 cm H ₂ O)	12.8 + 6.4 and 12.5 + 6.5 in active CPAP and sham group respectively	SF-36, POMS and FOSQ	Before and after 8 weeks of CPAP treatment	There was greater improvement in QoL in active CPAP group as compare to sham CPAP group after 8 weeks of therapy
Dutt et al. [47]	69 OSA patients(57 M + 12 F) 41 healthy controls	26.39 ± 16.62	SAQLI	Untreated	QoL was impaired in OSA patients in all the four domains of Calgary SAQLI. QoL impairment not directly proportional to severity of OSA.
Quan et al. [48]	199 mild OSA (AHI 5-15) patients and 40 controls with no OSA	10.9 + 2.5	SAQLI	Untreated	It evaluated mild OSA patients only. No significant difference in QOL between patient having mild OSA and no OSA
Mohanty et al. [49]	18 OSA patients	47.7 + 10.7	FOSQ	Before and after 3 months of surgery	OSA patients were not compared with controls but there was improvement in QOL after laser assisted uvulopalatopharyngoplasty

Table 3: Studies exploring QoL in patients of OOSA [28-49].

disease. The study further observed that mental health component and in particular vitality domain of SF-36 is possibly the best generic QoL instrument for OSA. It is also observed that OSAPASI, SAQLI, QSQ and MOSAS questionnaires are the only QoL instruments with good content validity. SAQLI has the best quality evidences among them but it is relatively long and interviewer administered [14].

The First study that explored QoL in OSA patients was published by

Gall et al in year 1993 which used SF-36 questionnaire to measure QoL [28]. The study was conducted among 42 males only and observed that QoL was significantly impaired in OSA patients. Interestingly in some severe OSA patients there was little impairment of QoL. After that, there have been many studies exploring QoL in patients of OSA which have been summarised in Table 3. The initial studies used only generic instruments to measure HRQoL in these patients. In 1997 Weaver et al developed FOSQ (Functional outcome of sleep questionnaire) an

OSA specific instruments to measure QoL in OSA patients [21]. After this other OSA specific Instruments like SAQLI (Sleep Apnea QoL Questionnaire), OSAPOSI (OSA Patient Oriented Severity Index) and QSQ (Quebec Sleep Questionnaire) have also been used. Among the Generic Questionnaires SF-36 has been used most. Among the generic instruments studies have shown significant variability in QoL assessment even among same patients [31]. Jenkinson et al used SF-36, PGI and Euro QoL among same group of OSA patients and observed that while SF-36 and PGI showed significant life impairment in OSA, in contrast to the EuroQoL, which showed little QoL impairment [31].

Most of the studies suggest that there is significant impairment of QoL in OSA patients but interestingly the QoL impairment has not been found to be directly proportional to the severity of OSA as determined by AHI [29,35,38]. Even no other polysomnographic variable has been consistently found to be associated with QoL impairment. It has been suggested that HRQoL deteriorates only to a certain level with increasing RDI, but then plateaus [5].

The question of effect of treatment on QoL in OSA patients has not been answered convincingly. Different studies have shown divergent results. Some studies have shown that CPAP treatment improves QoL so much so that it reaches the level of healthy controls but some studies did not observed significant improvement in QoL. In many studies of the CPAP trials, the issue of compliance has not been addressed properly and proper adjustment to take compliance into account has not been done. A 2006 Cochrane review on Continuous positive airways pressure for obstructive sleep apnoea in adults concluded that CPAP improves QoL in people with moderate and severe OSA [50]. There is paucity of data regarding effect of other treatment modalities on QoL.

Conclusion

OSA has significant impact on most of the domains of human life. Different generic and OSA specific QoL instruments have been used to assess QoL in OSA. Choice of the instrument should be based on settings and the research question. The review of available literature suggests that there is considerable impairment of HRQoL in OSA. The impairment in QoL is not proportional to the disease severity measured by AHI and has not been consistently found to be associated with any other polysomnographic variable. The impact of various treatment modalities of OSA on QoL has not been explored adequately but the available data suggest that there is improvement in QoL with CPAP treatment at least in moderate and severe OSA patients.

Future Perspective

Most of the studies in this review evaluated HRQoL in patients treated only with CPAP but the effect of other treatment modalities like surgery, dental appliances and life style modification on QoL is yet to be explored. Although short term impact of treatment on QoL is promising but the long term impact of treatment on QoL needs further studies.

We believe that none of the questionnaires presently being used is close to perfect and still there is space for development of a small yet adequate questionnaire to measure QoL in OSA which can be used both in clinical and research setting. Only few of the present questionnaires having adequate backing literature so more studies including inter-instrument comparative studies are required.

Conflict of Interest

There is not conflict of interest in this research.

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