Health-Related Quality of Life in Thai Patients with Obstructive Sleep Disordered Breathing

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Objective: *To assess the health-related quality of life (HRQOL) of Thai patients with obstructive sleep disordered breathing (OSDB) and their responses to continuous positive airway pressure (CPAP) treatment.*
Material and Method: *Thirty-eight healthy volunteers, 35 primary snorers (PS), and 108 patients with obstructive sleep apnea (OSA) diagnosed with polysomnography (PSG) were asked to fill questionnaires including Thai version of Short Form-36 (SF-36), and Epworth sleepiness scale (ESS). Thirty-two subjects with OSA who had been using CPAP adequately were asked to complete SF-36 twice, before and three months after treatment initiation.*
Results: *The role-physical and general health dimensions of SF-36 in OSA patients and PS were significantly lower than healthy volunteers ($p<0.05$). Other dimensions were not significantly different among groups of subjects. Nonetheless, the scores in all dimensions of SF-36 in OSA patients were lower than those of general population of Thailand, except for mental health. There were only weak but significant correlations between physical function, role-physical, general health, vitality, and role-emotional dimensions and ESS scores ($r = 0.17$-0.29). Most of PSG parameters, particularly apnea-hypopnea index, did not correlate with SF-36 scores except for a weak correlation between mean oxygen saturation and role-physical, mental health, and vitality dimensions. However, there was a significant improvement in all dimensions of SF-36 after three months of adequate CPAP therapy ($p<0.01$).*
Conclusion: *Thai patients with OSDB had poorer HRQOL compared to healthy subjects and general population at least in some dimensions, and an effective CPAP use can improve them. However, there was almost no relationship between HRQOL and PSG findings.*

Keywords: *Quality of life, Obstructive sleep disordered breathing, Sleep apnea, Thai*

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Obstructive sleep disordered breathing (OSDB) is a well-known spectrum of disorders ranging from primary snoring (PS) and upper airway resistance syndrome (UARS) to obstructive sleep apnea syndrome (OSAS). Several studies have demonstrated its association with excessive daytime sleepiness (EDS), impairment of cognitive performance, and various morbidities including obesity, hypertension, and cardiovascular diseases[1-3]. Given the prevalence of OSDB and its detrimental consequences, it is not surprising that the health-related quality of life (HRQOL) among these patients has been increasingly recognized as an important component in the assessment of OSDB impacts on both physical and mental function in research and clinical practice[4-7].

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While studies of OSDB and HRQOL have been commonly reported, the primary investigations were done in the Caucasian participants, or used Caucasians as the comparison groups with African Americans or Hispanic Americans[4-11]. Only a few researches had been reported regarding OSDB consequences on HRQOL in other ethnicities particularly in East Asian populations[12-14]. Since a systematic investigation of the relationship between OSDB and HRQOL among different ethnic groups with optimal measurements is an important step in advancing tailored care toward better health utilization outcomes, the availability of information for each local population is considered necessary. The objectives of the present study were, therefore, to measure the HRQOL of Thai patients with OSDB in relation to the diseases' severity classified by parameters from polysomnography (PSG) and to assess their responses to continuous positive airway pressure (CPAP) treatment.

Materials and Method

The authors declare that the present investigation was conducted between June 2010 and May 2011 as a part of project named the validity of Thai version of Functional Outcomes of Sleep Questionnaire in patients with obstructive sleep disordered breathing, which had a certificate of approval Number Si273/2010 from Siriraj Institutional Review Board (SIRB). This investigation had a financial support from the Faculty of Medicine Siriraj Hospital, Mahidol University.

Healthy subjects

Thirty-eight volunteers (23 males and 15 females) were recruited as a control group with inclusion criteria of healthy people age >18 years who had a body mass index (BMI) <30 kg/m^2, no history of snoring or witnessed apnea, no complaints of daytime sleepiness, and no history of insomnia or difficulty sleeping. Any volunteers who had underlying chronic illnesses such as hypertension, diabetes, cardiovascular diseases, psychiatric illnesses, malignancy, or chronic infectious diseases were not included. All volunteers must have had a regular sleep pattern starting before midnight and waking up no later than 8 am with an average sleep duration of seven to nine hours and must have no history of waking up after sleep onset >2 times per night or history of difficulty getting back to sleep. Any subjects who were shift workers or who had suspected symptoms of cataplexy, parasomnia, or restless leg syndrome (RLS) were excluded. Participants who used substance(s) or medications affecting sleep-wake cycle such as alcohol, hypnotics, anti-epileptics, or stimulants were also excluded from the present study.

Patients with OSDB

Thirty-five patients with PS and 108 patients with OSA aged >18 years old were recruited from the snoring clinic at Siriraj Hospital. Any patients who had co-morbidities such as chronic insomnia, parasomnia, movement disorders, chronic alcoholism, depressive disorders, unstable cardiovascular diseases, active pulmonary diseases, abnormal thyroid function, or cancer were excluded from the study. All participants underwent a gold standard overnight PSG (Compumedics; Profusion 3, Australia) which recorded electroencephalogram (EEG), electro-oculogram (EOG), electromyogram (EMG), electrocardiogram (EKG), airflow signals (both nasal pressure transducer and thermistor), thoracic and abdominal movement signals, oxygen saturation, and snoring sound. PSG parameters in the present study were scored manually by certified sleep technologists and reviewed by a board certified sleep specialist who was unaware of patient's information. The definitions of every PSG parameter, particularly on sleep stages and respiratory events in this studies had followed the recommended criteria in the manual of American Academy of Sleep Medicine (AASM) for the scoring of sleep and associated events 2007[15]. The disease's severity was classified by apnea-hypopnea index (AHI) into four groups including AHI <5 (PS or UARS), AHI 5 to <15 (mild OSA), AHI 15 to <30 (moderate OSA) and AHI ≥30 (severe OSA).

Medical outcomes short form-36 survey (SF-36)

Generic HRQOL of subjects in the present study was evaluated by a widely used self-administered questionnaire, SF-36, which is consisted of 36 questions measuring eight domains of general health including physical function (PF), role functioning-physical problems (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role functioning-emotional problems (RE) and mental health (MH). The scores of each domain can range from 0 to 100 in which the higher scores represent the better health status. The validated Thai version 1.0 of SF-36 was used in the present study with permission[16].

Epworth sleepiness scales (ESS)

The ESS is a set of self-administered questionnaires which aims to assess the degree of sleepiness during eight common situations where subjects are asked to rate their chance of dozing in recent times on a scale of 0 to 3 in each situation. The total score can range from 0 to 24 in which a lower score means less sleepiness. It is probably one of the most popular instruments in sleep medicine research due to its property of shortness and simplicity. In the present study, the authors used the validated Thai version of ESS, which has been recently published[17].

Assessment of the quality of life in subjects

All participants were asked to complete the Thai version of SF-36, ESS, and general questionnaires regarding age, sex, height, weight, sleep pattern, symptoms of OSDB, symptoms of other common sleep disorders, and underlying medical illnesses during a medical visit before any intervention was initiated. The scores in all dimensions of SF-36 were compared among healthy volunteers, PS, and OSA patients. The relationship of SF-36 scores with several important

PSG parameters was analyzed and the correlation of SF-36 with ESS was checked. In addition, the authors requested 32 OSA patients who had a good CPAP compliance (used CPAP machine nightly ≥4 hours and ≥5 days per week) to complete the SF-36 again at three months after treatment to check if there was any change.

Statistical methods

The SF-36 scores in each domain were reported by mean ± standard deviations (SD). For comparison of the mean scores among different groups, the authors used one-way Analysis of Variants (ANOVA). The relationship between SF-36 and continuous variables of PSG was tested with Spearman's correlation coefficients. To assess the changes in the scores after treatment with CPAP, the authors used paired t-test. Chi-square tests were used to compare dichotomous variables such as gender. Multivariate regression models were used to investigate the effects of gender, age, BMI and several PSG parameters on the scores of SF-36. Statistical analysis was performed by using the IBM SPSS (version 18.0, New York, USA). Significant level was accepted at $p<0.05$ in 2-tailed tests.

Results

HRQOL in healthy volunteers and OSDB patients

There were data from 141 males and 72 females used in the present study. According to AHI, there were 39 subjects with mild OSA, 27 subjects with moderate OSA, and 42 subjects with severe OSA, respectively. The demographic data of all subjects were presented in Table 1. The statistically significant differences between males and females were found in dimensions of PF (81.3±11.1 and 69.3±16.9) and BP (72.4±13.4 and 64.9±14.0, respectively) of SF-36 ($p<0.05$). Nevertheless, there was no significant different in other dimension of SF-36 and ESS between both genders. The mean scores of SF-36 in healthy subjects, PS, OSA patients, and normative data of Thai population[18] are shown in Table 2.

There were only significant differences in the domains of RP and GH of SF-36 between healthy volunteers and groups including PS and OSA patients ($p<0.05$). However, no significant difference was found between PS and OSA in all dimensions of SF-36. Other dimensions of SF-36 were not significantly different among groups of subjects. In additional subgroup analysis according to OSA severities classified by AHI as mild, moderate, and severe degree, there was still no statistically significant difference among them. Nevertheless, the means of every dimension of SF-36 scores, except for mental health in OSA patients were lower than those of general Thai population[18].

HRQOL and PSG parameters

Most of all PSG parameters, particularly AHI, did not correlate with SF-36 scores, except for only weak but significant correlations between mean oxygen saturation and RP, VT, and MH as shown in Table 3.

Correlation between SF-36 and ESS

There was a weak but significant correlation between SF-36 scores in domains of PF, RP, GH, VT, RE and ESS scores as shown in Table 4.

Table 1. Demographic data of subjects

	Healthy volunteers n = 38	Primary snorers n = 35	OSA patients n = 108	CPAP users n = 32	p-value[a]
Male/female	23/15	15/20	74/34	29/3	<0.01**
Age (yr)	45.9±6.7	46.1±9.1	50.4±11.0	53.4±8.9	0.01*
BMI (kg/m^2)	22.9±3.3	26.2±3.7	28.8±4.6	28.4±4.2	<0.01**
ESS scores	7.1±3.6	11.2±5.6	9.9±5.5	15.4±5.2	<0.01**
AHI	-	1.9±1.5	30.1±25.0	31.2±15.0	<0.01**

The quantitative data are presented in mean ± standard deviation (SD) but the qualitative data are presented in number. Chi-square tests were used to compare dichotomous variables.

* The statistical difference is significant at the level of <0.05 (2-tailed).

** The statistical difference is significant at the level of <0.01 (2-tailed).

[a] In the last column, p-values demonstrated the statistical differences among healthy volunteers, primary snoring, and OSA patients (overall). The data of OSA patients using CPAP was not compared.

BMI = body mass index; ESS = Epworth sleepiness scale; AHI = apnea-hypopnea index; OSA = obstructive sleep apnea; CPAP = continuous positive airway pressure

Table 2. Scores of SF-36 in healthy volunteers, PS, OSA patients, and general Thai population

SF-36 scores	Healthy volunteers	Primary snoring	OSA	General population (Thais)
Physical function (PF)	76.6±14.7	68.7±23.4	70.0±21.2	77.3±17.4
Role-physical (RP)	86.9±27.1	72.1±37.3*	69.9±21.2*	82.2±28.6
Bodily pain (BP)	69.5±14.0	66.2±18.8	69.3±18.8	75.6±18.4
General health (GH)	59.4±14.7	48.6±17.7*	50.7±20.4*	65.6±18.1
Vitality (VT)	56.5±12.6	57.3±15.2	57.2±18.6	62.2±13.3
Social functioning (SF)	73.7±19.0	76.1±21.3	75.3±21.8	78.2±18.2
Role-emotional (RE)	84.2±31.7	75.2±42.3	66.7±43.0	80.4±31.9
Mental health (MH)	66.7±15.6	66.6±16.2	68.3±17.1	66.1±12.9

The scores are presented in mean ± standard deviation (SD).
* The mean difference between healthy volunteers and groups including primary snoring and OSA patients is significant at the level of <0.05 (2-tailed).
OSA = obstructive sleep apnea; PS = primary snoring; SF-36 = medical short form survey-36

Table 3. Spearman correlation coefficients between each domain of SF-36 and important polysomnographic parameters

SF-36 scores	AHI	Mean O_2 saturation	Lowest O_2 saturation	Time spent O_2 >90%	Stage N3	Stage R
Physical function (PF)	0.10	0.08	-0.10	0.12	0.05	0.04
Role-physical (RP)	0.03	0.17*	-0.12	0.10	0.07	0.07
Bodily pain (BP)	0.08	<0.01	<0.01	-0.03	<0.01	<0.01
General health (GH)	0.04	0.14	-0.10	0.04	0.01	0.01
Vitality (VT)	0.03	0.19*	-0.02	0.11	0.06	-0.05
Social functioning (SF)	0.11	0.16	-0.03	0.13	-0.01	0.06
Role-emotional (RE)	0.08	0.16	-0.10	0.11	0.05	0.07
Mental health (MH)	0.01	0.19*	0.08	0.12	-0.04	-0.04

Values are presented in Spearman correlation coefficients (r).
* The correlation is significant at the level of <0.05 (2-tailed).
O_2 = oxygen; AHI = apnea-hypopnea index; SF-36 = medical short form survey-36

Table 4. Spearman correlation coefficients between each domain of SF-36 and ESS

SF-36	ESS
Physical function	-0.27**
Role-physical	-0.23**
Bodily pain	-0.66
General health	-0.29**
Vitality	-0.17*
Social functioning	-0.15
Role-emotional	-0.23**
Mental health	-0.12

Values are presented in Spearman correlation coefficients (r).
* The correlation is significant at the level of <0.05 (2-tailed).
** The correlation is significant at the level of <0.01 (2-tailed).
ESS = Epworth sleepiness scale; SF-36 = medical short form survey-36

Table 5. SF-36 scores before and after treatment with CPAP

	Pre-treatment	Post-treatment	p-value
Physical function	59.2±21.8	72.7±21.9	<0.01**
Role-physical	35.2±40.1	78.9±37.6	<0.01**
Bodily pain	63.7±16.7	77.0±16.0	<0.01**
General health	38.9±19.1	58.5±20.2	<0.01**
Vitality	46.9±16.5	64.2±16.5	<0.01**
Social functioning	59.4±20.1	78.9±17.2	<0.01**
Role-emotional	32.3±40.1	77.1±37.3	<0.01**
Mental health	56.5±18.1	75.4±12.6	<0.01**

The scores are presented in mean ± standard deviation (SD).
** The mean difference is significant at the level of <0.01 (2-tailed).
CPAP = continuous positive airway pressure; SF-36 = medical short form survey-36

HRQOL and CPAP treatment

In another group of 32 patients with severe OSA who had been using CPAP with a good compliance rate, there was a significant improvement in all dimensions of SF-36 at three months after treatment ($p<0.01$) as shown in Table 5.

Discussion

HRQOL is an increasingly important component in the assessment of the morbidity associated with OSA. Although there were several studies regarding HRQOL in OSDB, most of them were done in the Caucasians, African-Americans or Hispanics[4-11]. There were only a few reports in East Asian populations, particularly in Thais[12-14]. The result of the present study demonstrated that there was a significant difference in the domains of RP and GH of SF-36 between healthy volunteers and OSA patients but no difference in other dimensions was found among groups of subjects. Nonetheless, the scores in all dimensions of SF-36 in OSA patients of the present study were lower than those of general population of Thailand, except for MH, with the largest difference found in GH and RE[18]. The impairment of HRQOL in OSA patients relatively to general population is in accordance with the Sleep Heart Health Study which showed a poorer HRQOL in several dimensions of SF-36 in patients with severe OSA, except for RE, SF, and MH. In addition, the authors' findings are in agreement with those of British workers[19], Canadians[20], Turkish[21], and Taiwanese[13], except for a lesser degree of impairment in VT and SF in the present study. However, the data of the authors' investigation were slightly different from the report of Yang et al[7] which showed the impairment of PF, RP, and VT in moderate to severe OSA patient compared to control, and from the study of Tsara et al[22], which showed the impairment in OSA patients compared to normative data in Greek population, except for BP.

Most of PSG parameters, particularly AHI, did not significantly correlate with SF-36 scores except for only weak but significant correlations between mean oxygen saturation and RP, VT, and MH dimensions of SF-36. Although these are different from Wisconsin Cohort Study[23] which demonstrated a dose-response relationship between AHI and most of SF-36 domain, except for BP, the poor correlation between SF-36 and AHI in the present study was in agreement with several studies in the literature[3-5,13,19]. Thus, it implied that PSG parameters, especially AHI, were not good predictors for the quality of life in Thai OSDB patients. This is not surprising since several factors including the complexity of sleep-wake mechanism, the pathophysiology of OSDB, a variation in clinical manifestation of OSA (i.e. some patients may be asymptomatic despite having high AHI values), socioeconomic status, and the circumstances of each individual can all affect the quality of life.

There was only a weak but significant correlation between SF-36 in domains of PF, RP, GH, VT, RE and ESS scores. These findings are close to several studies such as the reports of Bennett[19], Wang[13], and Gulbay et al[21]. However, this is different from the study done by Kawahara et al[24], which showed no significant correlation between all dimensions of SF-36 and ESS scores.

In patients with severe OSA who had been using CPAP with a good compliance rate, there was a significant improvement in all dimensions of SF-36 after 3 months of treatment. These findings pointed in the same direction with their self-reported dramatic improvement in symptoms after therapy and confirmed that HRQOL of Thai patients respond well to adequate CPAP using, in agreement with several studies in the literature[22,24,25]. However, the authors' data showed more substantial improvement in SF-36 scores since the present study had selected only patients who had a high satisfaction with their treatment to assess the changes in health status.

There were possibly some limitations in the present study. Firstly, healthy volunteers were mainly full-time healthy employees and a gold standard PSG was not done in this group making them not an ideal control. In regard to this issue, the authors used a rigid inclusion and exclusion criteria so that the possibility of having OSA in this group would be minimal and the authors recruited the patients with PS diagnosed by PSG (AHI <5) to be another group for comparison. Secondly, there was mismatch in gender, age, BMI, and ESS scores among the samples. The majority of OSA subjects in the present study were older males with higher BMI and ESS scores, which are common findings to be expected from the fundamental knowledge. Thirdly, the influence of socioeconomic and educational status was not analyzed since it was difficult in determining the optimal cut-off point in Thais. Finally, the authors had used the first version of SF-36 in Thai language, which may have some disadvantages especially when compared with other studies. Whenever possible, the authors recommend better control groups and newer version of SF-36 questionnaires for conducting future research.

Conclusion

Thai patients with OSA had poorer HRQOL compared to healthy subjects at least in some aspects and an effective CPAP therapy can improve it. These were comparable to other ethnicities but with some differences. The present data also confirmed that there was almost no significant correlation between HRQOL and the severity of OSA as measured by PSG parameters. This information has underscored the importance of applying a local database in Asian people for better medical care and research in the future.

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Potential conflicts of interest

None.

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คุณภาพชีวิตของผู้ป่วยไทยที่มีภาวะหายใจผิดปกติขณะหลับชนิดอุดกั้น

วิชญ์ บรรณหิรัญ, ปารยะ อาศนะเสน, โชคชัย เมธีไตรรัตน์, วัฒนชัย โชตินัยวัตรกุล

วัตถุประสงค์: *เพื่อประเมินคุณภาพชีวิตของผู้ป่วยไทยที่มีภาวะหายใจผิดปกติขณะหลับชนิดอุดกั้น (OSDB) และผลการตอบสนองของคุณภาพชีวิตของผู้ป่วยที่ได้รับการรักษาด้วยเครื่องเป่าความดันลมบวกอย่างต่อเนื่อง (CPAP)*

วัสดุและวิธีการ: *ในการศึกษามีอาสาสมัครปกติจำนวน 38 ราย, ผู้ป่วยนอนกรนธรรมดาจำนวน 35 ราย และผู้ป่วยที่มีภาวะหยุดหายใจขณะหลับชนิดอุดกั้น (OSA) จำนวน 108 ราย ซึ่งได้รับการวินิจฉัยยืนยันจากการทดสอบการนอนหลับ (PSG) โดยผู้ป่วยทุกรายตอบแบบสอบซึ่งประกอบด้วย SF-36 และแบบประเมินระดับความง่วงนอนเอ็บเวิร์ธ (ESS) ฉบับภาษาไทย สำหรับผู้ป่วยที่เป็น OSA และรักษาโดยใช้เครื่อง CPAP อย่างต่อเนื่องสม่ำเสมอ จะทำแบบสอบถาม SF-36 อีกครั้งภายหลังจากที่เริ่มรักษาเป็นเวลาประมาณ 3 เดือน*

ผลการศึกษา: *พบว่ามีความแตกต่างอย่างมีนัยสำคัญทางสถิติของคุณภาพชีวิตของผู้ป่วยที่เป็นภาวะนอนกรนธรรมดา และ OSA จากอาสาสมัครปกติใน มิติ role-physical และ general health ($p<0.05$) แต่ไม่พบความแตกต่างในมิติอื่น ๆ ของแบบสอบถาม SF-36 อย่างไรก็ตามเมื่อเทียบค่าปกติในประชากรไทยทั่วไป พบว่าคะแนนแบบสอบถามดังกล่าวในผู้ป่วยที่เป็น OSA จะต่ำกว่าทุกมิติยกเว้น mental health เมื่อทำการศึกษาเปรียบเทียบคะแนน SF-36 กับแบบประเมิน ESS พบว่ามีความสัมพันธ์กันในระดับต่ำแต่มีนัยสำคัญทางสถิติในมิติ physical function, role-physical, general health, vitality, และ role-emotional โดยมีสัมประสิทธิ์ความสัมพันธ์ (r) อยู่ที่ 0.17 ถึง 0.29 เมื่อวิเคราะห์ความสัมพันธ์ระหว่างคะแนนของแบบสอบถาม SF-36 กับข้อมูลจากการตรวจ PSG พบว่า ไม่มีความสัมพันธ์ที่มีนัยสำคัญทางสถิติในมิติต่าง ๆ ยกเว้นความสัมพันธ์เพียงเล็กน้อยระหว่าง role-physical, mental health, และ vitality dimensions กับค่าเฉลี่ยของระดับความอิ่มตัวของออกซิเจนในเลือด อย่างไรก็ตามในกลุ่มผู้ป่วยที่ใช้ CPAP อย่างต่อเนื่องสม่ำเสมอ พบว่าระดับคุณภาพชีวิตในทุกมิติจากแบบสอบถาม SF-36 ดีขึ้นอย่างมีนัยสำคัญทางสถิติ ($p<0.01$)*

สรุป: *ผู้ป่วยไทยที่มีภาวะหายใจผิดปกติขณะหลับชนิดอุดกั้นมีคุณภาพชีวิตที่ต่ำกว่าอาสาสมัครและประชากรไทยทั่วไปอย่างน้อยในบางมิติ ซึ่งภาวะดังกล่าวดีขึ้นหลังจากการใช้ CPAP รักษาอย่างมีประสิทธิผล อย่างไรก็ตามพบว่าแทบจะไม่มีความสัมพันธ์ระหว่างคุณภาพชีวิตกับผลจากการทดสอบการนอนหลับแต่อย่างไร*