Correlational Study on Sleep Quality and Apnea Severity among Patients with Obstructive Sleep Apnea Syndrome

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Abstract

Background: Obstructive sleep apnea (OSA) is a prevalent sleep disorder characterized by repetitive episodes of upper airway obstruction during sleep, which results in low oxygen saturation or frequent awakenings**. Aim of the study:** The study aimed to assess sleep quality and severity of apnea for patients with obstructive sleep apnea syndrome. **Subjects and methods: Research design:** A descriptive research design was used. **Setting:** This study was conducted at Sleep Disordered Breathing Unit affiliated to Cardio Thoracic hospital at Zagazig University hospitals, Sharqia Governate, Egypt. **Subject: A** purposive sample of 100 patients who fulfilling the inclusion criteria was conducted. **Tool of data collection:** Three tools were used "A structured Interview Questionnaire**",** "The STOP-Bang questionnaire" ,and "The Pittsburgh Sleep Quality Index (PSQI)". **Results:** Revealed that, ,(55.0 %) of studied patients were male, (57.0%) between 51-60 years, lived in rural, and not worked. (74.0%) of the studied patients had high severity of apnea. Regarding sleep quality, (95.0%) of subjects had poor sleep quality. There was a statistically significant positive correlation between severity of sleep apnea, and sleep quality (p =0.022 & r =0.229). **Conclusion:** As regards study findings; the higher the severity of OSA ,the poorer sleep quality. **Recommendation:** Long term follow up and monitoring systems for OSA patients and CPAP adherence should be implemented for patients with OSA.

Keywords: *Apnea Severity, Obstructive Sleep Apnea Syndrome, Sleep Quality.*

Introduction

Obstructive sleep apnea (OSA) is a serious medical condition, although it is very common, and perhaps one of the most fatal sleep disorders because of repeated cycles of typically upper-airway collapse during sleep that result in intermittent hypoxia, sleep fragmentation, and excessive sleepiness during the daytime. Obstructive sleep apnea is an extremely common condition with bad outcome morbidity, but it is yet underdiagnosed because of the evolving diagnostic criteria, low awareness rates, and treatment compliance issues with Continuous Positive Airway Pressure therapy **(Iannella et al ., 2025).**

OSAS has numerous comorbidities, such as obesity, diabetes mellitus, coronary heart disease, stroke, congestive heart failure, cardiac arrhythmia, and gastroesophageal reflux. In addition, it is also an independent risk factor for hypertension and has a close relationship with atherosclerotic cardiovascular disease **(Dos Santos et al., 2022).**

The presence and severity of OSA are primarily defined using the apnea hypopnea index (AHI), or the respiratory disturbance index (RDI), which quantifies the frequency of obstructive events per hour of sleep or recording time. **(Hnin et al., 2018).**

poor sleep quality and insufficient duration of sleep may have serious consequences for health, as well as

reducing the quality of life. Moreover, this may be associated with numerous physical and mental conditions, as well as with sleep disorders. Sleep disorders affect approximately 25% of the general population; thus, poor sleep quality is a common problem (**Kania et al ., 2022).**

Assessments of sleep quality encompass features such as sleep onset latency, sleep duration, continuity, timing, alertness, and satisfaction. The Pittsburgh Sleep Quality Index (PSQI) is a well-recognized tool for assessing sleep quality(**Cienfuegos et al ., 2022)**.

Significance of the study

Obstructive sleep apnea (OSA) is a prevalent sleep disorder characterized by repetitive episodes of upper airway obstruction during sleep, which results in low oxygen saturation or frequent awakenings. It has been associated with significant health risks, including cardiovascular diseases, cognitive impairment, and decreased quality of life **(Chen et al., 2025).** Hence, the aim of the study was to assess the significant relationship between severity of apnea and sleep quality among patients with OSAS.

Aim of the study:

The aim of this study was to assess sleep quality and severity of apnea for patients with obstructive sleep apnea syndrome.

This aim was achieved through the following objectives:

1-Assess the level of sleep quality for patients with obstructive sleep apnea syndrome.
2-Determine the severity of apnea for patients with obstructive sleep apnea syndrome.
3-Explore the association between sleep quality and severity of apnea for patients with obstructive sleep apnea syndrome.

Research questions:

- What is the level of sleep quality for patients with obstructive sleep apnea syndrome?
- What is the severity of apnea for patients with obstructive sleep apnea syndrome?
- What is the association between sleep quality and severity of apnea for patients with obstructive sleep apnea syndrome?

Subjects and methods

Research design

A descriptive design was utilized to accomplish the aim of this study and to answer the research questions.

Study setting

This study was conducted at Sleep Disordered Breathing Unit affiliated to Cardio Thoracic hospital at Zagazig University hospitals, Sharqia Governate, Egypt.

Study subjects

The study involved a purposive sample of 100 patients based on the following inclusion criteria: age between 20-60 years, both sexes, had diagnosis for OSA, and accepted to participate in the study.

Tools for data collection

Tool I: A structured Interview Questionnaire (Theerakittikul et al ., 2022) included two parts as follows:

Part I: Demographic characteristics of patients which included eight questions (age, gender, residence, marital status, educational level, occupation ,living with alone / family , and monthly income)**.**

Part II: Health history of patient which were composed of six questions as past health problems, smoke, body mass index, apnea-hypopnea index level, Continuous Positive Airway Pressure (CPAP) usage, and using sleep medications **.**

Tool II :The STOP-Bang questionnaire consisted of 4 self-reportable (STOP: snoring, tiredness, observed apnea, and high blood pressure) and 4 demographic (Bang: body mass index [BMI; calculated as weight in kilograms divided by height in meters squared], age, neck circumference, and gender) items.

Scoring system :
The total score of Stop -Bang questionnaire was 8 grades (100%). Each Question has two answers : yes and no scored as 1and zero consecutively. The score (five – eight) indicates high severity , (three-four) is intermediate severity ,and (zero- two) is low severity of obstructive sleep apnea based on **(Pivetta et al., 2021)**.

Tool III : The Pittsburgh sleep quality index (PSQI) composed of 19 items grouped into seven subscales assessing in a subjective way sleep duration, sleep disturbance, sleep latency, daytime dysfunction due to sleepiness, sleep efficiency, overall sleep quality, and sleep medication use.

Scoring system :
The total score of Pittsburg sleep quality index was 21 grades (100%). The sleep components were scored on a four-point Likert scale (zero - three) which varied from the least to the greatest dysfunction, consecutively. However, questions (5, 6, 7, and 8) scored on four-point Likert scale (zero - three) that varied from "Not during the past month" to "Three or more times per week", 11 consecutively. But question (9) was about the patient's overall quality of sleep and scored on four-point Likert scale (zero - three) that varied from "very good" to "very bad", consecutively. A total score of ≥ five indicated poor sleep quality, while a total score of < five indicated good sleep quality **(Al Maqbali et al ., 2020)**.

Content validity and reliability
The tools were revised by a panel of five experts from different specialties including medical and nursing faculty staff, which included two professors of medical surgical nursing, two assistant professors of medical surgical nursing and one assistant professor of community health nursing reviewed the tool's content for clarity, relevance, comprehensiveness, applicability, understanding, and ease for implementation. The findings of the pilot study and the expertise's adjustments led to certain changes being made, such as rewording or rephrasing some of the questions and occasionally changing others. Cronbach's Alpha that used to measure the internal consistency (reliability of used tool) was 0.77 for patient knowledge about disease and health concerns associated with obstructive sleep apnea was 0.70, daytime sleepiness with obstructive sleep apnea was 0.83, the severity of apnea was 0.89.Testing for reliability was done prior to the start of data collecting.

Field work
The data collection phase lasted for 7 months during the period from the beginning of August 2024 to the end of February 2025 .The first phase of the work is the preparatory phase that done by meeting with nurses the mentioned siting after obtaining the official permissions, to know the average number of patients coming to sleep disordered breathing unit and working days and clarify the objective of the study and applied methodology to ensure their cooperation. The second phase that done by meeting the patients, each patient was met individually, got a full explanation about the aim of the study and was invited to participate. The patient who gave his/her verbal informed consent to participate was handed the self-administered questionnaire and was instructed during the filling. The data were collected six days per week except Friday (from 8:00 pm to 9:00 pm, the time used for finishing the questionnaire ranged between 20-30 minutes for each patient according to patients' physical and mental readiness.

Pilot study
A pilot study was conducted on ten patients (10%) in the setting. The goal was to check the clarity, applicability, relevance, and feasibility of the tools. And to identify the difficulties may be faced during the application. It also helped to estimate the time needed to fill in the sheets. Since no modifications were done.

Administration and ethical consideration

An official permission for data collection in Zagazig University Hospitals was obtained from the hospital administrative personnel by the submission of a formal letter from the dean of the faculty of nursing Zagazig University explaining the aim of the study in order to obtain permission and help. At the interview, each subject (patient) was informed about the purpose, benefits of the study, and they were informed that their participation is voluntary and they have right to withdraw from the study at any time without given any reason. In addition, confidentiality, and anonymity of the subjects were assured through coding of all data. The researcher assured that the data collected will be confidential and would be used only to assess health concerns, daytime sleepiness, and severity of apnea for patients with obstructive sleep apnea syndrome**.(M.D.ZU.Na.R /238/9/7/2024).**

Statistical analysis

The data obtained tabulated and statistically analyzed using SPSS, version 25.0. Quantitative data were expressed as the mean ± SD & (range), and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Percent of categorical variables were compared using Chi square test ($\chi 2$) or Fisher's exact test when appropriate. Spearman's rank correlation coefficient (r) was calculated to assess relationship between various study variables, (+) sign indicate direct correlation & (-) sign indicates inverse correlation p-value < 0.05 was considered statistically significant (S), and p-value ≥ 0.05 was considered statistically insignificant (NS). Also, multiple linear regression analysis was used to compare two classes. All tests were two sided. P-value < 0.05 was considered statistically significant (S), and p-value ≥ 0.05 was considered statistically insignificant (NS).

Results

According to **Table (1)** Revealed that, (57.0%) of studied patients their age ranged from 51-60 years with a mean age of (54.52±0.92), were males and lived in a rural area respectively. Also, (97.0%) of studied patients were married, and (39.0%) were not educated. Regarding patients' occupation (52.0%) of studied patients were not working. Moreover, (99.0%) were living with their families. Finally, (40.0%) of the patients studied had sufficient income.

Table (2) Shows that, the majority of studied patients (87.0%) had a health problem before diagnosis of obstructive sleep apnea syndrome, around half of studied patients (49.0%) had hypertension, and more than half of them (57.0%) had obesity. Regarding, smoking (23.0%, 17.0%) of studied patients were previous smokers and current smokers respectively. In relation to body mass index more than two thirds (66%) of studied patients were obese, with a mean± SD of 33.49±7.68 kg/m^2. Also, three fifths of the patients (61%) had a mild apnea hypopnea index and about one third of them (30.0%) did not use a continuous positive airway pressure (CPAP) device, while all of them (100.0) did not use sleep medications.

Table (3) Showed that (92.0%) of studied patients had snored loudly and (71.0%) of them had feelings of tiredness, fatigue, or sleepy during daytime. In addition to that, (69.0%) of patients studied stop breathing during sleep and (51.0%) were treated for high blood pressure. Also, (67.0% and 66.0%) of studied patients had a body mass index more than 35kg/m^2 and a neck circumference > 16 inches (40cm) respectively. Also (64.0%) of them were over 50 years old. As well as (55.0%) of studied patients were males. (74.0%) of the studied patients had high severity of apnea while, (22.0%) of them had intermediate severity of apnea. Also, the mean and standard deviation of total severity of apnea score were 5.37±1.53.

Table (4) Revealed that, sleep duration, sleep disturbance, daytime dysfunction and Sleep quality were the severest affected subscales with mean scores 2.04±1.00, 1.60±0.49, 1.24±0.69 and 1.20±0 .47 respectively. On the other hand, the score on intake of sleep medication was the lowest 0.11±0.49 followed by sleep latency 0.99±0.70. Also, high total PSQI score (mean ± SD = 7.30± 2.15) was recorded from the patients studied.

Figure I :Clarifies that, the majority of studied patients (95.0%) had poor sleep quality, while the (5.0%) of studied patient had good sleep quality.

Table (5) revealed that there were statistically significant positive correlations between severity of sleep apnea, and sleep quality (p =0.022 & r =0.229).

Table (6) regression model results revealed that severity of apnea was significant predictors for sleep quality. There statistically significant direct correlations between severity of apnea and sleep quality score with an increase in variables (age, sex, level of education, residence, occupation, income, living status and knowledge) is associated with an increase in sleep quality score.

Table (1): Frequency and Percentage Distribution of the Studied Patients According to Their Sociodemographic Characteristics (N=100).

Socio demographic characteristics		Studied patients	
		No.	%
Age (year)	20-30	2	2.0
	31-40	13	13.0
	41-50	28	28.0
	51-60	57	57.0
	Mean± SD	50.38±8.35	
	Range	22-60	
Gender	Male	55	55.0
	Female	45	45.0
Place of residence	Rural	56	56.0
	Urban	44	44.0
Marital status	Married	97	97.0
	Not married	3	3.0
Educational Level	Primary	23	23.0
	Secondary	28	28.0
	University	10	10.0
	Not educated	39	39.0
Occupation	Working	48	48.0
	Not working	52	52.0
Living status	With family member	99	99.0
	Alone	1	1.0
Monthly income	Sufficient	40	40.0
	Insufficient	60	60.0

Table (2): Frequency and Percentage Distribution of the Studied Patients According to Their Health History (N=100).

Health history		No.	%
Health problem before Obstructive Sleep Apnea Syndrome	Yes	87	87.0
	No	13	13.0
Comorbidity	Hypertension	49	49.0
	Respiratory diseases	34	34.0
	Diabetes	27	27.0
	Obesity	57	57.0
	Heart disease	20	20.0
	Hepatitis	4	4.0
	Stroke	2	2.0
	Thyroid disorder	5	5.0
	Neuromuscular disease	2	2.0
Smoking	Non-smoker	60	60.0
	Previous smoker	23	23.0
	Current smoker	17	17.0
BMI	Normal	12	12.0
	Overweight	22	22.0
	Obese	66	66.0
Mean± SD	33.49±7.68		
AHI level	Mild (5≤ AHI <15)	61	61.0
	Moderate (15≤ AHI <30)	14	14.0
	Sever (AHI ≥ 30)	25	25.0
Use of a continuous positive airway pressure (CPAP) device	Yes	30	30.0
	No	70	70.0
Using sleep medications	Yes	0	0.0
	No	100	100.0

Table (3): Frequency and percentage Distribution to Severity of Apnea among Patients with Obstructive Sleep Apnea (N=100).

Items	N	%
Snore loudly		
Yes	92	92.0
No	8	8.0
Feel tired, fatigued, or sleepy during daytime		
Yes	71	71.0
No	29	29.0
Stop breathing during sleep		
Yes	69	69.0
No	31	31.0
Treated for high blood pressure		
Yes	51	51.0
No	49	49.0
BMI more than 35kg/m^2		
Yes	67	67.0
No	33	33.0
AGE over 50 years old		
Yes	64	64.0
No	36	36.0
NECK circumference > 16 inches (40cm)		
Yes	66	66.0
No	34	34.0
GENDER: Male		
Yes	55	55.0
No	45	45.0
Total Severity		
High severity (5- 8)	74	74.0
Intermediate severity (3-4)	22	22.0
Low severity (0- 2)	4	4.0

Table (4): Mean Scores of the Sleep Quality among Patients with Obstructive Sleep Apnea (N=100).

Items	Score Range	Mean ± SD
Sleep quality	0-3	1.20±0 .47
Sleep latency	0-3	0.99±0.70
Sleep duration	0-3	2.04±1.00
Sleep efficiency	0-3	0.12±0. 45
Sleep disturbances	0-3	1.60±0.49
Sleep medication used	0-3	0.11±0.49
Daytime dysfunction	0-3	1.24±0.69
Overall PSQI	0-21	7.30± 2.15

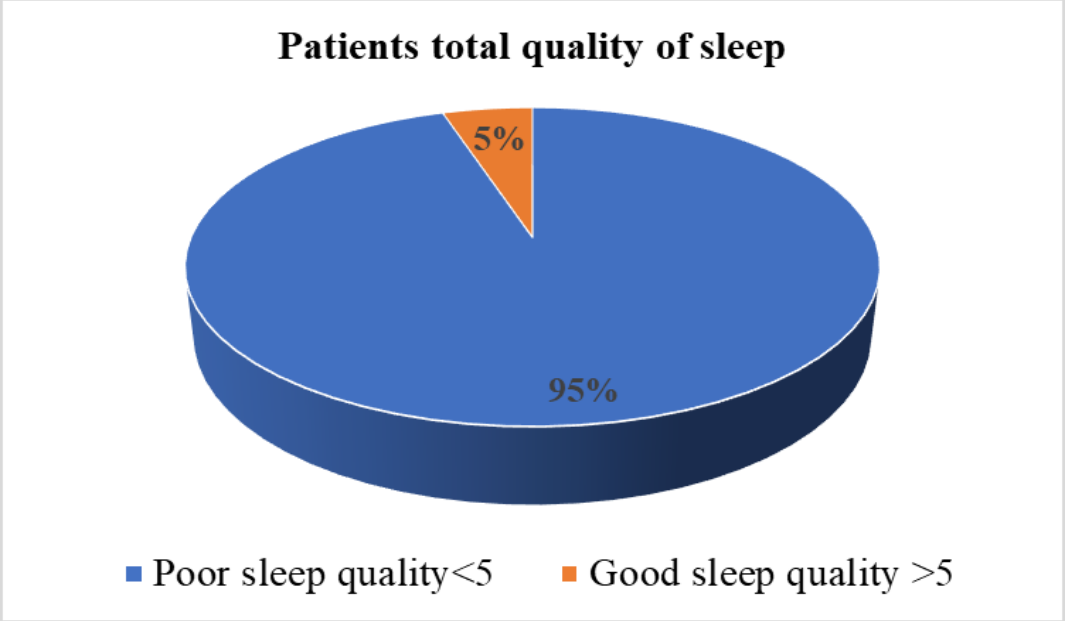

Figure I: percentage Distribution of Total Quality of Sleep among Patients with Obstructive Sleep Apnea (N=100).

Table (5): Correlation Coefficient Between Patients' Knowledge, Daytime Sleepiness, Severity of Apnea and Sleep Quality Among Studied Patients (N=100)

	Severity of apnea		Sleep quality	
	R	P	r	P
severity of apnea	-	-	.229*	.022
Sleep quality	.229*	.022	-	-

Table (6) Multivariate Linear Regression Analysis for factors Affecting Sleep Quality

	Unstandardized Coefficients		Standardized Coefficients			95 % Confidence	
	B	Std. Error	Beta	T -test	P value	Lower Bound	Upper Bound
Sleep quality							
(Constant)	11.546	3.765		3.067	0.003	23.321	12.432
Severity of apnea	0.091	0.043	0.254	2.095	0.039	0.091	0.043
R square 0.321 Model of ANOVA: F=3.349*, p 0.001*							
Variables entered and excluded (age, sex, level of education, residence, occupation, income, living status and knowledge)							

Discussion

Among demographic characteristics of the patients under study, the current study found that, more than half of studied patients their age ranged from 51-60 years with a mean age of (54.52±0.92). The current study's findings in the same context with (**Demir and Bulut., 2025)** conducted in Turkey stated that the mean age of the patients participating in the study was 52.1 ± 10.4 years. According to the present analysis, more than half of studied patients were male and the residual were female .The result was in the same line with(**Fietze et al .,2019).** conducted in Germany who reported, that, nearly three fifth of patients were men .

The present study revealed that he majority of studied patients had a health problem before diagnosis of obstructive sleep apnea syndrome. This finding is supported by**(Bonsignore et al .,2019)** conducted in Italy, who revealed that more than three quarters of patients with obstructive sleep apnea (OSA) show multiple comorbidities.

The present study revealed that around half of studied patients had hypertension. The finding of this study was in harmony with**(Lacedonia et al.,2018)** conducted in Italy **,** stated that arterial hypertension was the most frequent disorder in all groups, with a range from about three fifth in OSA .

The current study shows that more than half of them had obesity**.** These findings agreed with **(Kandasamy and Almeleebia,.2023)** conducted in Saudi Arbia stated that **,** two third of patients were obese.

The present study showed that, around three quarters of the studied patients had high severity of apnea while, nearly one quarter of them had intermediate severity apnea, and the mean and standard deviation of total severity of apnea score were 5.37±1.53. The present finding is supported by **(Dashzeveg et al., 2021)** conducted in Mongolia**,** that , nearly one quarter patients had mild OSA, nearly one quarter patients had moderate OSA, and more than half patients had severe OSA.

Concerning the Results of Pittsburgh Sleep Quality Index Used in Present Study, indicated that , the most affected subscales of PSQI were sleep duration ,sleep disturbance ,daytime dysfunction, and sleep quality with mean scores 2.04±1.00, 1.60±0.49, 1.24±0.69 and 1.20±0 .47 respectively, with total PSQI 7.30± 2.15 . These findings were in agreement with, **(Miyahara et al.,2019)** conducted in Brazil**,** that, the mean and standard deviation of PSQI was(7.68±3.83).

Confirmation of this current study showed that the majority of studied patients had poor sleep quality. In harmony with **(Kania et al,.2022)** conducted in Poland , about three quarters of patients had poor sleep quality .

The current study findings showed that, there were statistically significant positive correlations between severity of sleep apnea, and sleep quality (p =0.022 & r =0.252, and r =0.229) respectively .This result is

compatible with ,**(Frangopoulos et al,.2021)** conducted in Cyprus**,** that, there were statistically significant positive correlations between severity, sleep symptoms for OSA patients (p = 0.000 &p = 0.000)respectively.

Conclusion

On the light of the present study results. It can be concluded that, obstructive sleep apnea syndrome predominated by over age, male sex ,comorbidities, and obesity. The core points of study findings are that patients with severe OSA had poor sleep quality. Compatible with literature suggesting a significant OSA relationship, it is founded that, the higher the severity of OSA , the poorer sleep quality. Eventually, it is important to highlight that the current study answered all research questions.

Recommendations

Based on findings, the study recommended increasing attention towards conducting regular health educational sessions (theoretical and practical) for the patients about OSA syndrome. Also, there is need for lunching long term follow up and monitoring systems for OSA patients and CPAP adherence should be implemented for patients with OSA. Finally, developing multidisciplinary care teams including specialized nurses, dentist, speech- language pathologists, and physiotherapists to holistically manage patients with OSA.

Authours' contributions

M.G.M; Conceived and designed the study, developed the research tools, conducted data collection, and contributed significantly to data interpretation and manuscript writing. S.H.M ; Supervised all stages of the study, revised multiple drafts critically for intellectual content.M.K.AL; Provided the first draft of the manuscript before its publication, participated in all the steps of research. F.A.M ; Conducted the overall supervision of the manuscript before its publication and approved the final version for publication. All authors reviewed and approved the final manuscript and take full responsibility for the integrity of the work.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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