Sniffing Versus Side Lying Position among Obese Patients with Obstructive Sleep Apnea

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Abstract

Background: Adults are more likely to suffer from sleep problems, such as obstructive sleep apnea (OSA), with three out of four exhibiting symptoms of the condition. More than three quarters of patients with OSA are thought to go undetected which significantly impacts patients' general health**. Aim**: The aim of the current study was to evaluate the effect of sniffing versus side lying position on obese patients with obstructive sleep apnea. **Design:** Time-series quasi-experimental design was used to achieve the aim of the current study. **Setting:** The current study was conducted at inpatient medical wards located in the 2nd and 3rd floors at El Kasr Alini University Hospital, Egypt. Follow up of patients was performed at the outpatient medical clinics. **Subjects:** A convenient sample of 60 adult male and female patients with OSA that was collected over a period of 6 consecutive months and fulfilled the inclusion criteria (two equal intervention groups).**Tools:** Three tools were utilized to achieve the aim of the current study: **1)** Demographic and medical related data sheet, **2)** Apnea/ Hypopnea Index (AHI), and **3)** The Pittsburgh Sleep Quality Index (PSQI) questionnaire. **Results:** Sniffing position group's OSA severity mean scores was lower than these in the side lying position group along the three post intervention measurements time. High statistically significant difference was observed between both groups regarding sleep quality in the 3rdpost intervention period. **Conclusion:** Significant improvement in obese patients' condition regarding OSA was observed with a remarkable decline in the severity mean scores among sniffing position group rather than side lying position group along the three post intervention periods. **Recommendations:** Provide educational sessions regularly regarding sniffing position therapy for obese patients with OSA and replication of such study on a larger sample is recommended.

Keywords: Sniffing Position, Side Lying Position, Obstructive Sleep Apnea, Obese Patients

Introduction

Approximately one-third of persons' lifetime is spent in sleep. Sleep is a basic human need. It plays a vital role in promoting worthy health and well-being throughout one's life (National Sleep Foundation, 2020). Getting enough quality sleep can have a significant impact on daily functioning, alertness, mental and physical health, safety, and overall quality of life. Most people have experienced sleeping problems at one time or another **(Olutola & Adejuwon, 2020).**

Sleep apnea is a potential serious sleep disorder that occurs when a person's breathing is interrupted during sleep. It can be classified into three types. Central sleep apnea (Chyne-Stokes respiration*)* the airway is not blocked but the brain fails to signal the muscles to breathe due to instability in the respiratory control center. Obstructive sleep apnea; caused by blockage in the airway, usually when the soft tissues in the throat collapse during sleep with no disturbance is found in the respiratory center of the brain. Mixed sleep apnea*;* a combination of both central and obstructive sleep apnea **(American Sleep Apnea Association, 2019).**

Obstructive sleep apnea (OSA) is a common, chronic disorder that disrupts a patient's breathing during sleep. It affects all age groups, but especially those middle-aged and older have the higher incidence rate. Patients with OSA have times during sleep in which air cannot flow normally into the lungs. The blockage in airflow (obstruction) is usually caused by the collapse of the soft tissues in the back of the throat (upper airway) and tongue during sleep. This leads to partial reductions (hypopneas) and complete pauses (apneas) in breathing that last at least 10 seconds during sleep. Most pauses last between 10 and 30 seconds, but some may persist for one minute

or longer. This can lead to abrupt reductions in blood oxygen saturation, with oxygen levels falling as much as 40 percent or more in severe cases **(Fietze et al., 2019).**

The obstructive events (apneas or hypopneas) cause a progressive asphyxia that increasingly stimulates breathing efforts against the collapsed airway. The brain responds to the lack of oxygen by alerting the body typically until the person is awakened. This pattern can occur hundreds of times in one night. These episodes can interfere with sound sleep, reduce the flow of oxygen to vital organs, and cause heart rhythm irregularities. The result is a fragmented quality of sleep that often produces an excessive level of daytime sleepiness **(Iannella et al., 2022).**

Various risk factors of OSA that is including obesity, snoring, male gender, post-menopause and various craniofacial and oro-pharyngeal features, which may result in the obstruction of the oro-nasal airflow. The craniofacial feature such as neck circumference more than 40cm, retro-gnathic mandible, nasal obstruction, enlarged adenoids and tonsils, macroglosia increases the risk of having obstructive sleep apnea **(Randerath et al., 2018).**

Obesity, which considered a growing world-wide problem, may further increase prevalence and severity of OSA. Upper airway obstruction during sleep is often exacerbated by obesity-related peri-pharyngeal fat. It results in fatty deposits around the neck, which contribute to pharyngeal collapse. Although a decrease in weight has been shown to decrease critical closing pressures of the airway, there are inconsistent findings on the association between weight reduction and overall improvement in sleep and breathing patterns **(Benjafield et al., 2019).**

Morning headaches, fatigue, drowsiness, irritability, choking or gasping for air during sleep are predictive clinical features of OSA. Excessive daytime sleepiness is also an important indicator of OSA due to nocturnal sleep fragmentation, which considered the key symptom of the disorder, and being found in more than 80% of patients **(American Sleep Apnea Association, 2018).** As the manifestations progresses, the sleepiness becomes increasingly dangerous, causing impaired performance and major work-related and road accidents. Moreover, many patients can develop cognitive and neurobehavioral dysfunction, inability to concentrate, memory impairment and mood changes such as irritability and depression with a remarkable effect on the quality of life **(Redline, 2022).**

Because of the associated morbidity and mortality rates of OSA, it is considered an important public health issue worldwide. Over the years, recurrent episodes of apneas, intermittent hypoxia and sleep fragmentation can affect the function of different organs and systems, mainly the brain and the cardiovascular system, and alter the body's metabolic balance **(World Health Organization, 2018; Perger, & Taranto-Montemurro, 2021).** The main cardiovascular disorders include hypertension, ischemic heart disease, cardiac arrhythmias and stroke. Recently, type II diabetes mellitus and altered serum lipid profile are widely manifested in patients with OSA. Patients usually are not aware of nighttime symptoms until the progression of the disorder and the significant appearance during the daytime **(Osman, Carter, Carberry & Eckert, 2021).**

Actually; the diagnosis of OSA is confirmed through different levels of nocturnal monitoring of respiratory, sleep and cardiac parameters (Polisomnography or nocturnal cardio-respiratory poligraphy) aimed to detect the obstructive events and the following changes in blood oxygen saturation (SaO_2).The most commonly used index to define the severity of OSA is the apnea/hypopnea index (AHI); calculated as the number of obstructive events per hour of sleep **(Pattanaik, Rajagopal, Mohanty, & Panigrahi, 2018).**

Different treatment options are now available for effective management of OSA. Continuous positive airway pressure (CPAP) is the first-line of treatment. Other treatment modalities include weight reduction, oral appliance therapy, positional therapy, and surgery to correct anatomic obstructions although there is insufficient evidence to support these types of surgeries. Bariatric surgery can improve sleep parameters and symptoms in obese patients with obstructive

sleep apnea and can result in remission in many patients **(Chakraborty, 2018).**

On the other hand, the body position during sleep influences the frequency and severity of the obstructive events. The supine position probably interferes the airway passage that is in particular due to the effect of gravity on tongue and soft palate position, is generally associated with an increased frequency of apneas/ hypopneas. Many positional therapy (PT) strategies are now available, these include the simple tennis ball techniques trapped to the back to discourage supine position, supine alarm devices, sniffing position and a number of positional pillows. All these strategies accurately improve OSA, without any evidence of one being more effective over the others **(Pattanaik, Rajagopal, Mohanty & Panigrahi, 2018).**

But it was reported that positional therapy has been proposed as a potentially useful strategy to avoid supine sleeping and consequently reduce the severity of OSA. The severity, frequency, and duration of apneas are significantly influenced by sleep position; most patients have a lower apnea-hypopnea index (AHI) when lying on their left or right side as opposed to when they are on supine. Although the precise mechanism is not well understood, the anatomical features that altered in the supine posture may be one explanation for the positional reliance. The pharyngeal airway narrows in the supine position, according to research utilizing the acoustic reflection technique **(Akhtaret al., 2018).** An association between the influence of Body Mass Index (BMI) and sleeping position on the AHI has been shown in certain investigations including individuals with OSA. Over-weight patients benefited more from a non-supine sleeping position, according to **Olaithe, Bucks, Hillman and Eastwood, (2018).**

Another sleeping position was reported effective; as Sniffing neck position that can be described and applied as neck flexion with upper cervical extension, equilibrating the sternal notch and angle of the mandible which helps to keep the airway open. This type of therapy is particularly important and effective in obese patients with OSA. Also, it improves pharyngeal airway patency, and enables the mechanical load relief of the tongue's soft tissue from the soft palate, which may be a possible explanation for the retro palatal airway patency improvement. It is possible that the increase in bony enclosure in the sniffing position maybe effective in compensating for the excessive amount of soft tissue in obese patients **(Chakraborty, 2018).**

Last but not least; regardless of the mechanism, in obese OSA patients, the use of a higher pillow with a straight-up face position is proved to be effective in the maintenance of pharyngeal airway opening. Nurses can play a crucial role in the management of OSA through a range of responsibilities, including patient education, follow-up, encouragement of therapy adherence, screening, assessment, diagnosis, collaboration and coordination with other healthcare professionals **(Cerritelli et al., 2022).** Therefore, the researchers founded it might be valuable to conduct the current study as its aim was to evaluate the effect of sniffing versus side lying position on obese patients with obstructive sleep apnea.

Significance of the study

One-seventh of the world's adult population or approximately one billion people between the ages of 30 and 69 years are estimated to have OSA. Over the past four decades, obesity as the main risk factor for OSA has risen in striking proportion worldwide. In the past 5 years, the World Health Organization (WHO) estimated global obesity to affect almost two billion adults. The increase in its prevalence is driven by the global increase in obesity as the major risk factor for OSA. Obesity is a serious global public health concern, with adult prevalence rates exceeding 42% worldwide. Obstructive sleep apnea (OSA) prevalence is rising at the same time that the prevalence of obesity is rapidly increasing and restorative sleep is significantly declining **(Baran, Grimm, Infanger & Wehland, 2021).**

The exact prevalence of OSA is unknown, and the majority of patients is asymptomatic and may be unaware of the occurrence and frequency of their nocturnal arousals, and fail to seek timely medical attention. Thus, most patients remain undiagnosed and untreated. They underestimate the symptoms because they

are not always so evident about the related manifestations **(Osman et al., 2021).** Therefore, it is likely that the prevalence of OSA in the literature is underestimated. These common underestimated symptoms may include; excessive daytime sleepiness, loud snoring, episodes of stopped breathing during sleep, morning headache, mood change, sadness, irritability, and difficulty concentrating during the day. This could lead to becoming very sleepy during the day and nod off while working, watching TV, or even operating a motor vehicle **(Khokhrina, Andreeva & Degryse, 2020).**

Indeed, OSA remains a challenge that the health care providers are facing in general, and the nurses in particular as they are the first line care givers and the one who can monitor those patients closely specially during sleeping. Regrettably, its related risk factors expand day after day as obesity, respiratory problems……etc. on an expansion rhythm. Actually those patients need to be managed speedily as by adding modifications in their sleep position till their risk factors treated as it will take time. Also OSA is a life threatening and could not be weight until treating the underlining cause be treated **(Altree, Chung, Chan, & Eckert, 2021).**

Hopefully, the findings generated from this study can be utilized in the future for the concerned patients, manipulated by the health care providers, and contributes as an evident base in the clinical field**.** It is also anticipated that, the findings of the current study may help to improve the quality of patient care and establish evidence based data that can promote nursing practice and research. Additionally, it is hoped that this study will generate alternative attention and motivation for further researches into this topic. Therefore, the aim of the current study was to evaluate the effect of sniffing versus side lying position on obese patients with obstructive sleep apnea.

Aim of the study

The aim of the current study was to evaluate the effect of sniffing versus side lying position on obese patients with obstructive sleep apnea.

Research hypotheses

To achieve the aim of the current study, the following hypotheses were postulated to be tested:

H1: The OSA severity mean scores among patients who will apply sniffing position will be lesser than the severity mean scores among patients who will apply side lying position.

H2: The sleep quality mean scores among patients with OSA who will apply sniffing position will be greater than the sleep quality mean scores among patients who will apply side lying position.

Operational definitions:

Sniffing position (SP): In the current study, it is the application of the position which entails elevating the head by placing a pillow below it and then stretching it at the atlanto-occcipital junction. The oral, pharyngeal, and laryngeal axes will be aligned by the SP, which would help the airway to fall straight on the laryngeal inlet and in turn facilitate respiration and reduce obstructive sleep apnea manifestations.

Side lying position: In the current study, it is the patients' position shift from the supine to the non- supine position particularly to the lateral position as a self-management practice when experiencing episodes of sleep apnea in order to facilitate respiration; which will be applied by the patients as a self-management practice at the medical departments.

Obstructive sleep apnea: In the current study, it is patients' reports of waking up unexpectedly when lying on the supine position, snoring, with mild limb movement during sleep and having no trouble falling back asleep after experiencing apneas. It involves also a continuous complaining of waking up, feeling drowsy and exhausted, that was guided by the obstructive sleep apnea (OSA) based on the Apnea / Hypopnea Index (AHI).

Methods

Research Design:

Time-series quasi-experimental design was used to achieve the aim of the current study. This design is one of the quasi-

experimental designs in which the researchers periodically observed or assessed the subjects. The time-series design with its numerous observations or measurements of the dependent variable helps strengthen the validity of the design (Leedy & Ormrod, 2019). In the current study, this design helped to determine the effect of sniffing versus side lying position(intervention/independent variable) on the obese patients with obstructive sleep apnea (dependent variable) by conducting the assessment among two study groups (I & II) before and after the intervention to evaluate its effect.

Setting:

The current study was conducted at general inpatient medical wards that located in the2nd and 3rd floors, at El Kasr Elaini University Hospital, Egypt. Each floor contains two general medical wards. Each ward has both right and left sides for both male and female patients. Follow up of patients was performed at the outpatient medical clinics.

Subjects:

A convenient sample of 60 adult male and female patients with obstructive sleep apnea, that was collected within a period of 6 consecutive months. Patients who fulfilled the inclusion criteria were included and divided into two equal intervention groups (30 patients in each group).Group (I) applied sniffing position, while group (II) applied side lying position as patients' self-management intervention. Assigning patients to the two groups was random; the even numbers were for the group (I) and the odd numbers were for group (II).

Inclusion Criteria:

Conscious, with a confirmed diagnosis of obstructive sleep apnea, obese (BMI > 25), with an Apnea/ Hypopnea Index score more than five (AHI>5), able to communicate, and agree to participate in the study.

Exclusion criteria:

Patients unable to change their body positions, with head and neck surgeries, spinal cord injuries, disc prolapse, orthopedic surgeries, any neurological deficits, cardiac and renal disorders, deep venous thrombosis (DVT), and patients with other chronic respiratory illnesses, e.g. inflammatory lung diseases (ILD) as well as hypothyroidism. Alcoholic patients and those who took sleeping or muscle relaxant medications were also excluded from the study.

Tools:

The data of this study was collected using the following tools:

Tool I: Demographic and Medical Related Data Sheet:

It was developed by the researchers after reviewing related literature , and composed of two parts: **Part one: Demographic Data:** It included data related to patients' personal characteristics as age, gender, education, occupation, marital status, and smoking status (6 questions). **Part two: Medical Related Data:** It included data related to Body Mass Index (BMI), and history of apnea (2 questions).

Tool II: Apnea/ Hypopnea Index (AHI):

It is an adopted index tool used to measure the severity of OSA, and calculated as the number of obstructive apnea events per hour of sleep (Malhotra et al., 2021). Interpretation of the tool is as follows; **AHI < 5** means Normal or primary snoring. **5 < AHI < 20** referred to Mild degree. **20 < AHI <40** interpreted as moderate**,** while**, AHI ≥ 40** meant severe degree.

Tool III: The Pittsburgh Sleep Quality Index (PSQI) questionnaire:

It was an adopted Arabic version scale translated by Suleiman et al., (2010). This tool utilized to measure sleep quality and disturbances to discriminate between "poor" and "good" sleepers. It is one of the most widely used tools to assess general sleep quality. It is simple, validated, reasonably quick and easy tool to administrate. The PSQI is a 7 components (19 items) self-reporting questionnaire that measured sleep quality. These seven components classified as: subjective sleep quality (1 item), sleep latency (2 items), sleep duration (1 item), habitual sleep efficiency (3 items), sleep disturbances (9

items), use of sleeping medications (1 item), and daytime dysfunction (2 items).

Scoring system:

The nineteen rated items that were combined to form seven component scores, each of which had a range of 0-3 points: Score (0) indicated no difficulty. Score (1) indicated mild difficulty. Score (2) indicated moderate difficulty. Finally score (3) indicated severe difficulty. The global PSQI score, which varied from 0 to 21, was the sum of the scores of the seven components, with each component receiving a value between 0 and 3. The cutoff score was 5. Poor sleep was indicated by a global PSQI score to be more than 5, and higher levels denoted lower-quality sleep. Scores from (0-5) indicated good sleep quality, from (6-10) indicated mild alteration, from (11-15) indicated moderate alteration, while the scores from (16-21) indicated severe alteration.

Validity and reliability of tools:

Validity: Face validity was tested by a panel of five experts in medical surgical nursing specialty, Faculty of Nursing, Cairo University for both tool II; Apnea/ Hypopnea Index (AHI) and tool III; The Pittsburgh Sleep Quality Index (PSQI) questionnaire.

Reliability: Reliability test of tool II; Apnea/ Hypopnea Index (AHI) was excellent with a Cronbach alph=0.91. While, tool III; the Pittsburgh Sleep Quality Index (PSQI) was translated into Arabic and approved to be reliable with a Cronbach alpha (r= 0.89).

Procedure

Once approval to conduct the current study was obtained from the Research Ethics Committee-Faculty of Nursing-Cairo University, the researchers precede in the current study. It involved three phases; preparatory phase, implementation phase, and finally evaluation phase.

The preparatory phase: In this phase**,** the researchers informed the patients about the nature and aim of the current study then got their written informed consent individually regarding participation in the current study.

Schematic representation of the process of data collection: Intervals for data collection for group I & group II:

Tools	1st day Initial assessment (Baseline data)	2nd day (Post intervention1)	3rd day (Post intervention2)	One month (Post intervention3)
Demographic and Medical related Data Sheet	√			
Apnea/ Hypopnea Index (AHI)	√	√	√	√
PSQI questionnaire	√			√

Implementation phase: Primarily the researchers assessed patients' medical and nursing management regarding OSA and ensured that all patients in both groups received the same management. Then, the researchers utilized tool I: Demographic and Medical-related Data Sheet; followed by tool II: Apnea/ Hypopnea Index (AHI) in addition to Tool III: The Pittsburgh Sleep Quality Index (PSQI) questionnaire. These measurements were counted as the 1stmeasurement (Pre) intervention then the researchers divided the patients randomly into sniffing position (group I) and side-lying position (group II); the even numbers for group (I) and the odd numbers for group (II). Each tool lasted from 10-15 minutes to be filled by the researchers and these data was collected at the inpatient medical wards.

Regarding sniffing position (group I), the researchers trained each patient individually about the application of this positioning technique until they became able to apply it independently. Patients were instructed to put their ears and sternal notch in the same horizontal plane, raised the head about 10 cm (4 inches) off the bed by placing a folded sheet or other object under the head with the base of the neck flexed and the atlanto-occipital joint extended, as well as leaving their shoulders on the bed, noticed that this training was not exceeded more 15 minutes. Then, the researchers asked each patient to apply this position on each sleep time up to one month that was built on Chakraborty (2018), and follow up of them was performed through telephone calls.

Concerning side lying position (group II), the researchers asked each patient individually to apply the side lying position as an involuntary position performed during sleep. Noticing that, this training was not exceeded more 15 minutes. The researchers instructed each patient in the group to apply this position on each sleep time up to one month that was built on Martins & Conde (2021), and follow up of them was performed through telephone. Data collection process lasted about six months from January 2023 till June 2023.

The evaluation phase: Evaluation of patients' severity of OSA following the implementation of sniffing and side lying positions was performed in the following sequence: at the end of the first 1st, 2nd & 3rdday post intervention at the inpatient medical wards through using Tool II: Apnea/ Hypopnea Index (AHI) ; that based on Gleeson & McNicholas (2022), while evaluating the quality of sleep was performed after one month post intervention through using Tool III: The Pittsburgh Sleep Quality Index (PSQI) questionnaire at the outpatient medical clinics.

Ethical consideration:

For ethical reasons, an official permission for conducting the study was taken from ethics committee of the Faculty of Nursing, Cairo University No (IRB: 2019041701), and from the hospital director. Informed consent was obtained from each patient after explaining the nature and purpose of the study. The researchers emphasized that participation in the study was entirely voluntary; anonymity and confidentiality were assured through coding the data.

Statistical analysis:

Obtained data was tabulated, computed and analyzed using SPSS program, version 21 **(Rahman & Muktadir, 2021).** Descriptive statistics including frequency distribution means and standard deviation, as well as suitable inferential statistical analysis as t-test and chi-square tests were utilized to examine the effect of interventions on the study sample. Significant level was at P- value ≤ 0.05.

Results

Table (1) represents that (36.6%) of the sniffing position (group 1), and (30%) of the side lying position (group 2) were in age group ranged from41 to 50 years with the mean age of (45.8± 11.14) & (42.4 ± 11.55) years respectively. Concerning gender (53.3 %) of the sniffing position (group 1) and (66.7%) of the side lying position (group 2) were females. Regarding marital status, (60%) of the sniffing position (group1) and (26.7%) of the side lying position (group 2) were married. According to educational level, (23.3% and 30%) of the sniffing position (group 1) and the side lying position (group 2) respectively had a primary and preparatory school education. Regarding occupation, (56.7% and 66.7%) of the sniffing position (group 1) and the side lying position (group 2) respectively were working. Regarding smoking, (80% and 66.7%) of the sniffing position (group 1) and the side lying position (group 2) respectively were not smokers. As shown, there were no statistical significant differences between sniffing position (group 1),and side lying position (group 2) regarding demographic characteristics variables in terms of age, gender, marital status, educational level, occupational status and smoking, so the sample was homogenous.

Figure (1) shows that, in relation to patients' BMI,(46.7% &30%) respectively of the sniffing and side lying position groups were grade III obesity, in addition, (33.3% &43.3%) respectively in the same groups were grade II obesity. About (13.3 & 26.7%) respectively in both groups were grade I obesity and only (6.7%) in the sniffing position group were overweight.

Figure (2): shows that, (33.3% & 53.3%) respectively in sniffing and side lying position groups had a family history of OSA compared to (66.7% & 46.7%) respectively of them had no family history of OSA.

Concerning patients' severity levels of OSA before and after the intervention, table (2) indicates that, the highest percentage of patients in the sniffing and side lying position groups reported moderate apnea during pre-intervention (1st reading baseline) representing (66.6% & 83.3%) respectively. However, in 3rdday (post intervention 2)60% of patients in the sniffing position group exhibit mild apnea, the same percentage of the side lying position group reported moderate apnea. Furthermore, after one month (post intervention 3) assessment, the majority of patients in the sniffing position group (86.7%) reported mild apnea and only (13.3%) exhibit moderate apnea, but in the side lying position group (60%) reported mild apnea and (40%) reported moderate apnea. In addition, no one in both groups manifested severe apnea throughout 2nd and 3rd post intervention period. A

statistically significant differences were found between the two groups in relation to patients' severity level of obstructive sleep apnea in the 3rd post intervention period ($X^2 = 5.45$ at P= 0.02).

In table (3), it is interesting to note that, there was statistically significant difference between the sniffing and side lying position groups regarding obstructive sleep apnea severity mean scores only during the 3rd post intervention period (one month)(2.00 ±2.34 Versus 3.56 ±3.41, respectively) and (t-test= 2.07 , P value = 0.043).

As can be seen from figure (3), a considerable decrease was observed in OSA severity mean scores among patients who applied sniffing position (group 1) in comparison to those who applied side lying position (group 2) during1st&2nd post intervention period (7.40 Versus8.63 &4.33 Versus 6.10 respectively) and the 3rd post intervention period (2.00 Versus3.56 respectively).***Therefore, the first research hypothesis was supported.***

Concerning sleep quality scores throughout the intervention period, table (4) indicates that, the majority of patients in the sniffing position group had good sleep quality (96.7%)after one month of intervention, while (33.3%)of the side lying position group had mild sleep quality. A highly statistical significant differences were found between the two groups in relation to sleep quality scores at posttest 1 ($X^2 = 12.65$ at P= 0.002).

Table (5) shows that there was highly statistical significant difference between sniffing and side lying position groups after one month post intervention (t test=3.1 at P value=0.003)

In relation to, the research hypothesis (2) regarding patients' sleep quality mean scores among sniffing and side lying position groups throughout intervention, it is apparent from tables (4&5) that, statistically significant differences was observed among the sniffing and side lying position groups, and the lowest mean score is demonstrated by those patients who applied sniffing position (group 1) in comparison to those who applied side lying position (group 2). ***Therefore, the second hypothesis was supported.***

Table (1): Frequency and Percentage Distribution of Demographic Characteristics among the Study Sample (n=60)

Variable	(Group 1) Sniffing n=30		(Group 2) Side lying n=30		Test	P-value
	No	%	No	%		
Age:	2	6.7	7	23.3	T=1.16	0.25
21-30	6	20.0	6	20.0		
31- 40	11	36.6	9	30.0		
41-50	9	30.0	6	20.0		
51- 60	2	6.7	2	6.7		
61 and above						
Mean± SD	45.8± 11.14		42.4 ± 11.55			
Gender:					X^2= 1.11	0.29
Male	14	46.7	10	33.3		
Female	16	53.3	20	66.7		
Marital Status:	18	60.1	8	26.7	X^2= 6.98	0.07
Married	4	13.3	9	30.0		
Single	4	13.3	6	20.0		
Divorced	4	13.3	7	23.3		
Widow						
Education:	5	16.7	5	16.7	X^2= 0.68	0.98
Can't read & write	6	20.0	4	13.3		
Read and write	7	23.3	9	30.0		
Primary & Preparatory School	6	20.0	5	16.7		
Secondary School	6	20.0	7	23.3		
University						
Occupation:	17	56.7	20	66.7	X^2= 0.54	0.85
Working	13	43.3	10	33.3		
Not working						
Smoking:	6	20.0	10	33.3	X^2= 1.36	0.24
Smoker	24	80.0	20	66.7		
None Smoker						

*Significant at P- value ≤ 0.05 probability level

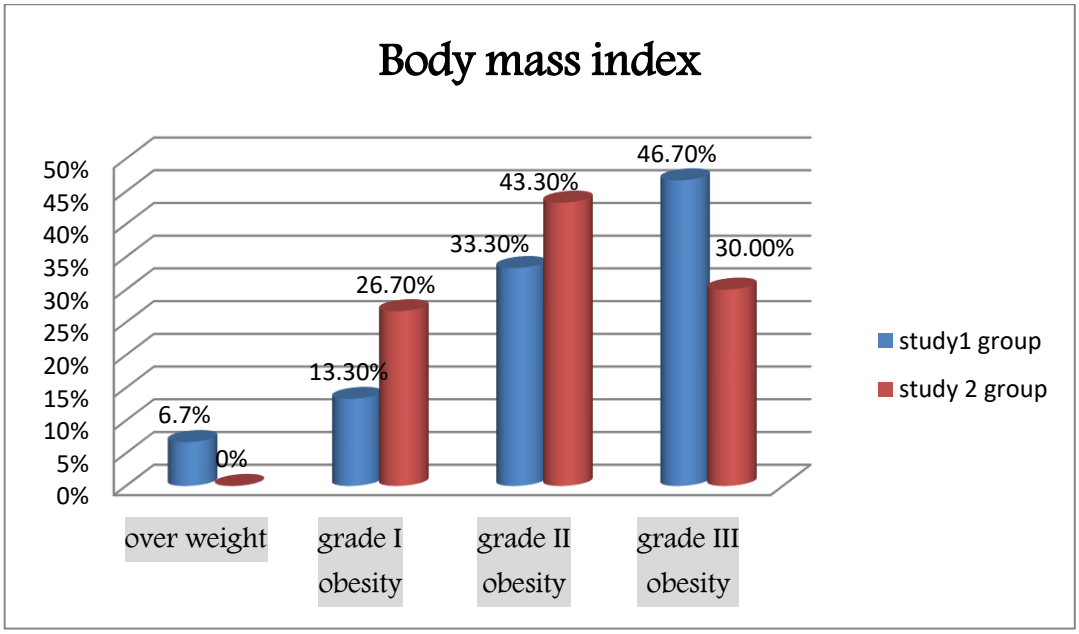

Figure (1): Percentage Distribution of Body Mass Index (BMI) among the Study Sample (n=60)

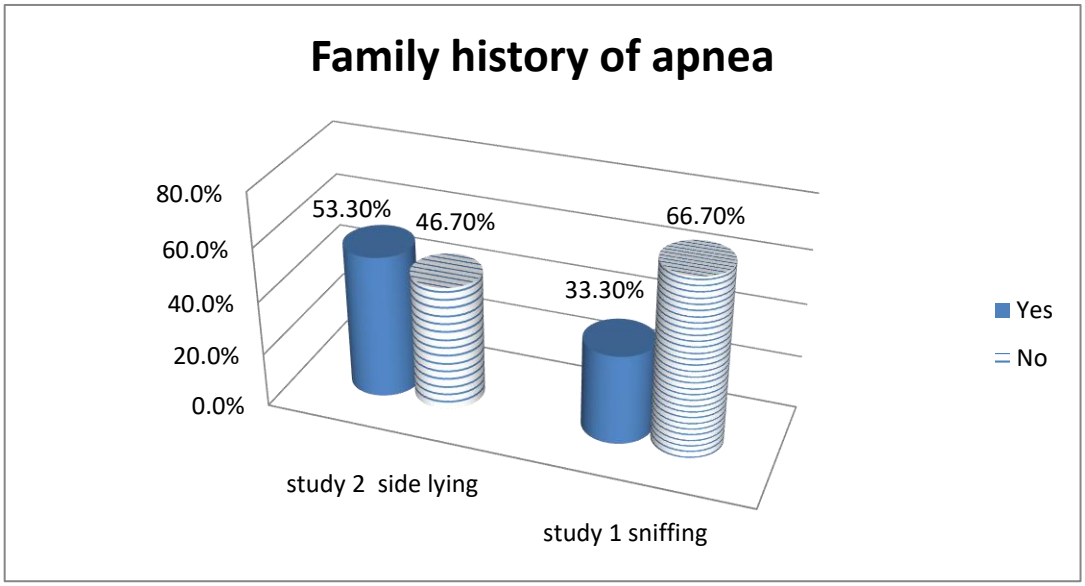

Figure (2): Percentage Distribution of Family History of Obstructive Sleep Apnea among the Study Sample (n =60)

Table (2): Frequency and Percentage Distribution as Regards Severity levels of Obstructive Sleep Apnea (OSA) among the Study Sample (n=60)

Variable	(Group 1) Sniffing		(Group 2) Side lying		$\chi 2$	P
	No	%	No	%		
Pre-intervention (1st day)					2.34	0.31
Normal (<5)	0	0	0	0		
Mild (5< 20)	5	16.7	2	6.7		
Moderate (20<40)	20	66.6	25	83.3		
Severe (≥ 40)	5	16.7	3	10		
Post-intervention 1 (2nd day)					2.85	0.24
Normal (<5)	0	0	0	0		
Mild (5< 20)	10	33.3	5	16.7		
Moderate (20<40)	18	60.0	24	80.0		
Severe (≥ 40)	2	6.7	1	3.3		
Post-intervention 2 (3rd day)					2.4	0.12
Normal (<5)	0	0	0	0		
Mild (5< 20)	18	60.0	12	40.0		
Moderate (20<40)	12	40.0	18	60.0		
Severe (≥ 40)	0	0	0	0		
Post-intervention 3 (One month)					5.45	0.02*
Normal (<5)	0	0	0	0		
Mild (5< 20)	26	86.7	18	60.0		
Moderate (20<40)	4	13.3	12	40.0		
Severe (≥ 40)	0	0	0	0		
***Significant at P- value ≤ 0.05 probability level**						

Table (3): Difference between Sniffing and Side Lying Position Groups as Regards Obstructive Sleep Apnea Severity Mean Scores (n = 60).

Variable	(Group 1) Sniffing (n= 30) Mean ± SD	(Group 2) Side Lying (n= 30) Mean ± SD	t-test	P- value
Pre Intervention (1st day)	10.93 ±8.15	11.30 ±5.78	0.20	0.842
Post Intervention 1 (2nd day)	7.40 ±6.08	8.63 ±4.91	0.86	0.392
Post Intervention 2 (3rd day)	4.33 ±4.18	6.10 ±4.55	1.56	0.123
Post Intervention 3 (One month)	2.00 ±2.34	3.56 ±3.41	2.07	0.043*
***Significant at P- value ≤ 0.05 probability level**				

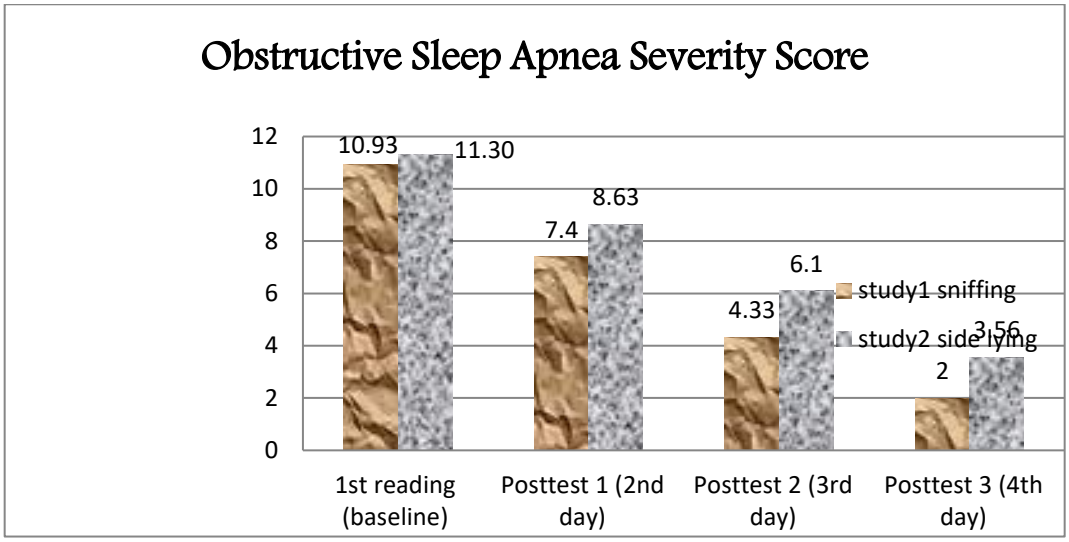

Figure (3): Comparison between Sniffing and Side Lying Position Groups as Regards Obstructive Sleep Apnea Severity Mean Scores (n = 60).

Table (4): Frequency and Percentage Distribution as Regards of Sleep Quality Scores among the Study Sample (n = 60).

Variable	(Group 1) Sniffing		(Group 2) Side Lying		χ^2	P
	No	%	No	%		
Pre intervention (1st day)					3.64	0.3
Good sleep quality (0-5)	4	13.3	5	16.7		
Mild alteration (6-10)	17	56.7	13	43.3		
Moderate alteration (11-15)	9	30.0	9	30.0		
Posttest 1 (after one month)					12.65	0.002**
Good sleep quality (0-5)	29	96.7	20	66.7		
Mild alteration (6-10)	1	3.3	10	33.3		
***Significant at P- value ≤ 0.05 probability level**						

Table (5): Difference between Sniffing and Side Lying position Groups as Regards Sleep Quality Mean Scores (n =60).

Variable	(Group 1) Sniffing(n= 30) Mean ± SD	(Group 2) Side lying(n= 30) Mean ± SD	t-test	P- value
Sleep Quality Index Mean Scores				
1st reading (baseline)	8.53±3.20	9.64±4.25	0.96	0.341
Posttest 1 (after one month)	2.40±2.22	4.40 ±2.74	3.1	0.003*
***Significant at P- value ≤ 0.05**				

Discussion

Obstructive sleep apnea is a serious health problem resulting in altered overall health of obese patients**.** Results from the present study revealed that, more than one third of the study sample in both groups was females; their age was from 41 to 50 years. More than one half of patients in sniffing position group was married, working, non-smokers, and had primary and preparatory education. The highest percentage of patients in the side lying position group was single, working, and non –smokers. Regarding BMI of the study sample, results from the present study indicated that more than one third of them in both groups had grade II and III obesity, while the rest had grade I obesity. In relation to family history of OSA, it was obvious that more than one half of the side lying position had a positive family history compared to one third in the sniffing position group.

In the same line was Ling (2023) who stated that, age, gender, and weight were biological characteristics that affected the development of OSA. Its risk rose at the ages between 30 and 70. Compared to other age groups, patients between the ages of 40 and 50 were more likely to be diagnosed with OSA and its higher prevalence was associated with larger weight. Surprisingly, Guo et al., (2020) also demonstrated that men were two to four times more likely than women to develop OSA which was contrary to the results of the present study. From the researchers' verification, this could be due to the fact that obesity and increased BMI was always linked to females who might be more likely than males to suffer from sleep apnea due to differences in hormones, anatomy, and metabolism. Age-related anatomical changes to the throat and neck region could be the cause of the rise in OSA prevalence especially in females. For instance, some female patients might have greater fat deposits around their throats, which increased the likelihood that they would obstruct airways as they sleep.

Supporting the results of the present study concerning female gender affection, was Gleeson and McNicholas (2022) who documented that, after menopause, women were more likely to have obstructive sleep apnea. Weight and upper airway structure could be affected by changes in hormone levels, which could also affect the risk of developing OSA. As a result, pregnant women and those with polycystic ovarian syndrome (PCOS) could also have increased incidences of OSA.

Moreover, Kline (2023) illustrated that, there has been a rise in the number of obstructive sleep apnea diagnoses in recent years. Over a 20-year period, the prevalence of OSA in American adults aged 30 to 70 rose by 25% for women and 27% for men. Two main variables, according to researchers' point of view, could be causing the rise in numbers: the expansion of testing and diagnosis access and the rising average weight of patients, as those who were overweight or obese had a significant increased chance of developing obstructive sleep apnea.

Another study that was conducted by Kimoff, Kaminska and Pamidi (2022) and determined that, a dangerous disorder; OSA could damage long-term health as well as the quality and satisfaction of sleep, attentiveness and efficiency while awake. An estimated 25% of adults were at risk for some kind of sleep apnea. Although it was more equal after menopause, males were more frequently impacted than females. Having a small mouth and throat, being overweight or obese, and being middle-aged or older are additional risk factors.

Contrary to the results of the present study regarding smoking was a research from the University of Wisconsin, Madison's Center for Tobacco Research and Intervention which found that, smokers had a threefold higher risk of developing obstructive sleep apnea than nonsmokers. It increased inflammation and fluid retention in the upper airway and throat, which leaded to obstructive sleep apnea (Veasey & Rosen, 2019). Furthermore, regarding patients who needed airway management, positioning therapy was an example of noninvasive airway management approaches. Obesity, advanced age, and a history of snoring were factors that raised the likelihood of ventilation issues (Osman et al., 2021).To enhance the safety features of oxygenation, a number of supplementary methods were advised, such as situating the patient to make ventilation and oxygen administration easier (Greenberg, Scharf, West, Rajan & Scharf, 2022).

Regarding severity of OSA, results from the current study showed that more than two thirds of patients in sniffing and side lying positions pre

intervention reported moderate sleep apnea. While, a significant decline in patients' complains regarding its severity among both groups was observed which was lesser among sniffing position than in side lying position group. Moreover, no one in both groups suffered from severe sleep apnea post intervention throughout the 2nd and 3rdpost intervention assessments. Supporting these results was Benjafield et al., (2019) who stated that, OSA was a highly prevalent condition worldwide, and up to 936 million patients worldwide suffered with mild to severe OSA.

Supporting the mentioned effect of side lying position on the severity of OSA, Nikolla, Beaumont, Lerman et al., (2020) added that, worldwide, over 60% of patients with respiratory problems preferred to sleep on their sides, according to statistics. The inclination to sleep on one's side intensified as one gets older. This could be because the spine became less flexible with age; elderly folks might found that sleeping on their sides was more pleasant. For those who had neck pain, side sleeping could also help with symptoms. Specifically, pregnant women, overweight, obese patients, and those with back discomfort could benefit from lying on their sides. Patients with acid reflux or sleep apnea benefit from sleeping on their sides since it could lessen snoring and heartburn.

Additionally, Kar, Senapati, Samanta, and Satapathy (2022), illustrated that, as people age, they tended to shift positions less frequently while they sleep. Age and the presence of obesity had an impact on the time distribution of sleeping postures. In particular, older adults and those who were overweight or obese spent more time in the side position and less time in the supine position. Compared to men, women adjusted their bodies and sleep positions less frequently. This might be due to the fact that women waked up less frequently than men, had shorter sleep onset times, and had higher sleep efficiency. Overweight and obesity had a positive correlation with the number of movement that occurred during the night, but the frequency of shifting sleeping positions had an inverse relationship. Obese patients often had poor sleep, which might be linked to increased amounts of body activity. Because the supine position increased the body's respiratory needs, patients who were overweight or obese often lied on their sides.

While another study conducted by Patil et al., (2019), highlighted the effect of applying sniffing position and revealed that, positional therapy was used to treat obstructive sleep apnea (OSA) and snoring. The study's goal was to determine if, while accounting for the possible confounding effects of body weight, posture therapy with a sniffing position might lessen snoring sounds in patients with mild-to-moderate positional OSA. On the first night (N0), as well as the second (N1) and third (N2) evenings, patients were instructed to adopt the sniffing position. It was hypothesized by McKeown, O'Connor-Reina, and Plaza (2021) that the sniffing position intended to prevent supine sleep could be a straightforward and efficient method of lessening the severity of snoring in patients with mild-to-moderate positional OSA, as the incidence of pharyngeal collapse and snoring might be dependent on the head position.

Parallel to the results of the present study was the study by Redline (2022),who added that, head posture could also had a positive effect on reducing snoring and obstructive sleep apnea severity. Generally speaking, sleeping with the chin on the chest was the worst position. The sniffing position which involved flexion of the neck (neck forward) and extension of the head (head back) was the best head position for keeping airway open.

Lastly, the current research shed the light on different positions that could play a pivotal role in the improvement of patients' condition with obstructive sleep apnea, even who suffered from interfering predisposing causes. Apparently the researchers accept both proposed current study's hypotheses confidently.

Conclusion:

Results from the present study showed a significant positive effect of both positional therapies particularly side lying and sniffing positions on reducing the severity of OSA. While higher significant improvement was observed among the sniffing position group than in the side lying position group, with high statistically significant differences observed in the OSA severity and sleep quality mean scores between sniffing and side lying position groups in the third post intervention period.

Recommendations

- Application of standardized clinical practice guidelines regarding sniffing position among obese patients with OSA.
- Provide health educational programs regarding sniffing position for obese patients with OSA.
- Monitoring the quality of sleep among obese patients with OSA utilizing objective measurement tools.
- Replication of such study on a larger sample and in different settings among obese patients with OSA.

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