Impact of Obesity on Selected Parameters among Patients with Chronic Obstructive Pulmonary Disease

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Abstract: Background: The prevalence of chronic obstructive pulmonary disease (COPD) and obesity is increasing dramatically throughout the world. Obesity frequently coexists with chronic obstructive pulmonary diseases (COPD) although obesity is not a risk factor for COPD. Both of these common health problems have been studied extensively in isolation, the impact of their combination is largely unknown. Aim of the study was to explore the effect of obesity on pulmonary functions, dyspnea, and fatigue among patients with COPD. Design: Comparative descriptive design was used in carrying out this study. Setting: Kasr Al Aini Hospital for Medical Diseases affiliated to Cairo University. Sample: A total of 40 adult male patients with COPD, age range between 40-60 years old, admitted from October 2009 to February 2010 were assigned into two groups according to their BMI; obese (BMI=30-34.9 kg/m^2) and normal weight (BMI=18.5-24.9 kg/m^2). Patients with continuous oxygen therapy, presence of other co-morbidities that could contribute to the studied variables were excluded. Tools: Structured Interviewing Questionnaire, Visual Analogue Scale for Dyspnea, Visual Analogue Scale for Fatigue, Parameters Record Sheet, Medical Record and Simple Spirometer were used to collect the related data. Results: There was no statistical significant difference between the obese and the normal weight patients with COPD as regards respiratory rate, dyspnea scores, and fatigue scores but there was a statistical significance difference (p≥5%) between obese and normal weight patients with COPD as regards blood gases and lung capacity results on admission. While there was a statistical significance difference (p≥5%) between obese and normal weight as regards all the selected parameters prior to discharge. Conclusion: Obesity decreases pulmonary functions measured by arterial blood gases and lung capacity. Dyspnea, and fatigue among patients with COPD are not affected by body weight.
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Key wards: Obesity, Body Mass Index, Chronic Obstructive Pulmonary Diseases, Dyspnea, Fatigue.

1. Introduction:

Obesity is increasing at an alarming rate throughout the world. The World Health Organization predicts there will be 2.3 billion overweight adults in the world by 2015 and more than 700 million of them will be obese (BCC News, 2008). Obesity is defined as a condition of abnormal excess body fat and is associated with a large number of debilitating and life-threatening disorders. Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m2). A person with a BMI of 30 or more is generally considered obese. A person with a BMI equal to or more than 25 is considered overweight (Leader, 2011). Chronic obstructive pulmonary disease (COPD) is a debilitating lung condition that manifests in shortness of breath, activity limitation, increased sputum production, and cough (O'Donnell *et al.,* 2008). Chronic bronchitis and emphysema -the main categories of COPD- are characterized by permanent airflow limitation. This limitation leads to multiple symptoms and frequent exacerbations (Small & Lamb, 2000). The American Lung Association (1999) reported that COPD is the fourth leading cause of death over the world. According to the WHO, chronic obstructive pulmonary disease (COPD) is one of the most prevalent diseases, expected to move to the 3rd leading cause of mortality in 2020 (Tkacova, 2010).

The number of patients with COPD, asthma or obstructive sleep apnea is also increasing. Diagnosis and definition of COPD severity was established in accordance with the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines. GOLD stage 0 (patient at risk) is diagnosed when patients report chronic cough and sputum production whilst their lung function is still normal. GOLD stage 1 (mild COPD) is defined as a ratio of FEV1/forced vital capacity (FVC) <70% but with the FEV1 ≥80% predicted. GOLD stage 2 (moderate COPD) is diagnosed if the FEV1 is between 50% and 80% predicted (Pauwels, *et al.,* 2001 and Lotte, *et al.*, 2006).

In Northern California (USA), 54% of patients with COPD were obese and had BMI ≥30 kg/m^2 compared to 20–24% prevalence of obesity in the general population (Schokker *et al.,* 2007). Obesity is reported in 18% to 54% of patients with COPD and

is associated with a better prognosis (Steuten *et al.,* 2006, and Eisner *et al.,* 2007) while low BMI (being too thin) has been associated with poor prognosis in patients with COPD (Leader, 2010). Both conditions of obesity and COPD when taken individually are characterized by physiological alterations in breathing mechanics along with functional limitations. However, the complex interactions between the two conditions could mitigate a negative synergic effect on exercise performance (Laviolette *et al.,* 2010).

Lung volumes are consistently affected by BMI in health and in disease, so, obesity may play a significant role in the pathogenesis of pulmonary diseases (Mancuso, 2010). The total respiratory compliance in obesity may be reduced to as little as one-third of normal. This results not only from the effect of excess truncal fat mass but also increased pulmonary blood volume and increased closure of the dependent airways of patients who are obese. Fat tissue accumulation impairs ventilatory function in adults (Chinn *et al.,* 1996 and Lazarus *et al.,* 1997) and children (Inselma *et al.,* 1993). Increasing BMI is typically associated with a reduction in forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), total lung capacity, functional residual capacity and expiratory reserve volume (Rubinstein *et al.,* 1990). Thoracic restriction associated with obesity is usually mild and is attributed to the mechanical effects of fat on the diaphragm and the chest wall: diaphragm excursion is impeded and thoracic compliance reduced (Chlif *et al.,* 2005, and McCoy, 2006).

Dyspnea and fatigue are the two most common symptoms experienced by patients with chronic obstructive pulmonary disease (Meek & Lareau, 2003). The disease often starts with chronic cough and sputum production, especially in the mornings, before the development of airflow limitations which are often ignored by the patients (Lotte, *et al.,* 2006). Dyspnea may be severe and often interferes with the patient's activities. Weight loss is common because dyspnea interferes with eating, and the work of breathing is energy-depleting. Often the patient cannot participate in even mild exercise because of dyspnea; as COPD progresses, dyspnea occurs even at rest (Brunner, Suddarth, & Smeltzer, 2008). Dyspnea in COPD patients may be evoked by simple activities, such as walking, doing housework, eating, and talking. To avoid the distressing sensations of dyspnea and other symptoms, the majority of COPD patients reduce their physical activities. As a result, some patients may lead an extremely sedentary lifestyle that may further decrease their abilities to perform physical activities.

Fatigue is one of the most distressing symptoms of this illness, and significantly impairs both functional performance and quality of life (Gift & Shepard, 1999). Oxygen delivery to muscle is not the only cause of fatigue in COPD; fatigue may be considered the second symptom in importance for patients with COPD after dyspnea (Baltzan, *et al.,* 2011). Weight loss is an independent negative factor for fatigue, which is also associated with reduced skeletal muscle aerobic capacity (Palange, *et al.,* 1998). Dyspnea has traditionally been considered the primary symptom limiting COPD patients; recent attention to measures of fatigue have shown both dyspnea and fatigue to be important symptoms in this population (Belza, *et al.,* 2001). COPD patients often report decreases in activity levels because of dyspnea, fatigue, or both. When these symptoms affect the performance of daily activities, the potential exists for overall quality of life to be decreased. Further, if these symptoms continue to limit daily activities and the intensity of the symptom increases (despite decreasing the magnitude of the daily activities), then the potential is great for patients to become deconditioned (Meek & Lareau, 2003). Besides, symptoms that occur frequently, such as dyspnea and fatigue, an elevated systemic inflammatory response is reported in relation to a decreased appetite and dietary intake (Vermeeren, *et al.,* 2001).

Significance of the Study

Obesity increases worldwide as well the prevalence of COPD as the WHO classified COPD as the 3rd cause of death by the year 2020. There is a lot of researches signifies the relation between low body mass index and severity of COPD. Moreover the four predictors of death among patients with COPD are detected as (BODE) low body mass index, obstruction manifested by low arterial O2 saturation, dyspnea and limitation of exercise tolerance; but the overweight patients with COPD had not the same chance to study the effect of their body weight on respiratory status and fatigue. Accordingly, this study was inducted aiming to increase nurses awareness about obese patients with COPD and to document the impact of obesity on health status of patients with COPD that either indicate the need for special nursing management for those cluster of patients or both normal weight and overweight patients can be managed with the same nursing protocol of care.

Aim of the study

The aim of this study was to explore the effect of obesity on pulmonary functions, dyspnea and fatigue among patients with COPD.

Research questions

1- Is there a difference between obese and normal

weight patients with COPD as regards pulmonary functions (respiratory rate, forced expiratory volume, arterial blood gases results) on admission?
2- Who will have higher dyspnea scores obese or normal weight patients with COPD on admission?
3- Who will have higher fatigue scores obese or normal weight patients with COPD on admission?
4- Who will have more prognosis prior to discharge obese or normal weight patients with COPD?

2. Subjects & Method:

Design:

Comparative descriptive design was utilized in this study; comparative descriptive research design examines and describes differences in variables in two or more groups that occur naturally in the setting. **Burns & Grove (2007)** viewed data collected through this research design describe and compare two or more groups of participants or entities (explores for differences).

Setting:

This study was conducted in Kasr Al Aini Hospital for Medical Diseases affiliated to Cairo University. The hospital consists of seven floors, the emergency unit at the first floor where the patients with COPD are admitted because of exacerbation or severe chest infection then transferred to another floor (intermediate care). Knowing that the number of patients admitted during 2008 were 138 patients (100 males, and 38 females), and during 2009 149 patients (76 male, and 73 female) respectively (Census of Cairo University).

Sample:

A total of 40 adult male patients with confirmed diagnosis of COPD; age ranged between 20-60 years old, admitted during winter season of 2009-2010 (from October 2009 to February 2010) constituted the study' subjects. Two groups were constituted twenty subjects for each according to body mass index (BMI); a group of patients with COPD have BMI= 30-34.9 kg/m^2 as obese group, and a group of the other twenty patients with COPD have BMI= 18.5-24.9 kg/m^2 as normal weight group were selected to match the medical background data of the obese group were recruited in the study. Exclusion criteria were patients on continuous oxygen therapy, as well presence of co morbidities that could contribute to the studied variables.

Tools

Data of this study was collected using the following tools: Structured Interviewing Questionnaire, Visual Analogue Scale for Dyspnea (VAS-D), Visual Analogue Scale for Fatigue (VAS-F), simple spirometry to measure forced expiratory volume, Patient Medical Record to obtain arterial blood gases results and parameter record sheet including respiratory rate, and the reading of the other parameters as regards obese and normal weight patients with COPD on admission and prior to discharge.

1. Structured Interviewing Questionnaire was developed by the researchers based on literature review, it included two parts: the first part includes data related to demographic data namely; age, residence; the second part includes data related to medical background data which namely: patients' complaints as regards cough and wheezing, duration of illness, number of previous hospitalization, reasons for the current admission, smoking history, as well exposure to irritants.

2. Visual Analogue Scale for Dyspnea (VAS-D) it is a numerical likert scale used to measure dyspnea ranged from zero to ten. Scoring system: zero means (no dyspnea), 1 to 3 means (mild dyspnea), 4 to 6 mean (moderate dyspnea), 7 to 10 mean (total or severe dyspnea) as mentioned by Potter and Perry (2009). Patients are asked to mark the line to indicate the degree of shortness of breath experienced over the past few days. Since there is little to read or see on the scale, the VAS-D can be used by people with some sight impairment, the anchor words at each end of the VAS-D are precise and easy to interpret (Woo, 1997). Reliability of the VAS-D is difficult to demonstrate because dyspnea is subject to change from time to time. However, the repeatability of horizontal visual analogue scale was reported in a study of COPD patients who were asked to rate dyspnea before, during, and after exercise for five consecutive days. Because the intensity of dyspnea, compared with the normal effort of breathing, is an extremely subjective experience, the value of the VAS for comparison of different populations is limited. It is more appropriate to use the VAS for repeated measurements in changes of disease status or for evaluation of the effects of different therapeutic interventions (Scott, 2004). It has the advantage of being quick and easy to use, which is particularly appropriate for patients with a limited concentration span, but the disadvantage of not taking any account of the relative contributions of different factors to the patient's perception of breathlessness (Mancini & Body, 1999).

3. Visual Analogue Scale for Fatigue (VAS-F). It is a numerical scale, horizontal line bipolar opposite descriptors aiming to measure a person's perceived exertion rate and assess the severity of fatigue on

continuous scale from 0 to 10. Scoring system: zero means (no fatigue), 1 to 3 means (mild exhaustion), 4 to 6 means (moderate exhaustion), and 7 to 10 means (total or severe exhaustion). Subjects are asked to mark on the line the point that they feel represents their perception of their current state (Potter, & Perry, 2009).

4. Parameters Record Sheet was developed by the researchers to record the following data: height, weight, BMI, respiratory rate as observed by the researchers, dyspnea and fatigue level as measured by VAS-D and VAS-F respectively, arterial blood gases from patients' medical record, and finally FEV as measured by simple spirometer. This spirometer is the most common lung function test and the most important in diagnosing COPD, its stage and can also be used to track the progression of disease and to monitor how well treatment is working. During this test, patient was asked to blow into a large tube connected to a spirometer. Spirometry is the measurement of air flow into and out of the lungs. Accurate measurement is dependent upon the patient's performing the appropriate maneuver properly (Brunner, Suddarth, & Smeltzer, 2008). Only FEV was monitored in this study using simple spirometer. Arterial blood gas analysis measures how well the lungs are bringing oxygen into the blood and removing carbon dioxide.

Ethical consideration

Official permission was obtained from the Head of all medical wards in Kasr El-Aini Hospital for Medical Diseases-Cairo University to conduct the study. Prior to the initial interview, the researchers introduced themselves to patients who met the inclusion criteria; each potential patient was fully informed with the purpose and nature of the study, and then an informed consent was taken from participants who accept to participate in the study. The researchers emphasized that participation in the study is entirely voluntary and withdrawal from the study doesn't affect care provided; anonymity and confidentiality were assured through coding the data.

Pilot Study:

Once permission was granted to proceed with the proposed study, a pilot study was carried out on 5 patients to test the feasibility and clarity of the used tools/instructions; modifications were done based on the results. The sample included in the pilot study was excluded from the final study sample.

Procedure:

Official permission was obtained from the Head of all medical wards in Kasr El-Aini Hospital for Medical Diseases affiliated to Cairo University to conduct the proposed study. Patients meeting the inclusion criteria were approached individually after admission, the purpose and nature of the study, procedures, and tools were explained; a written consent was taken from educated patients and oral consent from illiterate patients who accept to share in the study. Data were collected during higher admission period (October 2009 to February 2010). The following procedure was utilized; interviewing schedule to collect data, each subject was interviewed individually regarding socio-demographic data, as well as medical background, smoking history, and chief complaints (cough and wheezing); interview consumed about 15 minutes for each patient. Followed by measuring body mass index (BMI); BMI was calculated after measuring the height and weight using the hospital clothes and without shoes. Assessment of respiratory rate, forced expiratory volume using simple spirometer, dyspnea level using the Visual Analogue Scale for Dyspnea (VAS-D) and fatigue level using the Visual Analogue Scale for Fatigue (VAS-F) were conducted to record the initial data (on admission), then the arterial blood gases sample was drawn for analysis. Management regimen was initiated for all subjects including; administration of oxygen, as well prescribed medications (antibiotics bronchodilators, expectorant), and proper diet; when the subjects' status became stable (detected by medical team using arterial blood gases results) and none of them suffered from dyspnea, resting hypoxemia, or other conditions that could alter their capacity to perform daily activities, the pre discharge assessment data (respiratory rate and forced expiratory volume) were assessed at the morning of discharge day, then dyspnea and fatigue level were assessed.

Statistical Analysis:

Patients were classified by means of BMI; the collected data were coded and tabulated using a personal computer. Statistical package for social science (SPSS) version 11 was used. Inferential statistics was used to answer research questions. In this study t-test was used to compare means between normal weight and obese patients with COPD in relation to selected parameters, and chi-square test was used to compare between two qualitative variables such as socio-demographic data and medical background data. Statistical significance was considered at p-value <0.05.

3. Results

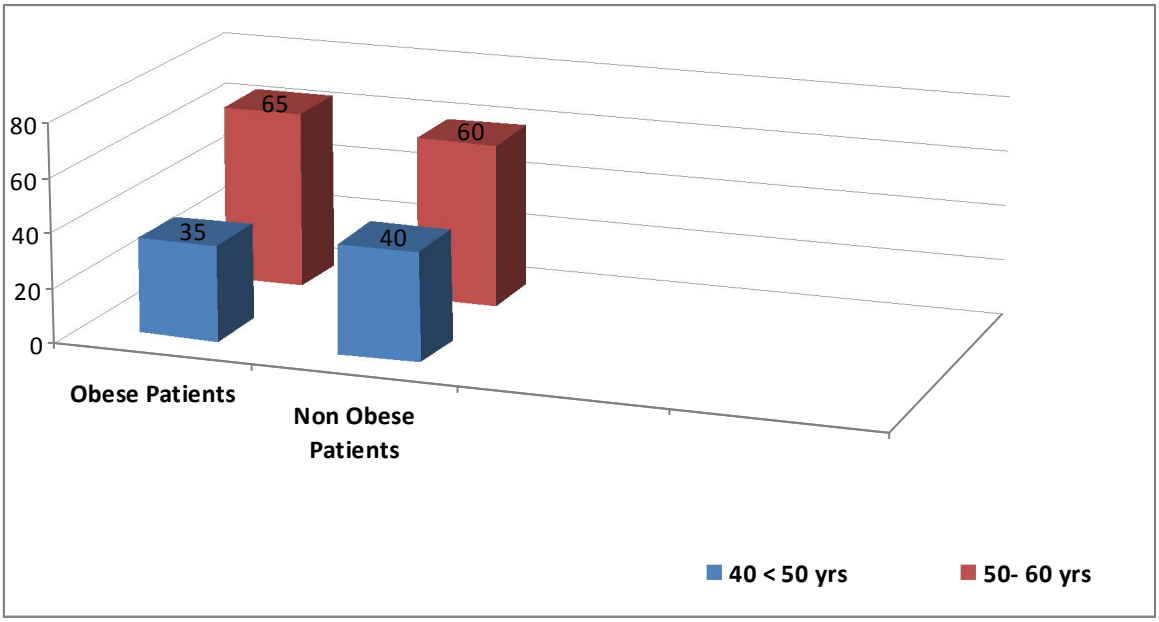
Findings of this study will be presented in three main sections: I) description of the study subjects' characteristics (socio-demographic and medical related data); II) differences between pulmonary

functions, dyspnea and fatigue (the selected parameters) among obese and normal weight patients with COPD, and III) differences between the selected parameters on admission and prior to discharge among obese and normal weight patients with COPD.

I. Description of study subjects' characteristics.

The recruited male patients in this study were homogenous in relation to socio-demographic characteristics and medical background data as there were no statistical significant differences between obese and normal weight patients was found in relation to socio-demographic characteristics. The age range was 40-60 years with mean of 50.7 ± 9.7 in obese group and it was 48.33 ± 10.29 years in normal weight group (t=0.887). All the patients were urban inhabitants working as painter, carpenter, and deal with cotton fibers, as well cement factories).

Figure (1): Percentage Distribution of Obese & normal weight Patients with COPD in relation to Subjects' Age.



Regarding medical background, there were no statistical significant differences between patients with COPD regardless their BMI. Duration of illness range from 2 up to 15 years with mean of 7.7±5.1 years in obese group and 5.9±4.9 years in normal weight group. A high percentage of both groups (60%) had confirmed diagnosis of COPD from 5 to less than 10 years (t=1.515). Number of previous hospital admission ranged from once up to 10 times, with mean of 5.1±3.2 times in obese group and 4.4 ± 3.9 times in normal weight group, 30% of obese patients group were admitted to hospital more than six times corresponds to 15% of the normal weight patients group, (t=0.276). Regarding reason of hospitalization, 50% of obese group corresponds to 25% of normal weight group were admitted complaining from respiratory infection and the difference between causes of admission to hospital was less than the accepted level of significance (X^2 = 2.88). The chief complains of the patients from both groups were cough and wheezing as well, there was no significant statistical difference between obese and normal weight patients as regards type of cough, sputum characters and onset. Wheezing also was described similarly in both groups.

Regarding smoking history, 70% of obese group and 20% of normal weight group were smokers up to the time of hospitalization (X^2 =9.6) with p > 0.5; the percentage of smoking per day differ significantly as 42.9% of obese group and all normal weight smokers smokes less than 10 cigarettes/day, while 35.7% of obese group smokes 10-20 cigarettes/day and 21.4% smokes less than 20 cigarettes/day.

II. Differences between pulmonary functions, dyspnea and fatigue (the selected parameters) among obese and normal weight patients with COPD:

Table (2) showed results of pulmonary functions on admission in relation to obese and normal weight patients; more than half of both groups had tachypnea on admission; as regards lung

volume measured as forced expiratory volume using simple spirometer, 75% of the obese had lung volume below normal corresponding to more than half of the normal weight group on admission.

Regarding arterial blood gases results, it was observed that the values of pH, PaO_2, Co_2, and O_2 saturation were abnormal among 75%, 50%, 75%, 75% of the obese group respectively, while the values of pH, PaO_2, Co_2, and O_2 saturation were abnormal among 45%, 25%, 40%, 55% of the normal weight group respectively on admission.

Table (2) also clarified that the dyspnea level which was assessed by Visual Analogue Scale ranged from moderate to severe; as 90% of obese group complained from severe dyspnea on admission; while, 75% of normal weight group complained from severe dyspnea on admission.

Regarding fatigue level which was assessed by Visual Analogue Scale, the same table showed that most of the recruited patients (65% of obese patients and 70% of normal weight patients) experienced severe exhaustion on admission.

Table (3) showed the results of pulmonary functions in relation to obese and normal weight patients, the percentage of patients with tachypnea decreased to 40%, and 15% among obese and normal weight patients with COPD respectively prior discharge.

As regards lung volume measured as forced expiratory volume using simple spirometer, the lung volume improved among the normal weight patients with COPD prior to discharge as only 30% of them still below normal, while 70% of the obese patients' lung volume still below normal.

Table (1): Distribution of study subjects according to their medical related data.

Data	Obese		Normal weight		t-value
	N	%	N	%	X^2
Duration of illness					
< 5 years	3	15	4	20	
5- years	12	60	12	60	**t=1.515**
10-15 years	5	25	4	20	
X±SD	7.7 ± 5.1		5.9 ± 4.9		
Number of hospital admission					
1-	3	15	5	25	
4-	11	55	12	60	**X^2= 0.276**
7-10	6	30	3	15	
X±SD	5.1 ±3.2		4.4 ± 3.9		
Reason of admission:					
- Respiratory infection	10	50	5	25	**X^2= 2.88**
- Respiratory distress	10	50	15	75	
Patients' complain					
Cough					
Type (Productive)	20	100	20	100	
Sputum					
Watery	2	10	4	20	
Colorless & high viscosity	7	35	6	30	
Green or yellow & high viscosity	11	55	10	50	**X^2= 1.264**
Onset					
Early morning	3	15	4	20	
At night	4	20	5	25	
Most of the day	5	25	5	25	**X^2= 0.622**
Can't sleep	8	40	6	30	
Wheezing					
With exertion	10	50	11	55	
Without exertion	10	50	9	45	**X^2=2.332**
Smoking history prior to hospitalization	20	100	20	100	**X^2 =9.6***
- Yes	14	70	4	20	
- No	6	30	16	80	
No. of cigarettes/day					
- >10	6	42.9	4	100	
- 10-20	5	35.7			
- >20	3	21.4			

* p-value significant at ≥ 0.05

Regarding arterial blood gases results, it was observed that the pre discharge findings showed improvement in both groups as the values of pH, PaO_2, Co_2, and O_2 saturation were abnormal among 30%, 25%, 40%, 40% respectively while the values of pH, PaO_2, Co_2, and O_2 saturation were abnormal

among 20%, 15%, 20%, 30% respectively of the normal weight group.

The dyspnea level which was assessed by Visual Analogue Scale ranged from moderate to severe; as 60% of the obese patients experienced severe dyspnea at pre discharge assessment. However, 20%of normal weight group complained from severe dyspnea at pre discharge assessment.

Regarding fatigue level which was assessed by Visual Analogue Scale, the same table showed that 55% and 15% for obese group and normal weight patients respectively experienced severe exhaustion at pre discharge assessment.

The difference between obese and normal weight patients with COPD as regards respiratory rate, lung capacity, blood gases results, dyspnea scores, and fatigue scores were tested using paired t-test at two intervals on admission and before discharge. Table (2) showed that the difference between lung capacity and arterial blood gases were statistically significant at the level of p 0.05, the normal weight patients were almost within normal range on admission. On the other hand, table (3) showed that respiratory rate, dyspnea scores and fatigue scores were higher among obese group than the normal weight patients group while lung capacity was lower among obese than normal weight patients group and arterial blood gases results were similar among both groups just prior to discharge.

Table (2): Distribution of obese and normal weight patients with COPD according to the selected parameters on admission and difference between them (n=40).

Variable	Obese		Normal weight		t-test
	N	%	N	%	
Respiratory rate					
- Normal (16-24)	9	45	8	40	.547
- Tachypnea >24	11	55	12	60	
X±SD	24.53±7.93		23.7±3.85		
Lung volume (FEV)					
- Normal 600-1200	5	25	9	45	-1.988*
- Below normal <600	15	75	11	55	
X±SD	376.6±288.5		498.3±213.6		
Blood Gases					
pH					
- Normal 7.35-7.45	5	25	11	55	-2.775**
- < 7.35	15	75	9	45	
PaO_2					
- Normal 80-100	10	50	15	75	
-Below normal < 80	10	50	5	25	
PCo_2					-4.184**
- Normal 35-45	5	25	12	60	
- > 45	15	75	8	40	
O_2 Saturation					-3.107**
- Normal 90-100	5	25	9	45	
-Below normal < 90	15	75	11	55	
HCo_3					
- Normal 22-26	17	85	6	30	
- < 22	3	15	14	70	2.478**
					-5.590**
Dyspnea score (VAS-D)					
Moderate level (4-6)	2	10	5	25	.861
Severe level (7-10)	18	90	15	75	
X±SD	8.3±0.95		8.0±1.6		
Fatigue score (VAS-F)					
Moderate level (4-6)	7	35	6	30	1.538
Severe level (7-10)	13	65	14	70	
X±SD	7.9±1.06		7.4±1.42		

*** P-value significant at ≥ 0.05** **** p-value significant at ≥ .000**

Table 3: Distribution of obese and normal weight patients with COPD according to the selected parameters prior discharge and difference between them (n=40).

Variable	Obese		Normal weight		t-test
	N	%	N	%	
Respiratory rate					
- Normal (16-24)	12	60	17	85	2.092*
- Tachypnea >24	8	40	3	15	
X±SD	23.23±2.01		21.03±2.46		
Lung volume (FEV)					
- Normal 600-1200	6	30	14	70	-3.993**
- Below normal <600	14	70	6	30	
X±SD	410±298.4		705±273.3		
Blood Gases					
pH					
- Normal 7.35-7.45	14	70	16	80	-.999
- < 7.35	6	30	4	20	
PaO_2					
- Normal 80-100	15	75	17	85	-1.02
-Below normal < 80	5	25	3	15	
PCo_2					
- Normal 35-45	12	60	16	80	
- > 45	8	40	4	20	
O_2 Saturation					-1.16
- Normal 90-100	12	60	14	70	
-Below normal < 90	8	40	6	30	
HCo_3					-1.44
- Normal 22-26	6	30	3	15	
- < 22	14	70	17	85	.817
Dyspnea score (VAS-D)					
Moderate level (4-6)	8	40	16	80	6.225**
Severe level (7-10)	12	60	4	20	
X±SD	6.8±0.95		5.4±0.1		
Fatigue score (VAS-F)					
Moderate level (4-6)	9	45	17	85	4.034**
Severe level (7-10)	11	55	3	15	
X±SD	6.60±1.163		5.47±1.08		

*** P-value significant at ≥ 0.05** **** p-value significant at ≥ .000**

III. Differences between the selected parameters on admission and prior to discharge among obese and normal weight patients with COPD.

Table (4) showed that there was a significant statistical improvement of the selected parameters among both groups except the respiratory rate among the obese patients.

Table (4): t-test between the selected parameters on admission and before discharge as regards obese and normal weight patients with COPD (n=40).

Item	Obese	Normal weight
Respiratory rate	.974	1.992*
Lung capacity (FEV)	-3.551**	-4.404**
Blood Gases		
- Ph	1.99*	2.37*
- PO2	4.55**	5.86**
- PCO2	4.707**	7.57**
- HCO3	1.02	1.76
- SaO2	1.99*	2.01*
Dyspnea	6.707**	10.11**
Fatigue	5.89*	10.10**

*** p-value significant at ≥ 0.05** **** p-value significant at ≥ .000**

4. Discussion

This research presents findings related to the effect of obesity on patients complaining from COPD. Only males were selected for the study in order to minimize possible gender influence on lung volumes and fatigue level (i.e., minimize measurement variability). Results of this research showed that the study subjects' age ranged from 40-60 years with mean of 50.7 ± 9.7 years in obese group and, 48.33 ± 10.29 years in normal weight group. This result go in accordance with Abramson, *et al.,* (2002), Abd Elaal (2006), and Milliman *et al.*, (2011), who reported that COPD prevalence rate increased with increasing age.

The research findings related to disease characteristics showed that more than half (60%) of the subjects regardless their BMI confirmed the diagnosis of COPD from 5 to less than 10 years with no statistical difference between the two groups. Data also revealed that the number of admission among more than half of patients in both groups ranged between four and seven times this finding can be interpreted in light of frequent susceptibility of the obese COPD patients to complain from exacerbation episodes of the COPD as a chronic disease and also explain the cause of the current admission. The main reason of the current admission was either respiratory infection or respiratory distress regardless BMI, however, the majority of normal weight group admitted because of respiratory distress, this finding contradictory with Sin *et al.,* (2002) who reported that the obese individuals were over 2.5 times more likely to complain of dyspnea than participants with normal body weight. Milliman analysis of MedStat (2007) reported that respiratory related admission make up 34% and 59% of total admissions of severe and very severe COPD patients.

In relation to smoking history, all the patients had a history of smoking, while most of obese group (70%) and less than one fourth of normal weight group were smoking cigarettes prior to hospitalization; two fifth of obese group and all normal weight smokers smoke less than 10 cigarettes/day, while more than one third of obese group smokes 10-20 cigarettes/day and two fifth of them smoke less than 20 cigarettes/day; according to Department of Health Services (2004) smoking is the primary risk factor for COPD and approximately 85% to 90% of COPD deaths are caused by smoking. The primary risk factor for COPD is chronic tobacco smoking. In the United States, 80 to 90% of cases of COPD are due to smoking (Young *et al.,* 2009). Also Brunner, Suddarth, & Smeltzer, (2008) mentioned that the most important risk factor for COPD is cigarette smoking. Pipe, cigar, and other types of tobacco smoking are also risk factors. In addition, passive smoking contributes to respiratory symptoms and COPD.

The research findings indicated that there was no statistical difference between obese and normal weight patients as regards respiratory rate on admission and tachypnea was one of the patients problems indicating hospitalization, this go in line with a study findings conducted by Ora, *et al.,* (2009) who reported that breathing pattern was similar in obese and normal weight groups; however, the obese group breathed more rapidly than the normal weight group at rest (by 3.4 breaths/min; P = 0.026), at early work rates (by 3.4 breaths/min; P = 0.06), and at peak exercise (by 4.6 breaths/min; P = 0.05).

Lung volume as measured by Forced Expiratory Volume was less than normal among both groups obese and normal weight but the FEV was higher in normal weight patients than obese group this go in accordance with Ora *et al.,* (2009) who mentioned that FEV is consistently affected by BMI in health and in disease. However, they found no significant differences between obese and normal weight groups in spirometric measurements.

According to Oguejiofo (2011) patients with COPD cannot breathe adequately when they have normal oxygen saturation levels. In order for them to stay alive, they need to have low oxygen saturation levels, because this is what gives them the impulse to breathe; based on this fact, the oxygen saturation values of the study subjects was expected where 45% of obese group had normal O_2 saturation on admission and 60% at pre discharge assessment, and from 45% to 70% for normal weight patients. As obesity and smoking can reduce oxygen saturation, the results of O_2 saturation were expected.

Results of this study indicated that dyspnea and fatigue sores were high among both groups on admission, this is may be due to subjectivity of such complains as they measured in the present study using Visual Analogue Scales, so the patients may reflect their feeling of fear as a result of admission to emergency unit and then transferred to intermediate care.

The hospital protocol of care was rendered to all patients regardless their BMI, which consisted of oxygen therapy, bronchodilators, antibiotics, expectorants, and proper diet. So, researchers compare the results of the selected parameters prior to discharge. The comparison between the obese and normal weight group in relation to the selected parameters revealed a significant statistical differences between them prior to discharge. These results may be because most of the obese patients were smokers prior to hospitalization and duration of illness among them was higher than the duration of illness among the normal weight patients, although

the difference between this data did not reach the accepted level of significance. The current research is contradicting the research conducted by Ora, *et al.,* (2009) who study the combined effects of obesity and COPD on dyspnea and exercise tolerance, and concluded that obese patients with COPD did not experience greater dyspnea and exercise limitation than normal weight patients knowing that those patients were matched as regards age, height, gender, smoking history and presence of co morbidities.

It was expected that normal weight patients will have higher lung capacity than obese patients but the results of this study proved that lung capacity did not differ significantly between obese and normal weight. This result might be because the majority of the normal weight group admitted to the hospital because respiratory distress.

Conclusion

Obesity decreases pulmonary functions measured by arterial blood gases and lung capacity. Dyspnea, and fatigue among patients with COPD are not affected by body weight. The prognosis measured by the selected parameters prior to discharge for normal weight patients with COPD is better than obese patients with COPD.

Recommendations

Based on the results of the current study, the researchers recommended the following:

- Weight reduction is undoubtedly the optimal health strategy for obese patients with chronic respiratory disease.
- Starting exercises (breathing and physical) as early as confirmation of diagnosing COPD is crucial especially for obese patients.
- Quit smoking should be started as early as possible for patients with COPD to prevent irreversibility of patients' complains.
- Replication of the study to explore the impact of co-morbidities on obese patients with COPD.
- Replication of the study using objective tools for measuring dyspnea and fatigue among that group of patients.

Limitations of the study:

Only male patients with COPD were included in the study so the results cannot be generalized as regards females. Co-morbidities had impact on the studied parameters so the results of this study are not applicable to the patients with COPD accompanied by those co-morbidities .As well the results are not applicable to morbid obese patients with COPD. Objective tools for measuring dyspnea and fatigue were not used as the patients were assessed initially at emergency unit.

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