

FREQUENCY OF LEFT LUNG BASAL ATELECTASIS IN POST BARIATRIC SURGERY PATIENTS

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ABSTRACT

BACKGROUND: The primary objective of this study was to investigate the frequency of left lung basal atelectasis in the individuals who undergone the post bariatric surgery. **METHODS:** Retrospective and observational study encompassing a cohort of 500 patients, and the evaluation analysis based on the chest X-ray and HRCT were carried out before, and after bariatric surgery. **RESULTS:** The overall frequency of left lung basal atelectasis was 21%. Notably, the highest prevalence was observed among the female participants. The study did not identify a statistically significant correlation between the body mass index and the occurrence of disease. **CONCLUSION:** The prevalence of left lung basal atelectasis following the post-bariatric surgery was determined to be 21%, the predominant risk factor was the female gender, especially females 35 years and older.

Keywords: Left lung basal atelectasis, basal atelectasis, post-operative bariatric surgery, and other

Background

Atelectasis is the physiological condition distinguished as the collapse of one or more than one segment of the lung, primarily focused on the air sacs known as the alveoli.¹ In the respiratory process, inhalation causes the influx of air into the lungs, prompting the filling of the alveoli.² As the alveoli are the predominant sites, play a significant role in transferring oxygen from the inhaled air towards the bloodstream.³ The blood streams transport oxygen to several tissues and organs, and grasp and regulate the metabolic functioning of the body.⁴

Basal Atelectasis is the condition where insufficient air inflows in the body, adequately dilating the alveoli or when the alveoli exert external pressure. This phenomenon occurs in the localized area or extends to encompass the pulmonary organ.⁵ Occasionally, a particular part of the lung is affected, reducing the

oxygen delivery in the bloodstream, predominantly causing the systemic health problems. The alveoli collapse is the outcome of several factors, for instance, postoperative conditions, shallow breathing, accumulation of external forces, and others. Clinical manifestation of the atelectasis has the potential to compromise the pulmonary function, and undermine the efficient oxygen exchange.⁶

Given the epidemic proportions, obesity has reached over 1.5 billion adults.⁷ Obesity manifests several fatal changes in the respiratory system, subsequently damaging the lungs functioning. Excessive fat deposits surrounded the diaphragm, and ribs imposing constraints on the mobility of the rib cage. Different studies imposed bariatric surgery on the patients refrain from responding to the invasive treatment. Bariatric surgery provokes several intra and post-operative respiratory

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complications. Bariatric surgery techniques, for instance, gastroplasty illustrate reduced lung volumes, respiratory muscle dysfunction, elevated respiratory rate, and others.⁸

Incidence of basal atelectasis was not contingent upon gender.⁹ Nevertheless, studies illustrate in patients with asthma, chronic obstructive pulmonary disease (COPD), or increased age, an elevated risk of the disease. This disease is more dominant in patients who undergo general anesthesia. Research reported the appearance of atelectasis depends on the regions of both lungs within five minutes of induction of anesthesia. In some cases of cardiopulmonary, and cardiac surgery this disease is more predominant, nevertheless, patients that underwent the procedures of thoracic, and abdominal surgeries elevate the risk of developing basal atelectasis. Obese and pregnant patients have a higher chance of developing atelectasis because of displacement of the diaphragm.¹⁰

Basal atelectasis is characterized as obstructive and non-obstructive. Former comprised the accumulation of post-surgical mucus plugs, narrowing major airways associated with respiratory diseases instance, tuberculosis, inhalation of foreign objects, and the blood clot or tumor presence in the airways. In contrast to this, non obstructive comprised the pleural effusion, chest injuries, and pneumothorax, several neurological conditions linked with breathing, disability, injury, and obesity.¹¹

A comprehensive approach is required for the diagnosis and treatment of basal atelectasis. Through medical history of the patient is conducted encompassing smoking history, respiratory symptoms, and other relevant preexisting lung conditions. Some imaging studies such as computed tomography (CT) scans, and chest X-rays conducted to confirm the presence of basal atelectasis. The diagnostic tools support the visualization of the partial or complete collapsed lung tissue, representing the significant information for appropriate diagnosis. Subsequently, the treatment strategy was implemented by understanding the cause of lung reflation. Several cases employed the use of targeted physiotherapy, incentive spirometer, and deep breathing to increase lung expansion. For overall management, addressing contributing factors including respiratory infections or bronchial obstruction is important. More severe cases require medical interventions such as bronchoscopy to clear the airway blockages

that contribute to the atelectasis.¹²

The study aimed to investigate the frequency of left lung basal atelectasis in post-bariatric surgery patients. This study's purpose is to understand the detailed aspects of the respiratory implications regarding bariatric interventions. With the emergence of obesity prevalence, the influence on pulmonary function increased drastically. Left lung basal atelectasis entails promising complications, for instance, undermined respiratory mechanisms. Therefore, a comprehensive understanding of the frequency of post-bariatric surgery is required to optimize patient care and to implement refined surgical protocols. This research contributes to the crucial understanding of the frequency of left lung basal atelectasis in a particular population, cultivating evidence-based techniques to increase postoperative respiratory management.

Methodology

This study followed the ethical guidelines approved by the Ethical Committee of Luqman International Hospital. This study was designed in a retrospective, observational manner. This study includes 500 participants (220 males, 280 females) admitted to the Luqman International Hospital, duration of October 2021 to October 2023. After 48 hours of bariatric surgery, the participant s reports were collected from the medical records of the Luqman International Hospital. Chest X-ray and HRCT reports of the study participants were analyzed to investigate the frequency of left lung basal atelectasis in the study participants.

2.1 Inclusion Criteria

Study inclusion criteria include the post-bariatric patients, who underwent the bariatric surgery with laparoscopy, BMI above 35 kg/m², and illustrate normal pulmonary function, normal preoperative chest X-ray and HRCT, no normal pulmonary symptoms or no lung disease. All of the patients who met with the inclusion criteria underwent the pulmonary functioning test, and chest X-ray with HRCT to observe post op. The study include 500 participants and cases with left lung basal atelectasis were further investigated to conduct the remaining study.

2.2 Exclusion Criteria

Study exclusion criteria were based on the patients suffering from the asthma or OASS, or the patients illustrating any surgical symptoms, for instance, bleeding, fistula, and clinical complications after the bariatric surgery. Patients with any other clinical manifestations such as diabetes, cardiovascular diseases, or any genetic syndrome (Down syndrome, sickle cell anemia, Huntington's disease, cystic fibrosis, and hemophilia) were excluded from the study. Patients that hospital stay after bariatric surgery increased the risk of developing pulmonary complications were excluded from the study. Patients who require continuous pressure airway pressure (CPAP), additional oxygen therapy, or any unstable conditions were excluded from the study.

2.3 Procedure

Bariatric surgeries (Gastric bypass surgery, adjustable gastric binding, sleeve gastrectomy, mini gastric bypass, and revision bariatric surgery) were conducted at the Luqman International Hospital. After 48 hours of bariatric surgeries, the frequency of left lung basal atelectasis was estimated within the patient s cohort. Multidisciplinary collaborations of surgeons, radiologist, and other specialists at Luqman International Hospital was done to achieve a comprehensive understanding of the study.

2.4 Study Variables

Patient demographics, gender, type of bariatric surgery, and presence of left lung basal atelectasis were recorded.

2.5 Post-operative Period

In the postoperative duration, all patients underwent respiratory physiotherapy two times a day. Patients revived the deep breathing, incentive spirometer, and bronchial hygiene resources. In each session, patients were assisted in the walking of 60 m. additionally, all patients took part in the follow-up an operative multidisciplinary group of doctor, psychologists, physical trainers, dieticians, and physiotherapists.

2.6 The radiological examinations

During the post-operative period i.e., 48 hours of bariatric surgery, the radiological examinations were conducted to observe the frequency of left lung basal

atelectasis. Four sessions of physiotherapy were performed, before taking the chest X-rays and HRCT. Two sessions underwent the first post-operative day, and two sessions on the second post-operative day.

2.7 The chest X-ray and HRCT examinations for the left lung

The HRCT investigation was conducted to analyze the report issued by the radiologist of the Luqman International Hospital. To determine the presence of left lung basal atelectasis the following criteria established by Wording and Reed were used: assessment of several radiological indicators such as pulmonary opacity, elevation of diaphragm, displacement of interlobular fissures, displacement of mediastinum, heart, trachea, pulmonary hilum, and compensatory hyperinflation of the left lung, loss of alveolar volume in left lung, and convergence of ribs. Clinical parameters such as oxygen saturation, and total lung capacity were evaluated. This assessment also includes the comprehensive investigation of patient demographic data (age, height, gender, body mass, body weight, mass excess, and body mass index).

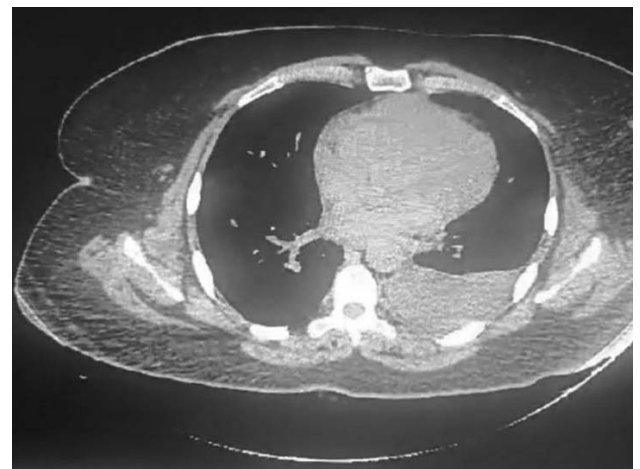


Figure 1: Illustration of left lung basal atelectasis.

2.8 SPSS Analysis

To observe the frequency of left lung basil atelectasis among the study participants, data were processed with employing the statistical package for social sciences (SPSS). The statistical parameters mean and standard deviation were elucidated on the normal data set. The patient s demographic information was computed on the database with the yes or no for the following changes: atelectasis, left lung basal

atelectasis, cardiac abnormalities, pleural effusion, pneumonia, and pulmonary congestion. The statistical analysis was conducted on the basis of the relationship between the test results of atelectasis along with the variables of age, gender, BMI, and relative risk with a confidence interval of 95%. To analyze the frequency of left lung basal atelectasis, and to determine the association of gender with the atelectasis chi-square (G-test) was used. Cut-off points were established for the age and BMI. *P-Values* ≤ 0.05 were considered statistically significant.

Results

Among the patients who represented normal pre-operative chest X-rays, 510 were selected. For the analysis purposes, post-operative chest-X-ray and HRCT (one per patient) were collected. Among them, 10 patient with post-operative chest X-rays were excluded because they underwent to the expiration phases. Hence, 500 patients were examined. (Tab.1&2) illustrate the characteristics of the group, table results show that women show the majority of the samples, 70% of the total study participants.

Characteristics	Mean	Range
Age	39.96	16 - 65
Height	160.40	142 - 194
Body Mass (Kg)	120.05	79.8 - 238.3
Excess Body Weight (Kg)	64.48	25 - 173
BMI (kg/m ²)	44.17	35.46 - 74.37

Table 1: Characteristics of the study participants.

Variables	n	%
Gender		
Male	220	44%
Female	280	56%
BMI		
<40	89	22%
40 - 49	231	57%
>50	80	21%

Table 2: Characteristics of the group based on the categorical variables.

The frequency of left lung basal atelectasis is represented in (Tab.3) and (Fig.2) represents the frequency based on gender.

Left Lung Basal Atelectasis	n%
Base	18 (85%)
Third Middle	2 (9.5%)
Apex	1 (5.5%)
Total	21

Table 3: Frequency of left lung basal atelectasis.

Frequency of Left Lung Basal Atelectasis

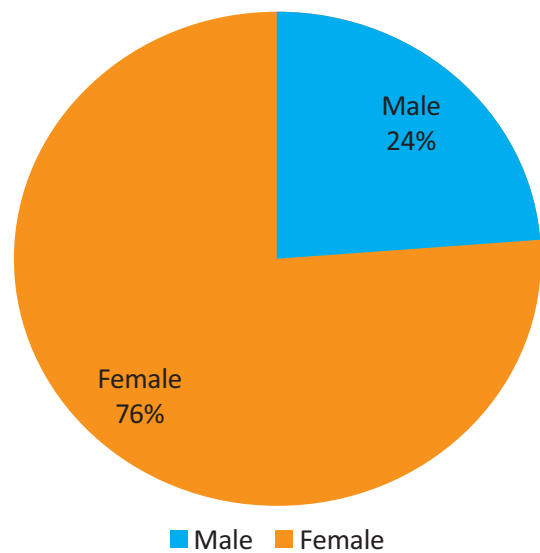


Figure 2: Frequency of left lung basal atelectasis based on gender

This figure illustrates the occurrence of the disease is more prevalent in females than males.

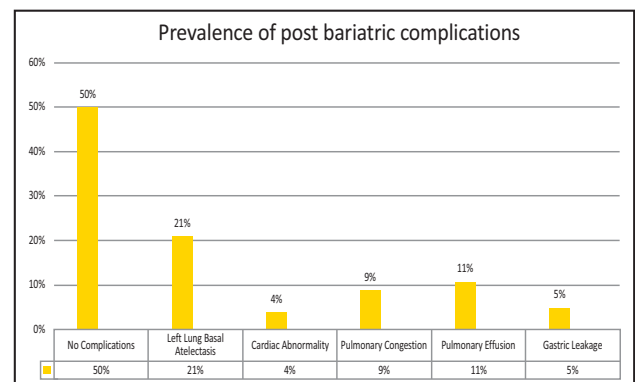


Figure 3: Prevalence of radiographic alterations.

Radiology reports assessment shows the prevalence of left lung basal atelectasis was 21% observed in the sample (Fig.3). Notably, a statistically significant difference was determined between the genders, representing the highest prevalence ($p=0.07$) among females. A relative risk (RR) of 1.48 (95% CI 0.98-2.21, $p=0.02$, with the prevalence of ratio of 70% in women, and 30% in men were present. The influence of BMI on the disease prevalence represents that RR of 0.94 (95% CI 0.7-1.21, $p=0.35$) and, prevalence of 36% in patients with specific BMI.

Discussion

This research study reported the highest prevalence of left lung basal atelectasis, in agreement with the previous studies that represent the higher prevalence of basal atelectasis in women. In the context of bariatric surgery, different studies reported obesity as the risk factor for the development of post-operative complications instance, atelectasis.^{13,14} Nevertheless, this study reported that BMI is not responsible for to increase in the occurrence of the disease.

The study assesses the prevalence of left lung basal atelectasis in the people underwent bariatric surgery, primarily focusing on the persistence and occurrence in the postoperative period. Atelectasis is categorized by the collapse of the some regions of the lungs. The previous study represent the morbidity of atelectasis in obese patients, it affects the mobility of the abdominal contents and shifts the diaphragms from normal positioning.¹⁵ Previous studies hypothesized that compression atelectasis was the outcome of the dysfunctional mobility of the supine position, which represents a significant risk relevant to anesthesia. This study aligns with the representing literature primarily focusing on the persistence of the atelectasis in the post-operative period, causing hindrance in the recovery process.¹⁶

This study reported the frequency of atelectasis is 37% in the participants. Previous studies reported the incidence of atelectasis after the subjection of anesthesia was approximately 80-90%.¹⁷ Another study reported that atelectasis was frequently observed in the dependent regions of the lungs which was consistent with the previous studies. Atelectasis

in the lung regions was removed with the ultrasound alveoli recruitment in all study groups, nevertheless, the control group reported the highest incidence of atelectasis in the chest at the end of anesthesia.¹⁸

The study reported the frequency of the left lung basal atelectasis was 21% among participants. Previous studies also reported the localization of the atelectasis base on the lung regions.¹⁹ The study reported the highest prevalence of atelectasis was in the base of the lungs. Whereas, the combination of the respiratory dynamics, fear, pain, deep breathing, and cough mechanisms increase the risk for the development of atelectasis.²⁰

This study investigates there is no significant correlation of increased BMI and age with the development of atelectasis. The previous study also reported that regardless of BMI, and age atelectasis developed in post-operative bariatric surgery patients.¹⁷ Nevertheless, another study reported that with the increased age the prevalence of developing atelectasis is increased in the patients. Another study reported that BMI was a potential risk for the development of atelectasis.²¹

Conclusion


In conclusion, Bariatric surgery is generally safe with no major complication. This study provides the in depth understanding of the healthcare sector the respiratory problem familiar with the left lung basal atelectasis. Basal Atelectasis is the physiological condition distinguished as the collapse of one or more than one segment of the lung, primarily focused on the air sacs known as the alveoli. The study conducted in the Luqman International Hospital is very supportive to understanding the localization of atelectasis in the patients, and to design the diagnostic and treatment approaches accordingly. Obesity is the major risk of developing the condition while having bariatric surgery. Incidence of basal atelectasis was not contingent upon gender. Nevertheless, studies illustrate in that patients with asthma, chronic obstructive pulmonary disease (COPD), or increased age, an elevated the risk of the disease. This research contributes to the crucial understanding of the frequency of left lung basal atelectasis in a particular population, cultivating

evidence-based techniques to enhance postoperative respiratory management.

Conflict of Interest: Declared none by authors.

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