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FAHS

Effect of Incentive Spirometry on Postoperative Pulmonary Complications after Bariatric Surgery: A Cross- Sectional Study



SUPERIOR UNIVERSITY

Thesis Submitted to Dr.Amdad Ali Faruqi

The Superior University Lahore

In Partial Fulfillment of the

Requirement for the Degree of

Master of Science in Allied Health Sciences

By

AFIFA ASIF KHAN

Roll No. SU91-MSAHW-S23-092

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Designation: : Assistant Professor

Faculty of Allied Health Sciences

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No part of this thesis has been submitted anywhere else for any other degree. This thesis is submitted to the Faculty of Allied Health Sciences, The Superior University, Lahore in partial fulfillment of the requirements for the degree of Master of Science in the field of **“Allied Health Sciences”** in Faculty of Allied Health Sciences at The Superior University, Lahore.

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DEDICATION

I am highly obliged to the Almighty God for blessing me with luminary ancestors and so I dedicate this work moreover to my FAMILY who during their earthly lives had been very loving, encouraging, and supportive towards me.

ACKNOWLEDGEMENT

In the name of Allah, the most Gracious, the most Merciful.

I am extremely thankful to Almighty ‘Allah’ Who is the entire source of knowledge and wisdom endowed to mankind, for providing me with the acumen and vision to complete this endeavor.

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LIST OF ABBREVIATIONS

ACC	Acyl CoA-Carboxylase
AFIP	Armed Forces Institute of Pathology
AGEs	Advanced Glycation End Products
BMI	Body Mass Index
DNL	de novo hepatic lipogenesis
ETC	Electron Transport Chain
FDA	Food and Drug Administration
ISM	Incentive Spirometry
PEFR	Peak Exploratory Flow rate

ABSTRACT

Background: One major global health issue was obesity, which is excess body fat, causing several health problems such as respiratory problems. As an effective treatment of severe obesity, bariatric surgery was introduced to attain such health improvement that includes weight loss and mitigating comorbidities. Nevertheless, bariatric surgeries predisposed to postoperative pulmonary complications such as hypoxia and poor recovery. Incentive Spirometry after bariatric surgery help encourage deep breathing and help prevent problems like pneumonia and atelectasis. This study focused hoe IS helps lungs after bariatric surgeries. **Methodology**The present study was carried out at Shalamar Hospital, Lahore through convenient sampling as 140 obese patients were taken through the study. Adults with BMI over 25 were included rater they had pulmonary complications or not. Data was carried out through questionnaires and analysis was done through SPSS 26.0 and MedClac 14.0.Ethical approval was obtained and all participants gave informed consent. **Results:** The research examined spirometry effectiveness based on patient smoking history combined with oxygen levels and respiratory conditions and ventilation support use and respiration counts. The 3 ball spirometry technique proved most useful for non-smokers at 50.43% and least useful for smokers at 28.22%. Pulmonary complication, especially atelectasis, led to improved efficacy measurements from both 2ball and 3ball spirometry tests (17.86% and 34.29%). The application of 3 ball spirometry achieved better results in patients with complications compared to other groups (39.29%). The hypoxic patients demonstrated their best response to normal oxygen levels which reached 46.43%. Patients without respiratory support demonstrated the best oxygen therapy outcomes using the 3 ball spirometer (56.83 %). Researchers identified statistically noteworthy ($p < 0.05$) differences between all recorded groups.**Conclusion** : Post operative pulmonary complications after bariatric surgery patients were most effectively handled using 3 ball spirometry (Incentive Spirometry) among patients who did not smoke and had regular oxygen levels and normal respiratory function. Future studies need to examine ways to increase spirometry delivery to patients who have multiple health conditions. **Keywords** : Obesity, Bariatric surgery, Postoperative Pulmonary Complications.

Chapter 1

INTRODUCTION

Obesity is excess body fat caused by both genetic and environment and not only controlled by dieting alone. Obesity, however, refers to having too much body fat. There certainly is a difference between all people who are overweight and above overweight people.(1).

The BMI calculation $\text{Weight in pounds} \times 703 / \text{Height in inches}^2$ establishes obesity or overweight status but Body Mass Index measurements serve for weight evaluation. People located within the BMI measurement interval between 18.5 to 24.9 fall into the healthy weight category. Health professionals consider weight status to be overweight from a BMI level between 25 and 29.9 with obesity starting when BMI reaches 30 or above. A person's BMI can identify three obesity levels which include Class I for 30–35 BMI and Class II for BMI between 35–40 and Class III for BMI 40 and above.(2).

By 2007, most adults in the United States were overweight or obese, and many Americans, as well as adults in many other developed nations, were also so. Nine hundred million adults worldwide are overweight (BMI greater than 25), and 200 million are obese (BMI greater than 30). Being obese causes you to be at higher danger from extreme health problems, for example, type 2 diabetes, coronary illness, joint issues, sleep apnea, and a few diseases. In addition, estimates of more and more children becoming overweight is up to 20 million worldwide. Diseases like type 2 diabetes that were once thought to afflict only adults are happening to children. Finally, as developing nations suffer from infectious diseases and malnutrition for decades, they are only now beginning to see the rise in obesity and corresponding health and economic problems (3).

Nearly seventy-five percent of worldwide overweight and obese people have experienced a double population increase since 1980 while making up thirty-three percent of global human counts. Obesity affects human health as an important public health crisis which produces negative impacts throughout the entire body structure. Diabetes and heart diseases together with particular cancers and joint problems and mental health issues move toward more frequent manifestation among individuals who suffer from obesity.

Multiple health conditions diminish health quality which leads to lower work productivity along with increased healthcare spending. For example, the amount the annual healthcare cost was\$ 1,901 in 2014 for one obese person in U.S. and \$149.4 billion nationwide. Weight-related concerns lead to substantial economic costs throughout the European territories. (4).

Certainly, as the obesity epidemic receives more attention, we have started to recognize the social consequences of obesity. All of these are affecting many people—very seriously. In many places, weight-based discrimination has been shown to take place at places of work, and obese employees are sometimes tormented by co-workers, turned down for jobs and promotions. Obese students are often mocked by peers, blacklisted in school classrooms, and sometimes even left off college rolls on the basis on their obese body. Obese patients are subject to bias from healthcare professionals (doctor, nurse, dietician, etc) in healthcare settings (5).

In recent days people who cannot lose weight by changing their lifestyle and exercise and by them facing problems in their health due to Obesity are preferring Bariatric Surgeries for reducing the effect of health problems.

The number of people affected by severe and morbid obesity has significantly risen because of recent obesity-related growth. Professionals within the medical field recognize bariatric surgery as a successful therapeutic solution for people who are extremely obese and have health conditions unable to respond to conventional medical interventions. Bariatric surgery proves successful in preventing new diabetes cases while also healing diabetes and cutting the need for medication and providing patients better quality existence along with longer life expectancy(6).

‘The standard obesity treatment known as bariatric surgery provides death risk reduction through obesity-related complications at 28 percent better than standard medical care according to Korte in his Zester Daily interview. The removal of diabetes remains strong during extended periods of weight loss along with benefits for other conditions such as high blood pressure and high cholesterol and cardiovascular disease. The reduction of mortality rates from diabetes reaches 92% while the decrease of cancer deaths reaches 60% and coronary heart disease deaths reach 52% due to bariatric surgery. (7).

Patients achieve the most effective obesity treatment for its health complications through Bariatric surgery. Two options exist for Bariatric surgery but RYGBP and SG do not surpass their position as the standard operative procedure. People prefer SG because it delivers effective explanations about weight reduction to users. Weight regain stands as the main medical complication alongside GERD in this method of treatment. The mini-gastric bypass procedure known as MGB by Rutledge has gained medical preference because of its safety design alongside easy operation along with its positive results. (8).

Through laparoscopic techniques surgeons perform 'Sleeve gastrectomy' or 'vertical sleeve gastrectomy' as a weight-loss surgical procedure. A surgeon removes 75–85 percent of the stomach to create a tubular structure that resembles a banana during this medical procedure. The weight-loss procedure 'gastric bypass' operates by the name 'Roux-en-Y gastric bypass'. A surgeon creates a small stomach pouch during the surgical procedure by making a stomach sleeve which connects directly to the small intestine.

Patients who undergo gastric bypass and similar procedures may experience lung complications that lead to hypoxia symptoms (9).

The health condition of obesity leads to respiratory problems in patients. All respiratory manifestations which include obesity hypoventilation syndrome exist within this group from mild cases to severe ones. Room air problems escalate in overweight patients because they develop higher rates of asthma and COPD and sleep apnea. Health professionals often fail to identify cases of hypoventilation syndrome until problems become severe enough to trigger a complication or when providers examine for apnea. Obese patients develop more postoperative complications during the surgical process because atelectasis, pneumonia, pleural effusion, pulmonary embolism and ARDS become more likely to occur (10).

Low levels of oxygen in your body tissues (hypoxia) mean oxygen saturation on oxygen probe show is below 90%. It results in confusion, restlessness, trouble breathing, fast heart rate and bluish skin. Hypoxia can be caused by lots of different chronic heart conditions and chronic lung conditions. Hypoxemia is reduced blood oxygen level within the blood at arterial level and therefore inadequate blood flowing to tissues. The low PAO₂ level lesser than 60 mmHg or with the help of pulse oximetry SpO₂ less than 90% can be

appreciated (11).

It plays an important role in decreasing pulmonary complications and hypoxia in Bariatric patient, after surgery. Chest physiotherapy ,deep coughing exercise , oxygen therapy , cough expulsion therapy and 3 ball incentive Spirometry becomes an important part in patients improvement. Durable and easy to use plus affordable to the patient, Incentive spirometer is more helpful to reduce pulmonary complication and hypoxia than other in the market.

The respiratory complications emerge after surgery and the risk is greater within patients who have abdominal or thoracic surgical procedures. Healthcare practitioners currently use incentive spirometry (IS) as the prominent preventive tool in various clinical setups because it represents an inhalation-based preventive technique. The system enables patients to perform natural deep breaths so their lungs can periodically increase volume as a method to stop atelectasis formation. Hospital staff choose IS as their preferred prophylaxis in numerous healthcare facilities so many research studies about it have been conducted. The postoperative care includes IS as a foundational component since it improves lung function while decreasing pulmonary complications according to evidence. (12).

There are two principal categories of ISM equipment including devices that operate via volume measurement and devices that work through measuring flow. Floating plastic elements within lightweight plastic constitute three connected areas of chamber sections on float-enabled ISM devices. During deep chamber inhalation intrathoracic pressure alterations draw inspiratory flows into the mouthpiece-tube system thus causing the floats to rise. Volume-based IS devices contain tubes that link a mouthpiece to indicators showing measured volume quantity. When patients inhale the chamber piston travels to its highest possible limit for aerodynamic volume displacement (13).

The two main categories of ISM equipment include volume mediated devices and flow mediated devices. A float-enabled ISM device incorporates a chamber space made up of three lightweight plastic components that interlock through each other to enable material floating. The connected tube and mouthpiece let air pass through during deep chamber breaths from patients which then produces float elevation as intrathoracic pressure

changes. Volume mediated IS devices feature a combination of a tube and a mouthpiece that displays recorded volume assessment results. Patient inhalation causes the chamber piston to reach its maximum allowed air displacement zone 14).

RATIONALE OF STUDY

Obese patients atelectasis, pneumonia with hypoxia is commonly seen in most of the patients following post operation of bariatric surgery within 2 days to 1 week post operation as obese patient are unable to use the device or neglect their rehabilitation because of which they are usually placed on incentive spirometry but due to their incompetency the patient record the most cases of pulmonary complications post bariatric surgery in patients. This study aimed to check if incentive spirometry effectiveness in such postoperative patients would be beneficial for this device.

AIM AND OBJECTIVE

The study aims to evaluate whether Incentive spirometer effectively prevents pulmonary complications which occur following bariatric surgery.

Chapter 2

LITERATURE REVIEW

A total of 600 million adults worldwide compose the 13 percent obese portion of the world population today. The increases in postoperative pulmonary risks include hypoxemia atelectasis pneumonia and laryngospasm and respiratory distress and a theoretical need to re-intubate all collectively affect the 468 609 yearly procedures (15).

The incentive spirometry serves as an internationally adopted intervention because it decreases postoperative pulmonary complications and facilitates lung function recovery. A study from 2018 demonstrated the importance of patient device placement training combined with educational materials because these factors improve both patient compliance and confidence rates through patient education sessions which result in better confidence levels at 73.8%. The implementation of IS represents an effective approach in respiratory wellness activities that leads to better recovery while simultaneously improving outcomes in postoperative environments (16).

Researchers studied respiratory therapy effects on abdominal surgery clinical results throughout 1983. Research findings confirmed that intermittent positive pressure breathing (IPPB) along with incentive spirometry (IS) combined with deep breathing exercises (DBE) produced the best outcomes for decreasing pulmonary complications compared to any form of treatment neglect. Our institution has used multiple reports about IPPB to prove the success of IS as an abdominal surgical treatment option that shortens patient hospital stays without negative consequences. (17).

Research conducted in 2003 evaluated whether incentive spirometry prevented pulmonary complications similarly to conventional chest physiotherapy in patients undergoing abdominal surgery by examining 876 participants. This study found no difference between incentive spirometry and chest physiotherapy regarding complications since 15.3 percent of participants in the chest physiotherapy group experienced

complications alongside 15.8 percent of incentive spirometry users. Both patients and healthcare providers evaluating the study reported identical clinical signs as well as chest radiograph abnormalities together with sputum pathogens and respiratory failure rates and hospital stay durations that were equal between groups. The study shows that preventive methods implemented post-abdominal surgery treatment were equally effective in patient treatment outcomes. (18).

The research about using Incentive Spirometry to boost postoperative respiratory status for major abdominal surgical patients at Billroth Hospitals began on December 15, 2018. A true experimental design including random selection of 60 patients examined their preoperative and postoperative lung functioning and checked for demographic correlations. The treatment analysis demonstrated that post-intervention 73.33 percent of patients reached a good respiratory result but 26.67 percent achieved an excellent status. The research data verifies Incentive Spirometry positively impacts respiratory outcomes for patients while demographic characteristics create no effect on these enhancements. (19).

The study included a randomized non-inferiority clinical trial that occurred from May 1, 2015 to June 30, 2016 for patients undergoing bariatric surgery. The study area included a single teaching hospital with a tertiary referral program where postoperative patients were allocated into two groups for IS use as control and clinical observation as test. Data showed that implementing Incentive spirometry did not impact the development of hypoxia or pulmonary complications significantly(20).

Research occurred on April 17, 2018 to examine the impact of incentive spirometry on post-abdominal surgical patients in Makkah's hospitals. The standard care group included 100 patients but an additional group of patients received preoperative incentive spirometry training and postoperative practice. The research revealed positive outcomes affecting breathing patterns along with vital signs during the first two days of postoperative treatment but these benefits disappeared after the third day. The functioning of incentive spirometry produces lung health benefits because it both improves

diaphragmatic mobility and decreases postoperative pulmonary complications while benefiting secretion clearance after abdominal surgery. (21).

Researchers performed a study to analyze incentive spirometry (IS) effectiveness for post-laparotomy lung complication prevention during August 2014 at Fauji Foundation Hospital in Rawalpindi. Two separate groups totaling fifty to sixty patients were formed for the study while one group used IS plus breathing exercises but the other group performed breathing exercises alone. The IS treatment group experienced improvements measured by FEV1/FVC along with BORG scale dyspnea measurements although results from control group patients exceeded those in IS patients. The authors demonstrated that IS demonstrated effectiveness for preventing postoperative pulmonary complications. (22).

. Research teams performed experiments in September 2001 to study the effectiveness of incentive spirometry (IS) in avoiding postoperative pulmonary complications (PPCs) after cardiac or upper abdominal surgical procedures. Studies provided limited proof that incentive spirometry works to prevent postoperative pulmonary complications among surgical patients undergoing procedures on the heart and upper abdomen. The review brings substantial value to medical practice today through its extensive manual and automated database research methods. The investigation team tried to find relevant clinical information for their research inquiry but quickly learned that Institutions Shift widely exists in healthcare institutions despite contrary evidence showing it would not work for postoperative pulmonary complication prevention during these surgical interventions. The effectiveness of alternative interventions must be assessed when studying particular patient groups or conditions that demonstrate IS benefits (23).

Research conducted in 2016 used Mangalore India as its study site to examine lung function results and exercise tolerance among open abdominal surgical patients after using flow and volume incentive spirometry. A total of fifty subjects received the study intervention where thirty-seven males and thirteen females split between flow and volume

spirometry groups. Research results indicated that patients in the total program showed enhanced pulmonary function and exercise tolerance by day 5 according to Six Minute Walk Test results. The subjects in the volume group demonstrated superior outcomes. Researchers determined that spirometry through both methods proves its safety and effectiveness as post-surgical recovery improvement strategies. (24).

On December 17, 2024 the hospital noted that Incentive Spirometry (IS) received routine prescription for postoperative patient pulmonary complications prevention. Although used extensively throughout many treatment protocols there is insufficient evidence that it delivers any benefits when used and healthcare professionals remain unsure about what exactly works with IS applications. The significant number of studies that have researched the effect of IS on postoperative pulmonary complications (PPC) have failed to establish a proven connection between IS benefit in PPC prevention. Research findings have led clinical practice statements to remove the recommendation for regular postoperative institutional suction as an intervention. The existing high quality clinical evidence fails to justify IS implementation as routine therapy for postoperative care so further high-quality clinical trial results must be obtained (25).

A study known to have been conducted in 2023 at Sohag University Hospital studied the effect of the use of incentive spirometer (IS) on oxygenation and postoperative lung complications in cases of open heart surgery for patients. It was done on 60 adult participants split into two groups. The IS was used by the intervention group of 30 patients two hours every day alongside standard hospital care, whilst the control group of 30 patients were subjected to the use of only standard care. From these three days, it was also seen that the intervention group showed significant improvements in terms of fewer hypoxic events, shorter periods of these events and reduced lengths of stay in both the ICU and the hospital. The results indicated that regular use of an IS could effectively reduce postoperative pulmonary complication and shorten recuperation time. It was stressed that critical care nurses need to be trained to use the new breathing techniques and patients trained in how to use an incentive spirometer prior to surgery (26).

In January 25, 2023, a study investigated the role of incentive spirometry (IS) on COPD hospitalized patients in exacerbation. The IS was used on Group 1 (forty patients) for two months, IS with medical treatment and Group 2 (also forty patients) without IS and medical treatment. PaCO₂, FEV₁/FVC ratio, diaphragmatic excursion and thickness were improved significantly in Group 1. However, IS improved arterial blood gases, spirometry, and diaphragmatic functions, but did not improve FVC nor mMRC dyspnea scale. The study has found that IS is beneficial in improving respiratory and diaphragmatic disability in COPD patients (27).

Investigators conducted Indian research on incentive spirometry (IS) effects on lung functionality after abdominal procedures during 2023. A total of eighty patients received testing at Burdwan Medical College and the researchers employed physiotherapy for one group while treating the other group with IS and physiotherapy. The research showed neither significant variations nor differences between testing groups. Patients who employed incentive spirometry showed slightly improved (better) results regarding lung function (PEFR). The research results showed successful prevention of lung complications through the combination of Interstitial Surgery and breathing exercises and early mobilization during postoperative care. (28).

This Egyptian research assessed hospital stay duration and postoperative lung complications and respiratory function of patients undergoing upper abdominal surgery who received flow incentive spirometry in combination with diaphragmatic breathing exercises in 2018. The study had three separate groups containing 120 patients who performed either diaphragmatic breathing exercises alone or flow incentive spirometry alone or their combination together. The combined therapy produced noteworthy improvements in oxygen saturation together with forced vital capacity and peak expiratory flow rate when used by patients. In the study the combined therapy successfully achieved the earliest hospital discharge period for patients compared to all other intervention groups. Multiple research studies demonstrated that combining diaphragmatic breathing exercises with respiratory flow incentive spirometry delivery beneficial results in improved lung function and minimized complications and shorter hospital stays following upper abdominal surgery. (29).

Scientists evaluated how incentive spirometry enhanced post-abdominal surgical expiratory breathing muscle strength in Indian patients during 2021. The research comprised thirty patients who organized into Group A for inspiratory and expiratory training and Group B for inspiratory training alone. The examination of MIP and MEP using an respiratory pressure meter failed to establish significant differences between groups ($P>0.05$). The study conducted measurements that ran from day 2 to day 7 after surgery to verify this point. The findings showed that inspiratory training had similar impacts as MEP (Group B) although statistical analysis through $P<0.05$ indicated Group A's better performance alongside extra improvements in expiratory strength after abdominal surgery for patients. (30).

The results of a 2013 research study indicated that incentive spirometry (IS) proved useful to increase lung function following upper abdominal surgery. The first instruction to patients in the IS group involved daily spirometer use three times and ten repeated use sessions per waking hour. Deep breathing exercises occurred ten times during each hour in the patient group assigned to the control condition. The spirometric evaluation included FEV1, FEV 6 and PEFr measurements which showed substantial lung function decreases in every assessment beginning from before surgery until three days and five days after surgery. The group who undertook deep breathing exercises showed improved pulmonary function at the three-day and five-day follow-up period than the IS group. The study demonstrates that deep breathing exercise recovery following upper abdominal surgery demands extra time compared to Interspinous muscle relaxation. (31).

Chapter 3

METHODOLOGY

3.1. Research Design

The study employed a Cross Sectional design methodology.

3.2. Clinical Settings

Research took place in the Surgical ICU of Shalamar hospital Lahore and its Surgical ward male and female divisions as well as its private rooms section.

3.3. Sample Size

- The equation used for cross-sectional study sample size determination appeared as follows:
- $$n = (Z^2 * P * (1-P)) / d^2$$
- n: Required sample size
- The required sample size n equals $(Z^2 * P * (1-P)) / d^2$. For a 95% confidence level, $Z \approx 1.96$.
- p: Expected proportion of patients with the outcome.
- The calculation requires four elements: Z-score and expected proportion P and desired error margin d.
- The sample size obtained for this study was 140 by taking prevalence p as 0.10(20)

3.4. Sampling Technique

Convenient sampling was employed as the data collection method for this study..

3.5. Duration of Study

The 4-month study took place within Shalamar hospital Lahore.

3.6. Selection Criteria

3.6.1. Inclusion Criteria

Patient having weight above 25 BMI Age between 18 years to 60 years ,having Post Operative pulmonary complication. Bariatric patients (Sleeve gastrectomy, Mini gastric Bypass, Sleeve gastrectomy to gastric bypass , sleeve re do surgery).

3.6.2. Exclusion Criteria

Patients weight below 25 BMI ,other abdominal surgery. Patients having absence of teeth .Patients age below 18 years .

3.7. Ethical Consideration

Informed Consent: Research participants received precise explanations about the study design and its advantages as well as their right to discontinue their participation at any time. All participants received written instructions through an informed consent document that provided clear explanations and possible answers for any concerns they may have.

Confidentiality and Privacy

I did maintained participant's confidentiality by ensuring all data is anonymized and securely stored.

Ethical Approval

Prior to initiating the study the Institution Review Board (IRB) at Superior University granted ethical approval. The review process conducted by the IRB confirmed both the adherence of research proposal guidelines and the protection of participant rights

3.8. Data Collection Procedure

The supervisor designed preformed questionnaires were used to obtain information from patients in SICU, GOT, Surgical ward and private rooms when they were discharged.

3.9. Data Analysis

Data analysis occurred by combining the software systems Med Calc 14.0.7 with IBM SPSS Statistics version 26.0. The study employed descriptive statistics combined with cross tabs to investigate how incentive spirometry affected pulmonary complications according to comorbidities among smokers and non-smokers along with regular oxygen levels and hypoxia using Chi-square methods of analysis.

Chapter 4

RESULTS

The study compared Incentive Spirometry effectiveness for minimizing postoperative pulmonary issues after bariatric surgery through data collection from 140 Shalamar hospital patients using a cross-sectional approach. This study examined the outcomes of spirometry by evaluating different patient variables as well as smoking status and pulmonary events and coexisting medical conditions and oxygen saturation levels and respiratory support and results measured with 3ball Spirometry(Incentive Spirometry).

Table no.4.1:Effect of Spirometry on the basis of Smoking history, Types of Pulmonray complications and Comorbidities.

Efficacy Of Spirometer	Smoking history		Types of Pulmonary Complications		Comorbidities	
	smokers	non smokers	No complications	Atelectasis	OSA	OSA\COPD
EFFECTS ON 1 BALL SPIROMETRY	2.14%	2.86%	0.71%	4.29%	0.71%	4.29%
EFFECTS ON 2 BALL SPIROMETRY	10.71%	10.71%	3.57%	17.86%	3.57%	17.86%
EFFECTS ON 3 BALL SPIROMETRY	17.14%	50.43%	39.29%	34.29%	39.29%	34.29%

p- values	0.02	0.01	0.01
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The analysis in this table evaluated Incentive Spirometry Effect on smoking History by conducting P value testing for different variables that impact spirometry efficacy. The analysis used P value to determine the relationship between spirometry effectiveness and the various pulmonary complications and Comorbidities. The 2.14% efficiency rate from 1-ball spirometry measurements indicated smoking history measurement below 2.14% while 10.71% emerged from 2-ball tests and 17.14% from 3-ball tests. The success rate for decline and rise spirometry testing for non-smokers was 2.86 % for 1-ball testing and 10.71 % for 2-ball testing and 50.43 % for 3-ball tests respectively. The 1-ball test produced positive results for uncomplicated participants at 0.71% but their results using 2 or 3 balls were 3.57% and 39.29% respectively.

The assessment methods of 2-ball investigation and 3-ball assessment were equally employed by Atelectasis patients at 17.86% and 39.29% rates respectively. Within the patient group, subjects reporting no atelectasis chose 3-ball testing above 39.29% along with 2-ball at 3.57% and 1-ball at 3.57%. Adult patients with OSA showed two-ball selection at 3.57% although 39.32% of them selected three balls. The testing with two balls became the preference for COPD patients at 17.86% as 34.29% of patients retrieved three balls during their examination.

Table no.4.1.2: Effect of Spirometry on the basis of Oxygen Level, Additional Respiratory Support, Respiratory Rate and Frequency Observed.

Efficacy Of Spiromet er	Oxygen Level		Additional Respiratory Support			Respiratory Rate		Frequency Observed of Spirometry		
	norma l OXY GEN LEVE L	hypo xia	Non e	nasa l canu la	CPAP\B IPAP	High RESPIRA TION	Normal RESPIRA TION	4 tim es a day	8 time s a day	12 time s a day
EFFECT S ON 1 BALL SPIROM ETRY	1.43%	3.57 %	0.72 %	2.16 %	2,16%	2.86%	2.14%	2.8 6%	2.14 %	0%
EFFECT S ON 2 BALL SPIROM ETRY	3.57%	17.8 6%	4.32 %	12.2 3%	4.32%	7.86%	13.57%	5.7 0%	15%	0.71 %
EFFECT S ON 3 BALL SPIROM ETRY	46.43 %	27.1 4%	56.8 3%	16.5 5%	0.72%	8.57%	65%	0.0 0%	52.1 4%	21.4 3%
p- values	0.01		0.01			0.01		0.01		

. The table depicts Incentive Spirometry effects on oxygen level analysis for different metrics of support and reports statistical P values for changes in respiratory rate and frequency. Test distribution showed normal outcomes for oxygen levels since the 1-ball group got 1.43% whereas 2-ball obtained 3.57% and the 3-ball group received 46.43%. Among patients suffering from hypoxia 3.57% received a score of 1-ball while 17.86% received a score of 2-ball and 27.14% earned a score of 3-ball. All unassisted patients scored a 1-ball assessment in merely 0.72% of cases but they scored a 2-ball assessment in 4.32% of cases and they scored a 3-ball assessment in 56.83% of cases according to the survey results. People using nasal cannula distributed at 12.23% for 2-ball and 16.55% for 3-ball distribution while patients with CPAP/BIPAP primarily received 1-ball at 2.16% and 2-ball at 2.16% together with 0.72% receiving 3-ball. Patients assessed with high respiration rates received a 1-ball score equal to 2.86% although assessment scores reached 7.86% and 8.57% for 2-ball and 8.57% for 3-ball. Participants with normal respiration rates scored 1-ball at 2.14% as well as 2-ball at 13.57% and 3-ball at 65% according to the survey results. Data collected from participants taking four daily tests showed one ball at 2.14% and two balls at 5.70% but no participants received a 3-ball score. When participants conducted eight tests in a day they achieved one ball at 2.14% and two balls at 15% while three balls at 52.14% were also reported. People who tested twelve times daily achieved none at 0% and two balls at 0.71% and received three balls at 21.43%.

Statistical Significance (P-values):

The obtained statistical significance exists between spirometry test results because three p-values fall below 0.05 at 0.02, 0.01, and 0.01.

The statistical significance of observed differences lies within the acceptable range of $p \leq 0.05$ for all tested categories which include oxygen levels and respiratory support as well as respiratory rate and frequency.

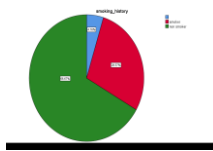


Figure 4.1 Smoking History:

Analysis of smoking patterns showed that 28.57% of 140 patients had a smoker history yet 66.67% of them were not smokers. An overwhelming number of patients in the study did not smoke compared to those patients who were smokers.

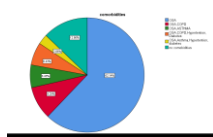


Figure 4.2: Comorbidities.

The data gathered from 140 patient medical histories showed the following results: OSA (Obstructive Sleep Apnea) affected 62.14% of participants.

The patient population with OSA (Obstructive Sleep Apnea) amounted to 62.14% according to the research.

- 12.86% had no comorbidities.

Research findings show that among the sample population 9.26% were patients who suffered from OSA and COPD (Chronic Obstructive Pulmonary Disease).

- 6.43% had OSA and Asthma.

The population of patients with OSA and both COPD and Hypertension and Diabetes amounted to 6.43 percent.

A total of 12.86% patients were diagnosed with both OSA and Asthma together with Hypertension and Diabetes.

A large percentage of the patients suffered from OSA while other patients displayed combinations of OSA with COPD, asthma, hypertension and diabetes. Among the study participants a minimal number existed without concurrent medical conditions.

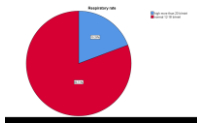


Figure 4.3:Respiratory Rate.

Among the 140 patients studied for respiratory rate results demonstrated 80.71% had normal rates and 19.29% exhibited abnormal rates when receiving room air. Most patients experienced normal respiratory rate yet only a limited number presented abnormal respiratory rate measurements.

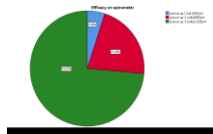


Figure 4.4:Effect on Spirometry.

A total analysis of 140 bariatric patients using the spirometer indicated that 5.00% selected one ball and 21.43% selected two balls and the most common result was 73.57% who selected three balls. The majority of patients using the spirometer succeeded in picking the highest number of balls at 3 whereas fewer patients managed to pick 1 ball or 2 or 3 balls.

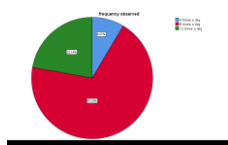


Figure4 .5: Frequency Observed.

The data collected from 140 patients revealed that 8.57% used spirometers four times daily whereas 69.29% used them eight times daily and the remaining 22.14% used them twelve times daily. Most patients performed spirometry eight times daily while the others conducted it twelve times or less than four times daily.

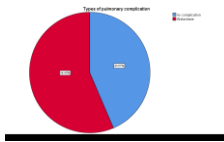


Figure 4.6:Types of Pulmonary Complications.

The research revealed that pulmonary complications existed among 53.47% of the 140 patients while the remainder had no pulmonary complications. Most patients in the study developed pulmonary complications according to this analysis..

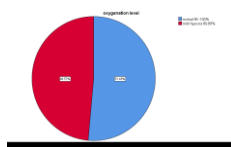


Figure 4.7:Oxygenation Level.

Out of the 140 patient subjects 51.43% maintained normal SPO2 values when testing spirometry on ambient air compared to 48.57% who showed mild hypoxia signs. A total of 51.43% of patients experienced normal oxygenation levels post-spirometry exercise according to analysis but 48.57% of patients exhibited mild hypoxia following the test.

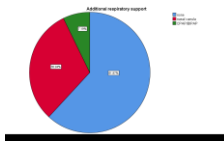


Figure 4.8: Additional Respiratory Support.

The research established that 61.87% of the 140 patients received no respiratory assistance but 30.94% utilized nasal cannula and 7.19% used CPAP/BIPAP. The majority of patients avoided respiratory assistance as their data demonstrates that nasal cannula or CPAP/BIPAP received usage by only a smaller selection.

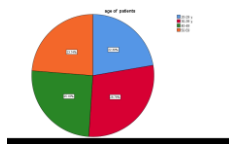


Figure 4.9: Age of Patients.

A total of 140 patients indicated their age distribution with 22.30% selected from the 20-29 years group while 28.78% picked the 30-39 years age group, 25.18% of patients were in the 40-49 years group, and the remaining 23.74% belonged to the 50-59 years age group. It shows that the most common patient demographic belonged to the 30-39 years group while the 40-49 years group came second with balanced distribution among other age groups.

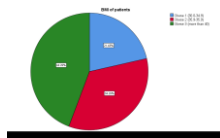


Figure 4.10: BMI of Patient.

According to BMI analysis the 140 surveyed patients were divided into three categories: Obese Class 1 (21.43%) while Obese Class 2 (34.29%) followed by the most numerous group consisting of Obese Class 3 (44.29%). The study demonstrates that the patients mostly belong to advanced weight classes as Obese Class 3 contains the biggest number of participants.

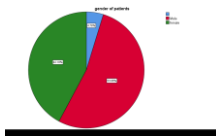


Figure 4.11: Gender of Patients.

According to BMI analysis the 140 surveyed patients were divided into three categories: Obese Class 1 (21.43%) while Obese Class 2 (34.29%) followed by the most numerous group consisting of Obese Class 3 (44.29%). The study demonstrates that the patients mostly belong to advanced weight classes as Obese Class 3 contains the biggest number of participants.

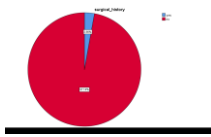


Figure 4.12: Surgical History.

The assessment for previous bariatric surgery operations shows that ninety-seven point fourteen percent of patients were without any preceding interventions. The study demonstrated that bariatric surgery history existed among 2.86 percent of patients. Most subjects participated in their initial bariatric procedure according to the study data because prior surgical interventions were reported by a limited group of participants.

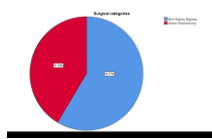


Figure 13: Surgical categories.

Among the 140 recorded patients Mini Gastric Bypass surgery stands as the main surgical operation since it was performed on 82 subjects which accounts for 58.57% of the total patient population. Among the total patients the research showed Sleeve Gastrectomy surgery used for 41.43% of the population. The performed extent of Mini Gastric Bypass surgery surpassed Sleeve Gastrectomy procedures across every patient case.

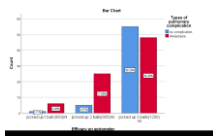


Figure no. 14:Effect of Spirometry on basis of Types of Pulmonary Complications.

Research outcomes from a spirometers evaluation study for pulmonary complication patients show significant results. The survey showed non-pulmonary-complicated patients picked one ball for 600 ml at 0.71% and two balls for 900 ml at 3.57% while three balls for 1200 ml appeared at 39.29%. Patients with atelectasis exhibited different spirometry results wherein 4.29% chose 1 ball for 600 ml and 17.86% used 2 balls for 900 ml while 34.29% decided on 3 balls for 1200 ml.

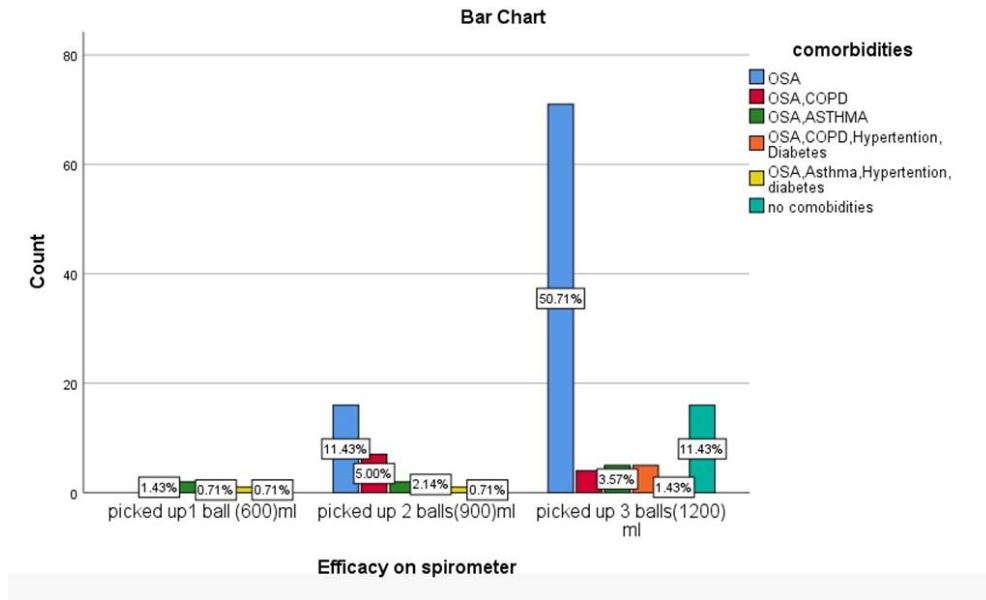


Figure no. 15:Effect of Spirometry on basis of Comorbidities.

The bar chart shows patient performance with spirometry equipment according to ball height measurement and their presence of additional medical conditions. One ball lift ability was detected in patients that only had Obstructive Sleep Apnea (OSA) among 1.43% of the participants yet the dual diagnosis of OSA with Chronic Obstructive Pulmonary Disease (COPD) or asthma was seen in 0.71% of patients. Among the participants who lifted 2 balls (900 ml) 11.43% had OSA and 5.00% had both OSA and COPD and 2.14% had OSA and asthma while 0.71% had OSA combined with COPD hypertension along with diabetes. The majority of patients who lifted the 3-ball weight of (1200 ml) performed the most efficiently where OSA was their sole condition while 3.57% performed well with OSA and COPD and diabetes together and 1.43% had OSA along with asthma and hypertension. Among patients without comorbidities the rate of success for lifting 3 balls (900ml) came out to 11.43%. Patients who had OSA by itself proved to have the best outcomes with spirometry but patients with two or more complicating conditions performed worse.

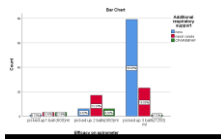


Figure no. 16: :Effect of Spirometry on basis of Additional Respiratory Support.

The spirometer assessment demonstrates different performance results between patients needing supplementary respiratory support who use no support, nasal cannula or CPAP. Among patients without respiratory support, 0.72% succeeded at picking the 1 ball at 600 ml position but 4.32% selected the 2 balls at 900 ml level while 56.83% completed the challenge at the 1200 ml 3 balls condition. Among nasal cannula users disability to pick 1 ball at 600 ml occurred in 2.16% of patients while 12.23% succeeded at 900 ml and 16.55% succeeded at 1200 ml but CPAP patients failed to achieve 3 balls at 1200 ml despite 4.32% picking 2 balls at 900 ml and 2.16% picking 1 ball at 600 ml. The patient group without respiratory support obtained better performance levels across all trials and especially at the 1200 ml volume as compared to patients who received nasal cannula or CPAP support.

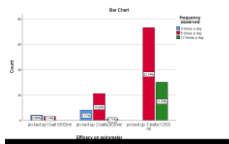


Figure no. 17: :Effect of Spirometry on basis of Frequency Observed.

Data assessment regarding the spirometer efficiency through daily spirometry frequencies highlights clear performance patterns. The majority of patients who performed spirometry four times per day managed to select one ball when reaching 600 milliliters while 5.71% successfully reached 900 milliliters with two balls. Among patients who executed the spirometry test 4 times daily, no participant managed to obtain 3 balls at 1200 ml. Out of patients who conducted spirometry eight times per day 52.14% successfully grasped 3 balls at 1200 ml, 15.00% obtained 2 balls at 900 ml, and 2.14% collected 1 ball at 600 ml. Members of the group which performed spirometry 12 times per day succeeded in picking 3 balls at 1200 ml by 21.43% of participants. The study reveals better patient outcomes as spirometry practice frequency increases particularly when patients performed the test eight or twelve times per day at the 1200 ml volume.

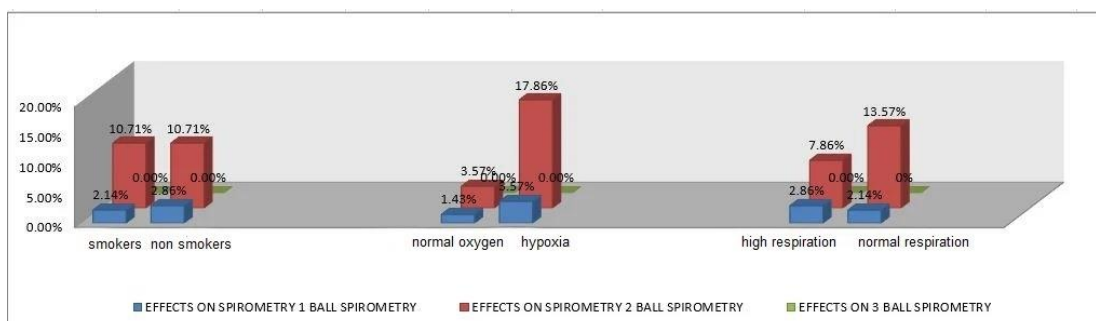


Figure no.18: Effect of Spirometry on basis of Smokers and Non-smokers, Oxygen Level and Hypoxia, High Respiratory Rate and Normal Respiratory Rate.

The spirometry performance data shows that smokers and non-smokers maintain unique patterns of results.

- Smokers vs Non-Smokers: Smokers show lower performance overall in spirometry.

The one-ball spirometry test achieved successful results in only 2.14% of smoking participants while 2.86% of participants who never smoked accomplished it.

Nonsmokers along with smokers successfully performed the 2-ball spirometry test at 21.42% frequency. The results revealed that smokers achieved 17.14% success rate during 3-ball spirometry administration while non-smokers attained 50.43% success rate.

Subjects with typical oxygen saturations performed better than those with abnormal oxygen saturations throughout every step of spirometry testing protocols. The 1 ball spirometry test succeeded only 1.43% of the time among participants with normal oxygen levels but those with hypoxia managed it at 3.57%. The group with normal oxygen levels achieved 3.57% successful 2-ball spirometry performance while hypoxic users reached 17.86% of successful 2-ball results. Forty-six point four-three percent of participants with normal oxygen levels achieved three balls during 3-ball spirometry testing but hypoxic participants managed only twenty-seven point one-four percent success with this task..

People with normal respiration performed superior spirometry testing compared to individuals who experience increased respiratory rates. Of the individuals with normal respiration who participated in 1 ball spirometry testing, 2.86% demonstrated success compared to the 2.14% who had high respiration levels. Among participants with normal respiration only 7.86% succeeded in the 2-ball spirometry task though patients with high

respiration attained success rate at 13.57%. People with normal breathing exhibiting excellent results in 3-ball spirometry reached 65% success but those with high respiration achieved only 8.57% success rate.

The combination of non-smoker status and normal oxygen levels along with normal breathing patterns produces the greatest test effectiveness of spirometry.

Chapter 5

DISCUSSION

The purpose of this research was to evaluate “the efficacy of incentive spirometry on post-operative pulmonary complications after bariatric surgery”, using a sample size of 140 patients .Data was collected from Shalamar hospital Lahore(SICU, Surgical wards ,Private rooms),patients consent was taken before taking data, sampling technique was convenient sampling technique, study type was Cross sectional study The sample size was determined based on previous studies, and the findings were statistically significant, with p-values less than 0.05 in all relevant categories. Analysis of statistical data occurred through the combination of IBM SPSS Statistics 26.0 and Med Calc 14.0.7. The study analyzed incentive spirometry effects on pulmonary complications using descriptive statistics and Chi-square tests for smoker and nonsmoker groups, normal and low oxygen level samples, and high and normal respiratory rates through cross-tabulation analysis.. The research and its objectives and relevant existing literature show their principal findings within this section.

The current statistics show that about 600 million adults among the world population comprising 13% are considered obese. Modern obesity rates have paralleled the growing number of bariatric surgeries performed in 2013 where 468 609 cases were reported. This population of obese patients manifests increased vulnerability to postoperative pulmonary complications that include hypoxemia alongside atelectasis and pneumonia and both laryngospasm and respiratory distress and re intubation situations (15).

A group of researchers conducted a 2003 study on 876 patients who underwent abdominal surgery to assess whether incentive spirometry produced superior outcomes than conventional chest physiotherapy in stopping pulmonary complications. Both incentive spirometry and chest physiotherapy generated equivalent rates of complications among their patient groups at 15.8% and 15.3% respectively. This study did not reveal

any differences between the groups regarding their clinical signs or chest radiograph findings or their pathogen detection in sputum or respiratory failure development rates or hospitalization times. The research established that prophylactic measures are equally successful for post-operative patient care following abdominal surgery(18).

Reliable data from the study demonstrated non-smokers using incentive spirometry attained 50.43% successful outcomes in their postoperative care through 3-ball spirometry tests. Genuine smokers displayed worse outcomes through their 1-ball spirometry results where they scored 2.14% as the main effect measure. Scientific evidence shows that tobacco usage diminishes breathing function and reduces the effectiveness of incentive spirometry and all post-surgical interventions. The smoking habit amplifies the risk of respiratory conditions including atelectasis and pneumonia and this affects the capability of spirometry in boosting lung function. Non-smokers achieve better results in lung function tests because their entry capacity exceeds the baseline lung limits of smokers.

Practice of incentive spirometry showed an average positive impact on patients who experienced post-operative atelectasis. The implementation of 3-ball spirometry produced a 34.29% efficacy rate which proved stronger than the results obtained by patients without complications who achieved 39.29%. Multiple research findings show incentive spirometry works to combat postoperative lung collapse because it expands lung tissue while minimizing hazardous consequences from surgical collapses. The use of spirometry functions as an effective preventive measure to stop pulmonary complications from developing after bariatric surgery procedures.

The therapeutic value of physical therapy spirometry for lung expansion became impaired in patients who had Obstructive Sleep Apnea (OSA) or Chronic Obstructive Pulmonary Disease (COPD). Research results show that OSA patients performed 3-ball spirometry with a success rate of 39.29% yet the combination of OSA and COPD patients achieved 34.29% effective results throughout the study. The statistical information demonstrates incentive spirometry effectiveness decreases among patients who have both OSA and COPD since these disorders continuously impact pulmonary function. Research data supports academic evidence that shows patients with existing respiratory conditions

cannot properly respond to standard post-operative treatments through incentive spirometry.

The extent of performance influence on spirometry tests came from oxygen concentration levels. 3-ball spirometry yielded the best outcome for patients with normal oxygen levels at 46.43% but normal patients achieved maximum success among all spirometry tests. Hypoxic patients showed reduced response to spirometry testing especially when performing 3-ball spirometry who managed to succeed in only 27.14% of trials. The obtained data underlines the requirement to maintain appropriate oxygen levels for delivering quality patient care after surgery. Respiratory function deterioration caused by postoperative hypoxia reduces the effectiveness of spirometry tests for pulmonary function improvements in patients who undergo bariatric surgery. Hypoxic patients need continuous monitoring and rapid intervention because these measures lead to better performance in spirometry assessments..

The study reveals respiratory support serves as a positive influence for obtaining superior spirometry results. The highest successful outcomes from 3-ball spirometry occurred when patients needed no additional respiratory aid at 56.83% while outcomes decreased significantly to 16.55% among patients receiving Nasal Cannula support and 0.72% among patients under CPAP/BIPAP support. This study shows spirometry achieves effective pulmonary function improvement while its results deteriorate when patients need respiratory support because their respiratory conditions are already severe. Advanced respiratory complications among users of CPAP/BIPAP devices make spirometry as an intervention less useful in these cases..

Respiratory rate significantly affects the success rates of incentive spirometry according to the research findings. The patient group with normal respiration demonstrated the greatest success rate in 3-ball spirometry measurements with 65% accuracy which indicates that healthy respiratory patients demonstrate superior use of spirometry. The evaluation indicators demonstrated that patients with elevated respiration rates achieved poor results particularly during 3-ball spirometry (8.57%). The high respiratory rate of patients affects their ability to use spirometers correctly thus decreasing spirometer effectiveness since stress or respiratory distress gets in the way.

However patients who used the spirometer eight times per day showed the slightest

improvement in results among the different frequency settings. Subjects in the 3-ball spirometry group achieved 52.14% effective results while patients who used spirometry four times a day had no successful readings. The data indicates that increasing spirometry tests from four to eight might provide some benefit yet reaches its maximum effectiveness at this level. The data matches current understanding that multitude spirometry applications lead to lung healing yet usage effectiveness reaches a point beyond which further increases show no additional benefit.

The research demonstrated statistical importance ($p\text{-values} \leq 0.05$) of spirometry results that showed variable effects based on oxygen levels, respiratory support and coexisting medical conditions. Data reveals with statistical significance that the studied variables directly affect how well incentive spirometry performs as a post-operative bariatric surgery pulmonary complication prevention method

Summary:

Post-operative pulmonary complications show a reduction when patients use incentive spirometry before they have normal oxygen levels without respiratory support and minimal comorbidities. Both non-smoking individuals along with patients who do not suffer from Atelectasis are eligible to benefit from extended pulmonary health through spirometry testing. Patients with OSA, COPD and those under CPAP/BIPAP care from their comorbidities show reduced benefits from the intervention hence requiring different approaches to treatment.

The strong findings from this research demonstrate that incentive spirometry serves as a crucial tool for post-operative bariatric surgery patient care among people who have low pulmonary complication risk. Additional investigation is needed to determine essential parameters of spirometry dosing as well as customized treatment approaches for patients with existing respiratory issues and severe post-surgical health problems.

Chapter 6

CONCLUSIONS

The study shows that increasing the lung capacity of incentive spirometry from one ball (600 ml) to two thirds (900 ml) and three balls (1200 ml) significantly decreases pulmonary complications following bariatric surgery. The introduction of 3-ball spirometry systems allowed patients to experience enhanced breathing capacity thus minimizing their dependence on respiratory support and maintaining appropriate oxygen levels during regular and safely tolerable breathing rates which subsequently reduced postoperative complications and required interventions. The results indicated that 1-ball and 2-ball groups had comparable results while demonstrating that larger capacity incentive spirometry equipment improves respiratory outcomes. Incorporating three ball spirometry as part of postoperative care would potentially yield beneficial outcomes for patients according to these findings. Larger sample studies are conducted to confirm these research results.

Limitation

1 .Single-Center Study:

For example, the study was conducted at a single center and as such is not very generalizable to other settings. The results may not be generalizable in settings or populations other than this.

2. Sample Composition:

Although the sample of patients might not actually represent all bariatric surgery patients, this may lead to results that are not applicable to other age groups or severity levels of obesity.

3 .Short-Term Focus:

This research did not evaluate the prolonged effects of incentive spirometry on respiratory complications after surgery.

4. Comorbidities Variability:

Some spirometry results could be impacted by undetected full severity of coexisting conditions like OSA and COPD.

5 .Lack of Control Group:

Depending on the study design, that without a control group (no spirometry), it is not possible to determine whether or not any improvement is as a result of spirometry alone or other aspects.

6. Compliance and Technique:

The results were not influenced by variations in patient compliance and the proper spirometry technique .

Confounding Variables not involved in the study:For instance, medications or surgical techniques that may affect the pulmonary outcomes were not controlled.

7 .Lack of Detailed Pulmonary Complication Data:

Pulmonary complications (such as pneumonia) of specific type or severity were not

accounted for so that we did not understand how varies in spirometry have an effect on any single topic.

Recommendations

1. Multi-Center Study:

To make the findings more generally applicable to a wider segment of bariatric surgery patients, the research involves conducting multi-center studies to increase the generalizability of the findings.

2. Long-Term Follow-Up:

Write the study to include a longer follow up to assess whether or not incentive spirometry remains effective in the delayed post-operative period.

3. Control Group:

The outcomes would be better compared and the effect to reduce pulmonary complications better confirmed if you include a control group of patients who do not use spirometry.

4. Detailed Assessment of Comorbidities:

Obtain more detailed information on the comorbidities, most commonly OSA and COPD to help understand the impact of comorbidities on the accuracy of spirometry and provide appropriate interventions.

5. Monitor Patient Compliance and Technique:

Patient adherence to and usage of spirometry needs to be monitored closely. I may try to add additional training or reminding to increase compliance.

6. Standardize Frequency of Spirometry:

Ascertain the frequency of spirometry across patients, or assess the impact of varying frequencies to want to establish which regimen would be most conducive for most of the in recovery from post-operative.

7. Account for Confounding Factors:

Potential confounders (such as medications on the pain management, sedatives and surgical techniques) that may alter for the pulmonary outcomes and efficacy of spirometry are controlled for.

8. Detailed Pulmonary Complication Data:

To gain more information on the type, severity and timing of pulse complications, such as pneumonia or atelectasis, and thus more information on the specific benefit of spirometry for different complications.

9. Tailor Spirometry Protocols:

Based on patient characteristics (such as smoking history, oxygen levels and comorbidities) develop individualised spirometry protocols in order to maximize effectiveness of reducing postoperative pulmonary complication.

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APPENDICES

ENGLISH CONSENT FORM

The study you are about to participate is a cross sectional titled as;

"Effect of Incentive Spirometry on Postoperative Pulmonary Complications after Bariatric Surgery: A Cross-Sectional Study"

The study has no potential harm to participants. All data collected from you will be coded in order to protect your identity, and should not be disclosed to anyone. Following the study there will be no way to connect your name with your data. Your answers to the questions will not affect the quality of education given to you. Any additional information about the study results will be provided to you at its conclusion, upon your request.

You are free to withdraw from the study at any time. You agree to participate, indicating that you have read and understood the nature of the study, and that all your inquiries concerning the activities have been answered to your satisfaction.

NAME _____

SIGNATURE _____

DATE _____

URDU CONSENT FORM

میں _____ تصدیق کرتا/ کرتی ہوں کہ محترمہ (YOUR NAME URDU) نے اپنی اس تحقیق

” Effect of Incentive Spirometry on Postoperative Pulmonary Complications after Bariatric Surgery: A Cross-Sectional Study

زیرنگرانی (Dr.Amdad Ali Faruqi) کے متعلق بتا دیا ہے۔ مجھے اس تحقیق کی نوعیت، مقاصد، احاداف، توقعات، فوائد اور خطرات کے متعلق ، ساری معلومات فراہم کر دی گئی ہیں

اس تحقیق کے دوران ساری معلومات صیغۂ راز میں رہیں گی اور مریض کا نام اور دیگر معلومات صرف تحقیق کے لیے استعمال ہوں گی۔ مجھے یہ بھی بتا دیا گیا ہے کہ میں اس تحقیق سے متعلق ہر قسم کے سوال پوچھنے کا مجاز ہوں اور یہ تحقیق صرف ایک شخص ک مفاد میں نہیں ہے بلکہ بحسبیت مجموعی انسانیت کا مفاد اس سے وابستہ ہے۔ تمام تفصیلات جاننے کے بعد یس تحقیق میں شامل ہونے یا نہ ہونے پر کسی کا قائل نہیں ہوں۔ اس تحقیق سے کسی بھی وقت علیحدہ ہونے پر مجھ پر کوئی پابندی نہیں ہو گی۔ میں بذاتِ خود بقائمی حوش و حواس

اور رضا مندی سے اس تحقیقاتی عمل میں شامل ہوتی/ ہوتا ہوں

دستخط محقق _____

دستخط شرکت کار _____

تاریخ _____

Demographics and Questionnaire

Data Collection Performa

1) Age:

20-30 years
30-40 years
40-50 years
50-60 years

2) Gender

Male:

Female:

3) BMI: kg/m²

	Yes	No
Over weight(2.0-29.9)		
Obese II (35.9-39.9)		
Obese III (≥40)		

Marital Status :

Married	.....	.....
Un Married	.....	.....
Other	.....	.....

4) Patient had history of:

	Yes	No
Smoking status		
• Smoker		
• Previous Surgical History		

5) Comorbidities:

	Yes	No
Obstructive Sleep Apnea		
COPD		
Asthma		
Diabetes		
Hypertension		
Hyperthyroidism		
Hypothyroidism		

7) Respiratory rate:

- a) High
- b) Normal
- c) Low

8) Type of surgeries:

	Yes	No
Roux-en-Y Gastric Bypass		
Sleeve Gastrectomy		
Mini Gastric Bypass		
Adjustable Gastric Banding		

9) Lung capacity seen on incentive spirometer:

Patient picked	One ball, 600 ml	.....
Patient picked	Two balls, 900 ml	.....
Patient picked	Three balls, 1200 ml	.....

Frequency observed

4 times a day	.....
8times a day	.....
12 times a day	.....

10) Pulmonary complications:

	Yes	No
a) Atelectasis		
b) Pneumonia		

Oxygenation level %	Yes	No
Normal SPO2 90-100%		
Mild Hypoxia SPO2 80-89%		
Moderate Hypoxia SPO2 70-79%		
Severe Hypoxia SPO2 $\leq$ 70%		
11) Additional Respiratory Support, IF Yes:		
	Yes	No
a) Nasal Cannula		
b) O2 Face Mask		
c) NRB Mask		
d) CPAP / BIPAP		
12) Outcome		
Re Admission		

PERMISSION LETTER

To,

Chief Operating Officer,
Shalamar Hospital,
Lahore.

Subject: Application for permission letter for data collection.

Madam,

With due respect it is stated that I am working as Respiratory Therapist in SICU from 21st Feb 2020 till date and currently I am doing MS (AHS) respiratory therapy from Superior University Lahore. I required permission letter for data collection on my thesis titled "Effect of Incentive Spirometry" on Post-Operative Pulmonary complications after Bariatric Surgery: A Cross Sectional Study.

Kindly grant me favor, so that I can carry out my research data collection work. I shall be thankful to you for this act of favor. Ethical approval letter of research committee superior university is already attached on backside.

Yours Respectfully,

Afiifa Asif Khan

E-Code: 10069

MS AHS (Respiratory Therapy).

Date: (18/11/24)

Rec & Forwarded


DR. (R) DR. M. MUBEEN
Professor & HOD Anaesthesia
4798-P
Shalamar Hospital Lahore
18/11/24

ETHICS COMMITTEE LETTER



OFFICE OF THE DEAN-FAHS

SUPERIOR UNIVERSITY

Ref.: IRB /FAHS/Allied-HS/10/24/MS/RS-3577

Date: 29th October 2024

Name: Afifa Asif Khan (MS Allied Health Sciences)

Registration: SU91-MSAHW-S23-092

Subject: Ethical Approval Letter

The Research Ethical Committee convened on Dated: **17th October, 2024** to discuss your protocol titled **"Effect of incentive spirometry on post operative pulmonary complications after bariatric surgery :a cross sectional study"**

No further corrections and recommendations were suggested. The above-mentioned protocol has been approved after considering various research issues including ethical concerns with condition that the researcher will submit completion report at the end of his/her research.

Prof. Dr. Muhammad Naveed Babur
Dean/Convener REC
Faculty of Allied Health Sciences
Superior University, Lahore

17-KM, Main Raiwind Road, Lahore.
UAN: 042 111 00 00 78 | www.superior.edu.pk

PLEGIARISM REPORT



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