International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

A Study to Observe the Lung Volumes on BMI Associated with Normal Weight, Overweight and Obese

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Abstract: ***Obesity is becoming a serious public health issues in worldwide and is related to lung dysfunction. Higher percentage of body fat is associated with lower lung volumes. (1) Direct and indirect measures of adiposity had similar associations with lung function. According to the study shows that there is a connection between the lung volumes and different level of body mass index. When individual weight is increased, lung volume gets altered. Our study shows that the increase in weight status is associated with a general reduction in lung volume measurements which may reflect decrease lung volume in obese people than the overweight. The lung volume of overweight people decreased than the normal people.***

Keywords: Obesity, Overweight, Lung function, Body Mass Index, Balloon Technique

1. Introduction

Obesity is becoming a serious public health issues in worldwide and is related to lung dysfunction. Higher percentage of body fat is associated with lower lung volumes. (1) Direct and indirect measures of adiposity had similar associations with lung function. Adiposity had a greater effect or lung volumes in men than women but was associated with airway function only in women. The prevalence of overweight and obesity in India is increasing faster than the world average. The prevalence of overweight will more than double among Indian adults aged 20–69 years between 2010 and 2040, while the prevalence of obesity will triple. Specifically, the prevalence of overweight and obesity will reach 30.5% (27.4%-34.4%) and 9.5% (5.4%-13.3%) among men, and 27.4% (24.5%-30.6%) and 13.9% (10.1%-16.9%) among women, respectively, by 2040 (2)

The balloon method is simpler, but is likely to be less accurate than the water displacement method. The balloons may not be exactly spherical, you may find it difficult to measure diameter accurately, and there will be increasing resistance to inflation as the balloon stretches. The water displacement method is a little more complicated, but is more likely to be accurate. (10)

2. Methodology

The present clinical trial was conducted in Jaya College of Paramedical Sciences, College of Physiotherapy. For the study, 30 subjects were selected. Subjects were selected in the study on the basis of inclusion criteria (Non – smokers, Patient with no past medical history related to lung condition, Age: 18 to 25). Subjects were selected by measuring BMI. Subjects were evaluated using a special evaluation form. Pulmonary function was assessed by Balloon Method. Subjects were informed about the procedure, merits and demerits of the treatment. Consent is obtained from each subject for voluntary participation. Participants were randomly assigned as Group A, Group B and Group C.

3. Procedure

Choosing of balloons:
Fill the balloon with water and measure by inch tape while filling should be done until the balloon gets burst. Now note the point where the balloon gets burst. so repeat the same procedure on another balloon and note the value so if the balloon get burst at same point the balloon in the packet were manufactured in same proportion. • So now can use these balloons to check the volumes. Fill up balloon with water to compare your results. Place the lip of a balloon over a faucet and carefully run water into it. Stop when the balloon is the same size as the balloon filled with gas. If you accidentally put too much water in, carefully pour some out. It will be difficult to get the balloons to exactly the same size. To be more exact, wrap a cloth tape measure around the centre of the water balloon to check its circumference. Adjust until it's the same as the gas-filled balloons. Have someone help you measure the circumference of the water balloon while you hold it. Pour the water out and measure it. Empty the balloon into a large measuring cup, beaker, or something else that can measure volume. Record the amount of water that was in the balloon.

Outcome Measures:

Tidal Volume
Stretch a round balloon lengthwise several three times. Inhale normally and then exhale normally into the balloon. Note: Do not force your breathing. Immediately pinch the end of the balloon shut so that no air escapes. Place the

balloon on a flat surface. Have your partner use the metric ruler to measure the diameter of the balloon at its widest point. Deflate the balloon and repeat steps 2 and 3 two more times. Use your three measurements to calculate an average diameter.

Vital Capacity
After breathing normally, inhale as much air into your lungs as possible. Immediately pinch the end of the balloon shut so that no air escapes. Deflate the balloon and repeat steps 2 and 3 two more times. Use your three measurements to calculate an average diameter.

Expiratory Reserve Volume:
Inhale and exhale normally. During exhalation, exhale all the air left in your lungs into the balloon; pinch the balloon closed to prevent air from escaping. Measure and record the circumference of the balloon. Repeat this procedure four more times; record each circumference.


Measuring Lung Function by Balloon Method

Statistical Analysis:
The present study included thirty subjects, in which ten subjects were on Group A, ten subjects were on Group B and ten subjects were on Group C. [Table 1], represents demographic data of the study participants

Tidal Volume:
There is **no significant** difference between Groups A and B in terms of mean values of TV ($t = 0.50$, $p = 0.625 > 0.05$). In addition, the mean value of Group A (470) is not so different from that of Group B (435). Hence, we **cannot** conclude that there is significant difference between Group A and Group B in terms of mean values of TV.

There is **significant** difference between Groups A and C in terms of mean values of TV ($t = 5.12$, $p = 0.000 < 0.05$). In addition, the mean value of Group A (470) is greater than that of Group C (263). Hence, we conclude that the mean value of Tidal Volume (TV) for Group A (normal weight people) is greater than that of Group C (Obese people).

There is **significant** difference between Groups B and C in terms of mean values of TV ($t = 2.92$, $p = 0.009 < 0.05$). In addition, the mean value of Group B (435) is greater than that of Group C (263). Hence, we conclude that the mean value of Tidal Volume (TV) for Group B (Overweight people) is greater than that of Group C (Obese people).

Vital Capacity:
The evidence is **sufficient** to conclude that there is **significant** difference between Groups A and B in terms of mean values of VC ($t = 2.37$, $p = 0.029 < 0.05$). In addition, the mean value of Group A (4450) is greater than that of Group B (3850). Hence, we conclude that the mean value of Vital Capacity (VC) for Group A (Normal weight people) is greater than that of Group B (Overweight people).

The evidence is **sufficient** to conclude that there is **significant** difference between Groups A and C in terms of mean values of VC ($t = 9.93$, $p = 0.000 < 0.05$). In addition, the mean value of Group A (4450) is greater than that of Group C (2600). Hence, we conclude that the mean value of Vital Capacity (VC) for Group A (Normal weight people) is greater than that of Group C (Obese people).

The evidence is **sufficient** to conclude that there is **significant** difference between Groups B and C in terms of mean values of VC ($t = 4.68$, $p = 0.000 < 0.05$). In addition, the mean value of Group B (3850) is greater than that of Group C (2600). Hence, we conclude that the mean value of Vital Capacity (VC) for Group B (Overweight people) is greater than that of Group C (Obese people).

Expiratory Reserve Volume:
The evidence is **sufficient** to conclude that there is **significant** difference between Groups A and B in terms of mean values of ERV ($t = 2.66$, $p = 0.016 < 0.05$). In addition, the mean value of Group A (1160) is greater than that of Group B (920). Hence, we conclude that the mean value of ERV for Group A (1160) is greater than that of Group B (920).

The evidence is **sufficient** to conclude that there is **significant** difference between Groups A and C in terms of mean values of ERV ($t = 9.62$, $p = 0.000 < 0.05$). In addition, the mean value of Group A (1160) is greater than that of Group C (515). Hence, we conclude that the mean value of ERV for Group A (1160) is greater than that of Group C (515).

The evidence is **sufficient** to conclude that there is **significant** difference between Groups B and C in terms of mean values of ERV ($t = 6.58$, $p = 0.000 < 0.05$). In addition, the mean value of Group B (920) is greater than that of Group C (515). Hence, we conclude that the mean value of ERV for Group B (920) is greater than that of Group C (515).

4. Conclusion

According to the study shows that there is a connection between the lung volumes and different level of body mass index. When individual weight is increased, lung volume gets altered. Our study shows that the increase in weight status is associated with a general reduction in lung volume measurements which may reflect decrease lung volume in obese people than the overweight. The lung volume of overweight people decreased than the normal people.

5. Acknowledgement

It is my pleasure to express deep sense of gratitude towards ***Dr. V. Balchandar, (PT),*** for his encouragement and critical review of this work at regular "Thesis Meetings" and **Dr. S. Nagaraj, (PT),** an ideal supervisor who has encouraged me during the course of study. A Special word of appreciation for the kind co operation to my subjects who believed in me and co operated to their extent. I owe my gratitude to **Dr. K. Velpari (PT)** and **Dr. D. Mythili (PT),** who were very helpful in completing this study.

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Table 1

S. NO	Group	Age	Height	Weight	BMI	TV Value	VC Value	ERV Value
1	A	21	165	50	18.5	550	4500	1200
2	A	20	162	55	21	300	4000	1200
3	A	21	165	50	18.5	550	5000	1500
4	A	21	168	63	22.3	500	4500	1200
5	A	21	171	61	20.9	500	4500	1250
6	A	21	172	70	23.7	650	5000	1250
7	A	21	175	65	23.1	300	4000	800
8	A	21	172	73	21.2	300	4000	1200
9	A	20	188	80	22.6	550	4500	1200
10	A	24	167	64	22.9	500	4500	800
11	B	21	175	83	27.1	750	5000	1200
12	B	21	173	78	26.1	300	3000	800
13	B	21	172	75	25.4	500	4000	800
14	B	21	163	68	25.6	650	4000	1200
15	B	28	178	88	27.8	650	5000	1200
16	B	21	166	80	29	300	3500	800
17	B	21	166	73	26.5	300	3500	800
18	B	25	172	88	29.7	300	3500	800
19	B	21	179	86	26.8	300	4000	800
20	B	27	168	75	26.6	300	3000	800
21	C	21	162	90	34.3	300	3000	550
22	C	20	165	94	34.5	240	2000	500
23	C	23	167	91	32.6	250	2500	550
24	C	22	164	83	30.9	300	3000	550
25	C	21	163	88	35.1	300	3500	500
26	C	19	152	80	34.6	250	2500	500
27	C	21	156	80	32.9	240	2000	500
28	C	24	158	80	32	250	2500	500
29	C	20	158	85	34	250	2500	500
30	C	23	160	85	32	250	2500	500