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Study of FEV1/FVC Ratio In Relation to BMI in Young Group of Rohilkhand Region.

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ABSTRACT

Background: The aim of study was to to assess respiratory indices in underweight and overweight young group (subcategory) and compare the same with normal weight controls (in the age group of 18 to 30 years). **Methods:** In the present study 210 subjects were included, aged between 18 yrs-30 yrs after applying inclusion and exclusion criteria. The groups (n=210, case= 132 and control= 78) are divided into group A, B, C, D, E and F respectively each having 21, 78, 40. 35, 29 and 7 subjects on the basis Of international classification of BMI. **Results:** In our study mean predicted value of FEV1/FVC ratio in group A 84.02±31.24(underweight), group C 86.83±29.46(pre-obese), group D 92.10±13.31(obese class 1),group 93.72±9.49 (obese class 2) and group F191.02±22.24(obese class 3), when compared to control group B 87.95±26.77 was found to be decreased in group A and increased in other obese group , but it was within normal range in all groups and no statistical difference found between different groups (P value>0.05). **Conclusion:** After analyzing the data, we did not observe any statistically significant difference in FEV1/FVC between the control and underweight and overweight group.

Keywords: Obesity, Body Mass Index, FEV1/FVC ratio, Spirometry.

INTRODUCTION

Obesity is becoming a worldwide phenomenon in both developed and developing countries, particularly in India, which is experiencing a rapid epidemiological transition due to changes in lifestyle. Indo-Asian countries are now experiencing the unique challenge of a rapid rise in childhood obesity despite a persistently high burden of under nutrition.[1] Changes in dietary habits and developing a sedentary lifestyle has changed energy uptake and output balance contributing to the development of obesity.

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Obesity is defined as an abnormal and excessive collection of fat in the body[2] and is considered to be an important global health hazard and has been linked to increased incidence of cardiovascular diseases, hypertension, metabolic disorder like diabetic Mellitus, hyperlipidemia and pulmonary dysfunction[3]. Clinical obesity is also associated with impairment of lung function.

According to WHO, worldwide obesity has more than doubled since 1980. In 2014, more than 1.9 billion adults of 18 years and above were overweight. Most of the world's population lives in countries where overweight and obesity kills more people than underweight.[4]

Body mass index (BMI) is a simple index of weight for height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2). BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and for all ages. The normal BMI range is between 18.5 and 24.99 kg/m^2. As per WHO definition BMI greater than or equal to 25 is overweight and a BMI greater than or equal to 30 is obesity.[5] WHO classification includes an additional subdivision of BMI 35.0-39.9 in recognition to the fact that management options for obesity differ above BMI of 35.

There is not many available data in India about the relationship between respiratory indices to BMI in young adults. Therefore, we aim to study the effects of obesity on spirometry tests among healthy young adults in Northern India. Our study is limited to spirometry part of PFT because spirometry tests are considered to be the initial screening tool for pulmonary diseases and are the most widely used tests.

MATERIALS AND METHODS

The study was carried out in the Department of Physiology in Rohilkhand Medical College & Hospital, Bareilly during Jan 2015 to 31st Dec 2015. Approval for this study was taken from the ethical committee of the Rohilkhand Medical College & Hospital, Bareilly. It was a cross-sectional study to compare the respiratory indices in relation to BMI in age groups of 18-30 years. The subject of the proposed study was selected randomly from medical students, nursing staffs, lab technicians of Rohilkhand Medical College & Hospital, Bareilly in age groups of 18-30 yrs.
The groups are formed according to the International Classification of BMI.[6]

Groups and BMI (kg/m2)
Group A - Underweight <18.50
Group B -Normal range (as control) 18.50-24.99

Overweight ≥25. 00
Group C- Pre-obese 25.00-29.99
Group D- obese class 1 30.00-34.99
Group E- obese class 2 35.00-39.99
Group F- obese class 3 ≥40. 00
The inclusion criteria were 1) Subjects who have given written consent 2)Age between 18-30 years, 3)Non-smoker 4)subjects falling within the range of normal weight, underweight and Overweight 5) Healthy individuals free from any systemic disease. The exclusion criteria were subjects having physical deformities of the chest wall, subjects suffering from respiratory diseases such as chronic obstructive pulmonary disease, bronchiectasis, interstitial lung disease, pulmonary tuberculosis that might affect pulmonary function. Subjects with present or past (last 3 months) history of respiratory tract infections, subjects suffering from any cardiovascular diseases or metabolic disorders like hypertension or diabetes mellitus.\The sample size was calculated using the formula without finite population correction:

$$n= z2p (1-p) /d2$$

Where n= Sample size
Z= Z statistic for a level of confidence.
P= Expected prevalence or proportion.
d= Precision.
Assuming expected prevalence 15% and precision 5%. Total 210 subjects were included in study.

Statistical Analysis:
The data obtained in both study and a control group was expressed as the mean ± standard deviation. Statistical analysis was done to compare the mean between the two groups with the help of statistical software SPSS 17.0. The p value of < 0.05 was considered as statistically significant. Data was analyzed using unpaired T-test (α error set at 5%).

RESULTS

In the present study 210 subjects were included, aged between 18 yrs-30 yrs after applying inclusion and exclusion criteria. The groups (n=210, case= 132 and control= 78) are divided into group A, B, C, D, E and F respectively each having 21, 78, 40. 35, 29 and 7 subjects on the basis
Of international classification of BMI.
The spirometric parameters which were studied with respect to BMI includes FEV1, FVC and FEV1/FVC ratio.

Table 1(a): Comparison of M. PRED Mean value of FEV1/FVC and SD between Group A and Group B.

Group According to BMI	N	Range (L)	Mean	SD	t-value	P. Level	Significant
A	21	4.72 –100.0	84.02	31.24	0.58	> 0.05	NS
B(control)	78	2.66 –100.0	87.95	26.77			

*NS-not significant, M. PRED-Measured Predicted

Table 1(b): Comparison of M. PRED Mean value of FEV1/FVC and SD Between Group B and Group C.

Group According to BMI	N	Range (L)	Mean	SD	t-value	P. Level	Significant
B(control)	78	2.66 – 100.0	87.95	26.77	0.21	> 0.05	NS
C	40	3.17 – 100	86.83	29.46			

*NS-not significant, M. PRED-Measured Predicted

[Table 1 (a)] Shows that the M. PRE Mean value of FEV1/FVC of Group A and Group B is 84.02 and 87.95 respectively, but the p-value is more than 0.05 levels. So there is no any significant change in FEVI/FVC between groups A and B.
[Table 1 (b)] Shows that the M. PRE Mean value of FEV1/FVC of Group B and Group C is 87.95 and 86.83 respectively but the p-value is more than 0.05 levels. So there is no any significant change in FEVI/FVC between groups B and C.

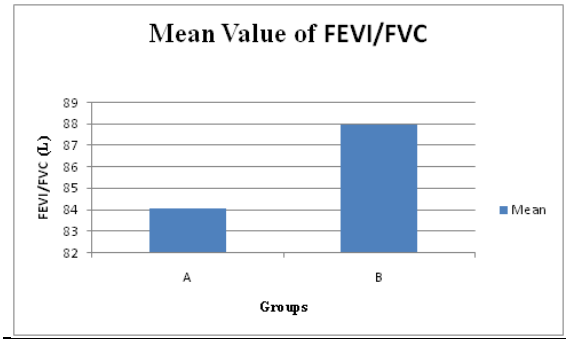

Figure 1(a): the Bar diagram showing the M. PRED Mean value of FEV1/FVC between Group B and Group A.

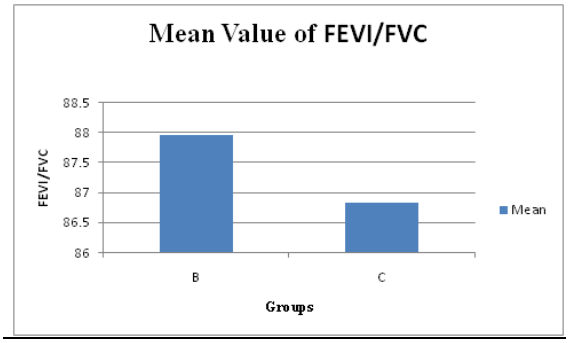

Figure 1(b): the Bar diagram showing the M. PRED Mean value of FEV1/FVC between Group B and Group C.

Table 1(c): Comparison of M. PRED Mean value of FEV1/FVC and SD between Group B and Group D.

Group According to BMI	N	Range (L)	Mean	SD	t-value	P. Level	Significant
B(control)	78	2.66 – 100.0	87.95	26.77	0.83	> 0.05	NS
D	35	3.41 – 100.0	92.10	13.31			

*NS-not significant, M. PRED-Measured Predicted

Table 1(d): Comparison of M. PRED Mean value of FEV1/FVC and SD between Group B and Group E.

Group According to BMI	N	Range (L)	Mean	SD	t-value	P. Level	Significant
B(control)	78	2.66 – 100.0	87.95	26.77	1.13	> 0.05	NS
E	29	67.30 – 00.0	93.72	9.49			

*NS-not significant, M. PRED-Measured Predicted

Table 1(e): Comparison of M. PRED Mean value of FEV1/FVC and SD between Group B and Group F.

Group According to BMI	N	Range (L)	Mean	SD	t-value	P. Level	Significant
B(control)	78	2.66 – 100.0	87.95	26.77	0.29	> 0.05	NS
F	7	40.67 – 00.0	91.02	22.24			

*NS-not significant, M. PRED-Measured Predicted

[Table 1 (c)] Shows that the M. PRE Mean value of FEV1/FVC of Group B and Group D is 87.95 and 92.10 respectively but the p-value is more than 0.05 levels. So there is no any significant change in FEVI/FVC between groups B and D.

[Table 1 (d)] Shows that the M. PRE Mean value of FEV1/FVC of Group B and Group E is 87.95 and 93.72 respectively but the p-value is more than 0.05 levels. So there is no any significant change in FEVI/FVC between groups B and E.

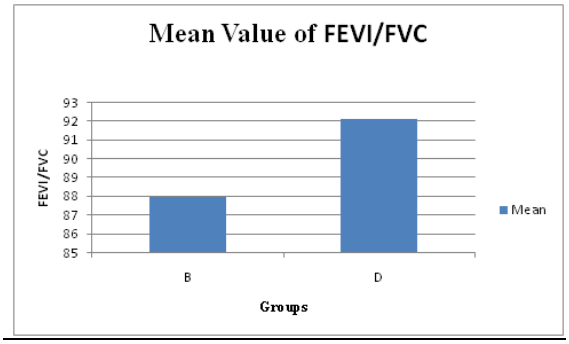

Figure 1(c): the Bar diagram showing the M. PRED Mean value of FEV1/FVC between Group B and Group D.

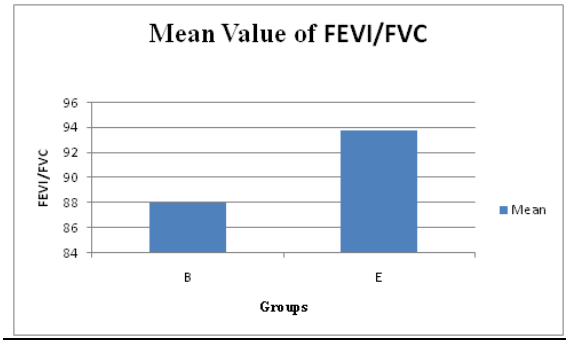

Figure 1(d): the Bar diagram showing the M. PRED Mean value of FEV1/FVC between Group B and Group E.

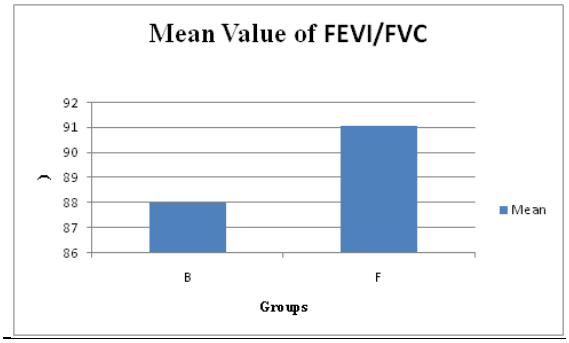

Figure 1(e): the Bar diagram showing the M. PRED Mean value of FEV1/FVC between Group B and Group F.

[Table 1 (e)] Shows that the M. PRE Mean value of FEV1/FVC of Group B and Group F is 87.95 and 91.02 respectively but the p-value is more than 0.05 levels. So there is no any significant change in FEVI/FVC between groups B and F.

DISCUSSION

FEV1/FVC ratio indicates what percentage of the total FVC was expelled from the lungs during the first second of forced expiration. It is critically important in the diagnosis of obstructive and restrictive diseases. In healthy adults, this should be approximately 70-85% which declines with age.[7] In our study mean predicted value of FEV1/FVC ratio in group A 84.02±31.24 (under weight), group C 86.83±29.46 (pre-obese), group D 92.10±13.31 (obese class 1), group 93.72±9.49 (obese class 2) and group F191.02±22.24 (obese class 3), when compared to control group B 87.95±26.77 [Table 1 a, b, c, d, and e] was found to be decreased in group A and increased in other obese group, but it was within normal range in all groups and no statistical difference found between different groups (P value>0.05). The normal value of the FEV1/FVC ratio in this study may be due to the fact that inspiratory and expiratory muscle strength is normal as per finding of Joshi et al.[8] Obesity might impair pulmonary function via several mechanisms. The increased adiposity around the ribs, diaphragm, and abdomen, leading to limited movement of the ribs, decreased total thoracic and pulmonary volume causes a reduction in chest wall compliance and preventing full excursion of the diaphragm. There are also effects of obesity on upper airway tone.[9,10] Resistance, as well as mechanical load, will be increased which in turn increases the work of breathing. Obese individuals have an increased demand for ventilation and respiratory muscle insufficiency, decreased functional residual capacity and expiratory reserve volume and closure of peripheral lung units. It adversely affects chest wall mechanics and causes a decrease in total respiratory compliance due to deposition of subcutaneous adipose tissue.[11]

CONCLUSION

Spirometry is the most commonly used lung function screening study. Generally, it should be the clinician's first option, with other studies being reserved for specific indications. Most patients can easily perform spirometry when demonstrated by an appropriately trained technician or other health care provider. The test can be administered in the ambulatory setting, physician's office, emergency department, or inpatient setting.

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