ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 03 | March - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

THE EFFECTS OF BODY MASS INDEX AND GENDER ON CHRONIC OBSTRUCTIVE PULMONARY DISEASES ON PULMONARY FUNCTION TEST IN ADULTS.

Respiratory Medicine

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ABSTRACT

Introduction – We have collected data of PFT in 4011 individuals and diagnosed them with COPD , tried to find the relationship between BMI and gender with COPD. **Duration Of Study –** 8 Months from Jan 2021 to March 2022. **Objective –** We aimed to determine the effects of BMI and Gender on the development of COPD. **Methodology –** We collected data of 4011 pulmonary function tests in Respiratory Medicine department in Maharashtra from 2021 to 2022. And we defined COPD diagnosis based on the ICD-10 code and prescribed medication . BMI Classified them to five groups (Asian population) and six groups (standard classification WHO 1998). **Discussion –** Several studies have assessed the factors associated with nutritional status in selected COPD populations. Some of these have suggested a relationship between malnutrition ,impaired pulmonary status and female gender individuals with low weight have hyperinflation ,lower diffusing capacity and lower exercise capacity.The study of Vestbo et al indicated that BMI decreased with increasing COPD severity. **Results –** Among 1827 females there were 505 subjects with post bronchodilator FEV1 over FVC ratio below 0.7 (COPD) and 1322 female subjects with post bronchodilator FEV1 over FCV ratio above 0.7(non COPD). Among 2184 males there were 799 subjects with post bronchodilator FEV1 over FVC ratio below 0.7 (COPD) and 1375 male subjects with post bronchodilator FEV1 over FCV ratio above 0.7(non COPD).So in given population prevalence of COPD in male was around 36.75 % and female 27.61%. In the COPD population about 18.47 % had underweight 34.14% normal weight 15.95% overweight , at risk 23.69% obese Ⅰ and 7.75% obese Ⅱ according to BMI classification in adult Asians. And according to BMI classification in adult Europoids WHO (1998) 18.47 % underweight , 50.09 % normal weight , 23.69 % pre obese ,5.84 % obese Ⅰ ,1.5 % obese Ⅱ and 0.4 % obese Ⅲ. **Conclusion –** The results of this study indicate that the proportion of persons with COPD progressively increased as BMI decreased . In addition compaired with the non COPD group, the proportion of COPD subjects in underweight and normal weight categories were higher while in the obese categories were lower. Also the prevalence of COPD in male is more than in females.

KEYWORDS

INTRODUCTION:-

Chronic obstructive pulmonary disease (COPD) may lead to poor nutritional status, weight loss and induce the development of sarcopenia and cachexia similar to other chronic diseases [1]. These changes are caused and mediated by the natural course of COPD characterized by hypoxaemia with airway obstruction, oxidative stress, inflammation, glucocorticoid treatment for acute exacerbations, malnutrition and smoking [2]. Besides, sarcopenia and cachexia may adversely influence the natural course of COPD and contribute to severe symptoms, poor lung function, rapid disease progression, frequent exacerbations and increased mortality of COPD [3,4].

Accordingly, BMI is included in the BODE index (BMI, airway obstruction, dyspnoea, exercise capacity)[5], Variable risk factors, including smoking, advanced age, biomass fuels [6, 7], occupational dust, socio-economic status, respiratory infections, pulmonary tuberculosis and asthma, have been suggested to develop COPD [8]. Sarcopenia and cachexia are associated with malnutrition, poor health status, low socio-economic status and impaired immune status, which are known to be related to COPD development.

Animal studies have shown that starvation can induce emphysema and COPD [9,10]. Some recent reports suggest the potential role of low BMI as a risk factor for COPD development [8,11]; Data from epidemiologic studies have shown that the prevalence of COPD is higher in those patients with lower BMI.12 In addition results from longitudinal studies have shown that low BMI is an important risk factor for subsequent development of COPD in men, for increased FEV_1 decline in the same gender and for having a new exacerbation in patients hospitalized for severe exacerbation.[13]

MATERIALS AND METHODS :-

A portable, battery-operated, ultrasound transit-time-based spirometer was used to perform pulmonary function testing. Calibration was checked daily with a 3-liter syringe. Subjects performed up to 15 forced expiratory maneuvers (average 5–6) to obtain three American Thoracic Society (ATS) acceptable maneuvers, with forced vital capacity (FVC) and forced expiratory volume in the first second (FEV_1) reproducible within 150 ml.[14] Albuterol 200 mcg was then administered by inhalation through a 500-ml spacer, and the test was repeated 15 min later (average 4–5 maneuvers). All spirometric examinations were carried out with the subject seated, using a nose clip and a disposable mouthpiece.

Exclusion Criteria:-

for spirometry included recent thoracic or abdominal surgery, myocardial infarction, eye surgery or retinal detachment, hospitalization for any cardiac condition, tuberculosis, pregnancy, or a pulse rate above 120 beats per minute.We collected data of 4011 pulmonary function tests in Respiratory medicine department in Maharashtra from 2021-2022.

We used the definition of COPD proposed by the Global Initiative for Chronic Obstructive Lung Disease (GOLD): a ratio of the post bronchodilator FEV_1 over FVC below 0.70 .2 This definition is consistent with the European Respiratory Society and ATS directives 1 Anthropometric measurements were taken. Height was measured with a portable stadio meter (precision 0.1 cm), using the technique recommended by Lohman et al.[15]

Weight was measured using an electronic weight scale (precision 200 g). The analysis of nutritional status was based only on the assessment of BMI. It was calculated as the ratio weight/height^2 (kg/m^2) and categorized into five groups(BMI in adult Asians): underweight (<18.5 kg/m^2), normal weight (18.5–22.9 kg/m^2), overweight , at risk (23.0–24.9 kg/m^2),obese I (25–29.9 kg/m^2)and obese II(≥30.0 kg/m^2).

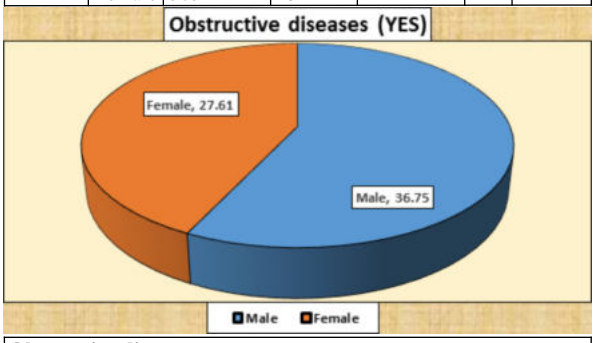
And compared with BMI in adult Europoids (WHO 1998)) and

categorized into Six groups : underweight (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight , pre obese (25.0–29.9 kg/m^2),obese I (30–34.9 kg/m^2) obese II (35.0–39.9 kg/m^2) and obese III (≥40.0 kg/m^2) and checked weather difference in classification can make any difference in results of COPD on PFT.

Statistical Analysis And Results:-

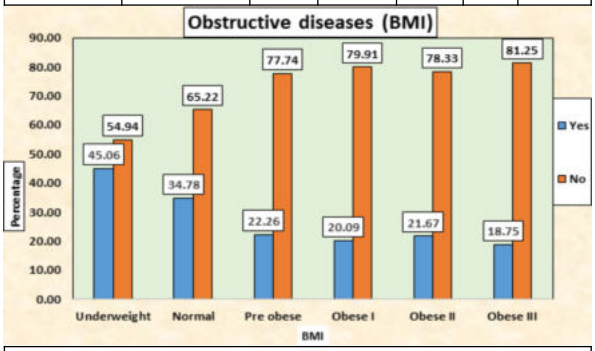
Obstructive Diseases						
Gender	Yes		No		Total	
	Frequency	%	Frequency	%	Frequency	%
Male	799	36.75	1375	63.25	2174	0.54
Female	505	27.61	1322	72.36	1827	0.46

Variable	Groups	Obstructive diseases		Chi-square	d. f.	p value
		Yes	No			
Gender	Male	799	1375	37.51	1	0.000
	Female	505	1322			



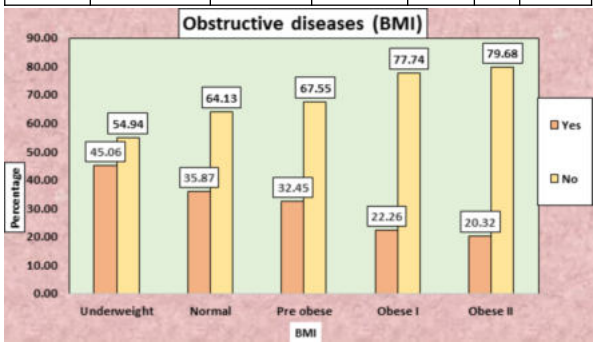
Obstructive diseases						
BMI	Yes		No		Total	
	Frequency	%	Frequency	%	Frequency	%
Underweight	333	45.06	406	54.94	739	18.47
Normal	697	34.78	1307	65.22	2004	50.09
Pre-obese	211	22.26	737	77.74	948	23.69
Obese I	47	20.09	187	79.91	234	5.85
Obese II	13	21.67	47	78.33	60	1.50
Obese III	3	18.75	13	81.25	16	0.40
Total	1304	32.59	2697	67.41	4001	100.00

Variable	Groups	Obstructive diseases		Chi-square	d.f.	p value
		Yes	No			
BMI	Underweight	333	406	124.06	5	0.000
	Normal	697	1307			
	Pre-obese	211	737			
	Obese I	47	187			
	Obese II	13	47			
	Obese III	3	13			



Obstructive diseases						
BMI	Yes		No		Total	
	Frequency	%	Frequency	%	Frequency	%
Underweight	333	45.06	406	54.94	739	18.47
Normal	490	35.87	876	64.13	1366	34.14
At Risk	207	32.45	431	67.55	638	15.95
Obese I	211	22.26	737	77.74	948	23.69
Obese II	63	20.32	247	79.68	310	7.75
Total	1304	32.59	2697	67.41	4001	100.00

Variable	Groups	Obstructive Diseases		Chi-square	d. f.	p value
		Yes	No			
BMI	Underweight	333	406	126.31	4	0.000
	Normal	490	876			
	At Risk	207	431			
	Obese I	211	737			
	Obese II	63	247			



Complete interviews achived in 4202 subjects from a total 4325 eligible individuals , and spirometry was performed in 4011 eligible individuals . among this population there were 1827 females and 2184 males. Among females there were 505 subjects with post bronchodilator FEV1 over FVC ration below 0.7 (COPD) and 1322 female subjects with post bronchodilator FEV1 over FVC ratio above 0.7 (non COPD).

Among 2184 male individuals there were 799 male subjects with post bronchodilator FEV1 over FVC ratio below 0.7 (COPD) and 1375 male subjects with post bronchodilator FEV1 over FVC ratio above 0.7 (non COPD).

So in given population prevalence of COPD in male population was around 36.75 % and in females 27.61%.

In the COPD population about 18.47 % had underweight (<18.5 kg/m^2),34.14% normal weight (18.5–22.9 kg/m^2),15.95% overweight , at risk (23.0–24.9 kg/m^2),23.69% obese I (25–29.9 kg/m^2)and 7.75% obese II (≥30.0 kg/m^2) according to BMI classification in adult Asians.

And according to BMI classification in adult Europoids WHO (1998) 18.47 % underweight (<18.5 kg/m^2), 50.09 % normal weight (18.5–24.9 kg/m^2), overweight , 23.69 % pre obese (25.0–29.9 kg/m^2),5.84 % obese I (30–34.9 kg/m^2) ,1.5 % obese II (35.0–39.9 kg/m^2) and 0.4 % obese III (≥40.0 kg/m^2).

Descpritions of total population and subjects with COPD are presented in tables . In the entire population there were significant differences among the BMI categories in Age ,Gender ,smoking status and Spirometry values.

The proportion of subjects without COPD progressively increased from the underweight to obese categories, whereas the proportion of COPD subjects progressively decreased (p<0.0001). There was a higher proportion of COPD subjects in the underweight and normal-weight categories compared to non-COPD subjects, whereas in the obese category the proportion of subjects without COPD was higher and a similar trend was observed in the overweight category (p=0.0001). In others words, the proportion of COPD subjects progressively increased as BMI decreased.

DISCUSSION:-

We found a progressive increment in the proportion of COPD subjects as BMI decreased, with the converse in subjects without COPD. Compared with non-COPD subjects the proportion of COPD subjects in the underweight and normal-weight categories were higher, whereas in the obese category was lower. The factors associated with lower BMI in male COPD subjects were aging, current smoking, In females with COPD, current smoking, lower education ,lower BMI.

During the last decade the influence of the BMI on different epidemiologic and functional aspects of COPD has become an area of increasing research interest. Several studies have documented a clear association between low BMI with poor prognosis and mortality in

patients with established COPD. Additionally, there is evidence suggesting that COPD prevalence increases as BMI decreases and that low BMI increases FEV_1 decline and subsequent risk for getting COPD. Nutritional depletion has been commonly reported in COPD patients.
Our results indicate that in COPD subjects the FEV_1/FVC ratio progressively increased from underweight to obese category, whereas the proportion of current smokers progressively decreased as BMI increase. We also found that compared with non-COPD population there was higher proportion of COPD subjects falling in the underweight and normal-weight categories.

Another important aspect of this study was analysis of the COPD population on the basis of sex , our results indicate that the prevalence of COPD among male is more than females this is probably due to smoking habits.

Several studies have assessed the factors associated with nutritional status in selected COPD populations . Some of these have suggested a relationship between malnutrition, impaired pulmonary status and female gender. Individuals with low weight have more hyperinflation, lower diffusing capacity, and lower exercise capacity. Recent reports have suggested a relationship between unexplained weight loss and various mediators of inflammation.Little information is available regarding the factors influencing BMI in a population-based sample of persons with COPD. The study of Vestbo et al indicated that BMI decreased with increasing COPD severity, in particular in women. The knowledge of the COPD prevalence by BMI categories and the factors that influence the BMI in these patients is very important because they may help to better understand the important association between BMI with COPD morbidity and mortality and also because some of them are amenable to intervention.

Finally, there are some limitations of the present study that deserve to be discussed. First, because of the characteristics of the study, our definition of COPD was based on postbronchodilator FEV_1/FVC <0.70 at a single examination. Although this is the most widely accepted definition for COPD, it represents a simplified case definition for epidemiological purposes and not a definitive clinical diagnosis. Second, the analysis of nutritional status was based only on the assessment of BMI. Although BMI is a marker with a widely accepted prognostic value and a well-known association with morbidity outcomes in COPD, other measures such as body composition have been recommended to evaluate nutritional condition in these patients. Because of the design of the study, these types of analyses could not be obtained; therefore it is likely that our results may tend to underestimate the true rate of nutritional depletion in COPD, and in the entire population as well. Third, this is a cross sectional looking at a population at a given point in time and not a longitudinal study.

In summary, the results of this study indicate that the proportion of persons with COPD progressively increased as BMI decreased. In addition compared with the non-COPD group, the proportion of COPD subjects in the underweight and normal-weight categories were higher, while in the obese category was lower. However, even among persons with COPD, more than half have a high BMI. Also the prevalence of COPD in male is more than females this is probably due to smoking habits.

CONCLUSION –

The results of this study indicate that the proportion of persons with COPD progressively increased as BMI decreased . In addition compaired with the non COPD group, the proportion of COPD subjects in underweight and normal weight categories were higher while in the obese categories were lower. Also the prevalence of COPD in male is more than in females .

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