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The Relationship Between Body Mass Index (BMI) and Pulmonary Function Among Healthcare Workers in Mosul City/Iraq

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Body mass index, BMI, Obesity, Lung function, FEV1, FVC, FEV1/FVC%, respiratory diseases, Pulmonary functions, COPD, Healthcare workers, Hospitals

ABSTRACT
The study was designed to evaluate if there is a relationship between Body Mass Index (BMI) and pulmonary function. This highlights the mechanisms by which obesity and overweight status could affect lung health, through parameters such as Forced Expiratory Volume in 1 Second (FEV1%). To determine pulmonary function, spirometry is the main method. It defines the severity of pulmonary function impairment according to FEV1% as normal to mild: average ≥70%, moderate 40-69%, and severe ≤39%. Interestingly, the review even points out that a form of malnutrition can also cause pulmonary function decline. This is why nutritional status should be one consideration in clinical assessments for some types of diseases. Reflecting the fact that obesity is an important contributing factor to respiratory health. It is stated in the document that obesity results from some unwanted changes which can cause the development of smaller lung volumes and also reduce total capacity even less sucking capacities (compared to non-obese people). It also considers waist circumference and additional waist-to-hip ratio as potentially better predictors of pulmonary function than BMI only, because body fat distribution is not reflected by the presence or absence of obesity. The research likewise links this eating pattern to the worldwide rise in obesity and suggests a correlation with myriad health issues such as asthma. This indicates that mechanical consequences of increased body mass could exacerbate airway remodeling, predisposing to subclinical airway dysfunction. Second, it emphasizes the extra burden of breathing experienced by obese patients that may render them short of breath and possibly wheezy. In conclusion, whilst BMI remains a pragmatic measurement to reflect body fat content adequately and therefore pulmonary implications of obesity on lung physiology upstream from Acute exacerbations are also influenced not just by the quantitative trajectory of adiposity (BMI) but qualitative factors related to body distribution including abdominal girth as well as overall nutritional status.

1. Introduction

Pulmonary Function is measured mainly with spirometry [1]. A normal to mild pulmonary function impairment is proven if the Forced Expiratory Volume in one-second ratio (FEV1%) predicted level is 70%, moderate pulmonary function impairment is indicated when the FEV1% level is 40%–69%, and severe pulmonary function impairment is a FEV1% of <40%. However, malnutrition, expressed as a decrease in these indicators, is usually associated with a decline in pulmonary function measured by FEV1%, thus, nutrition status should be a clinical objective in this population [1]. Patients often develop obesity or become overweight due to impaired daily living activities and the side effects of prednisolone [2]. Body Mass Index (BMI) takes the weight and height of a person to calculate body fat percentage, which can happen for both males & females regardless of their age or sex. The body mass index is calculated as a person's weight in kilograms divided by the square of their height in meters or BMI = kg/m^2 [3]. The World Health Organization (WHO) describes overweight and obesity as abnormal or excessive fat accumulation which may impair health. Overweight is when a person has a body mass index of 25 or over, obesity, meanwhile is for those with a body mass index of 30 or over [4]. Clinical and research evidence has revealed that various risk factors are associated with lung function deterioration. Among these risk factors, being overweight has been one of the health problems with the fastest increase among the general population, almost threefold this issue over the past three decades [5]. Obesity is a worldwide health problem that relates to obesity-related problems and diseases [6]. Obesity is known to be one of the main factors affecting the respiratory health of a person [7].

Over the last 30 years, both obesity and asthma have increased in prevalence. Although the study pathophysiology phenomenon is not commonly linked to each other yet, the data and research seem to suggest some sort of connection [8]. By conducting a meta-analysis of several prospective studies, it was shown that a higher body mass index (BMI) has more chance of getting asthma [8]. The rise in body mass causes a change in airway function and thus, the question is whether the mechanical effects of increasing body mass index (BMI) are the reasons for airway remodeling of the respiratory system that can cause subclinical airway dysfunction [7]. The increasing rate of both overweight and obesity has become a major public health problem worldwide [9]. The predominant cause of the reduction in lung volumes such that certain lung units are closing during tidal breathing and hypoxemia is obesity. Implementing these studies may be challenged by the clinical practice side [10]. In obese people, increased work of breathing is a result of breathlessness and wheezing. Obesity can either narrow the airways, on the other hand, it can increase functional lung volume, or even respiratory muscle strength [7] Numerous studies have shown that an obese person has smaller lungs and thus less lung volume and capacity compared to a non-obese one [9].

There is a study that claims markers such as waist circumference (WC), waist-to-hip ratio, and abdominal height are more important and better predictors of pulmonary function, than BMI since it does not provide information on body fat distribution nicely shows the association of obesity [9]. The respiratory system could be affected negatively because of low-grade systemic inflammation and the heavy mechanical load of truncal fat that limits chest expansion in obesity conditions [6]. Many diseases of the lungs are the cause of impaired lung function which leads to increased mortality, as well as lung diseases, such as COPD [5]. According to what has been found, the situation in patients with COPD can be delayed by early diagnosis and intervention, thus, the improvement of these patients' physical and mental health can be gained [11]. It then becomes necessary to explore causes that can be managed especially for those with the risk of COPD [11].

1.1. Objectives of the Study

1. Assess pulmonary function and evaluate BMI's impact on healthcare workers' health.
2. Identify risk factors that face healthcare workers' respiratory system and promote awareness.

Table (1.1.): The Body Mass Index status [3]

BMI	WEIGHTS
below 16.5kg/m^2	**Severely underweight**
lower than 18.5 kg/m^2	**Underweight**
more than or up to 18.5 to 24.9 kg/m^2	**Normal weight**
more than or up to 25 to 29.9 kg/m^2	**Overweight**
more than or up to 30 kg/m^2	**Obesity**
30 to 34.9 kg/m^2	**Obesity class I**
35 to 39.9 kg/m^2	**Obesity class II**
more than or up to 40 kg/m^2 (similar, stated to massive obesity, extreme, or severe)	**Obesity class III**

2. Related works

The paradox of obesity, which shows better survival in obese people, is not valid for elderly patients with critical illness short-term Intensive Care Unit (ICU) outcomes [12]. Obesity was a major cause of the disorders of the patients with acute respiratory distress syndrome (ARDS). Obesity was the primary cause of death among patients with acute respiratory distress syndrome, thus forming a ground for more issues that need to be tackled [13].

One of the obstacles expressed by the variation of the lung capacity models was the frequency of comorbidities in the different BMI categories judged so concerning the two different classifications [14]. The study emphasizes the relationship between BMI and outcomes in patients with acute respiratory distress syndrome, emphasizing the fact that there is incomplete data about it hence we need more clarification on this [15]. Greater BMI and the possibility of inhaling vapors, gas, dust, and fumes were attached to the increased respiratory burden scores [16]. The variation from the raising of BMI due to gender was not very significant, but individuals with asthma ranged the most who did not have the disease from those who did. The more frequently they were exposed to VGDF, the more their respiratory burden rose, but no statistical difference was seen according to sex or asthma status [16].

Acute respiratory distress syndrome in patients may have an increased risk of short-term and longterm mortality if they are obese [17]. being overweight is closely linked with almost all the diseases of the respiratory system (up to 20 out of 35 respiratory diseases) and on the contrary, obesity reduces the risk of bronchiectasis [18]. Chronic Obstructive Pulmonary Disease (COPD) is defined by the persistent presence of respiratory symptoms and incomplete completely reversible airflow obstruction. BMI is an essential parameter related to health–status in patients with COPD, e.g., mortality, fatalities, and quality of life [19]. To their knowledge, no study has examined the BMIhealth care expenditures relationship among different COPD severity grades [19].

It is suggested, however, to monitor BMI as a separate risk factor for COVID-19 infection and severity thus indicating the need for heightened observations of individuals with higher BMIs blood yielding presence of co-morbidities [20]. The interesting novel results presented here are in agreement with the obesity paradox in COPD: low BMI is an independent risk factor for lung function decline and high one has a protective effect, compared to normal BMI. It could be mediated by shared but not yet identified causative mechanisms — the exploration of which may turn up new types or therapeutic targets [21]

3. Results and Discussion

The social and demographic features of 162 participants are presented in **Table (3.1.):** The major demographic of respondents (67.3%) was of the age group between 20-29 years old. 29.7 ± 9.9 years was the mean age of the participants, while their ages varied from 20 to 59 years. The percentage of male participants was only 63.6%, whereas the percentage of female ones was 36.4%. It was found that 53.1% of them were not yet married, whereas 46.9% were married. Diploma/Higher diploma was the demographic variable that had almost equal distribution in two levels, which comprised 46.9% of the participants. Almost two in five participants were degree holders (doctors, masters, etc.). Also, 1.9% of them were poor readers, but on the other hand, 6.8% were the most itineratesever-pre-schools-stats. The majority of the respondents were young (20-29 y/o), men, unmarried, highly educated, and among the individuals who own a certificate or a diploma.

Table (3.1.): Socio-Demographic Characteristics of (162) Participants

Socio-Demographic Characteristics of (162) Participants		No.	%
Age (years)	20---29	109	67.3
	30---39	27	16.7
	40---49	13	8.0
	50---59years	13	8.0
	Mean±SD (Range)	29.7±9.9	(20-59)
Sex	Male	103	63.6
	Female	59	36.4
Marital Status	Married	76	46.9
	Single (unmarried)	86	53.1
Highest level of education	Illiterate	3	1.9
	Primary school	11	6.8
	High school	5	3.1
	Preparatory school	11	6.8
	Diploma/Higher diploma	76	46.9
	Bachelor's degree	9	5.6
	Postgraduate degree	47	29.0
Total number	**162**		

Figure (3.1.) The BMI Status of 162 Participants

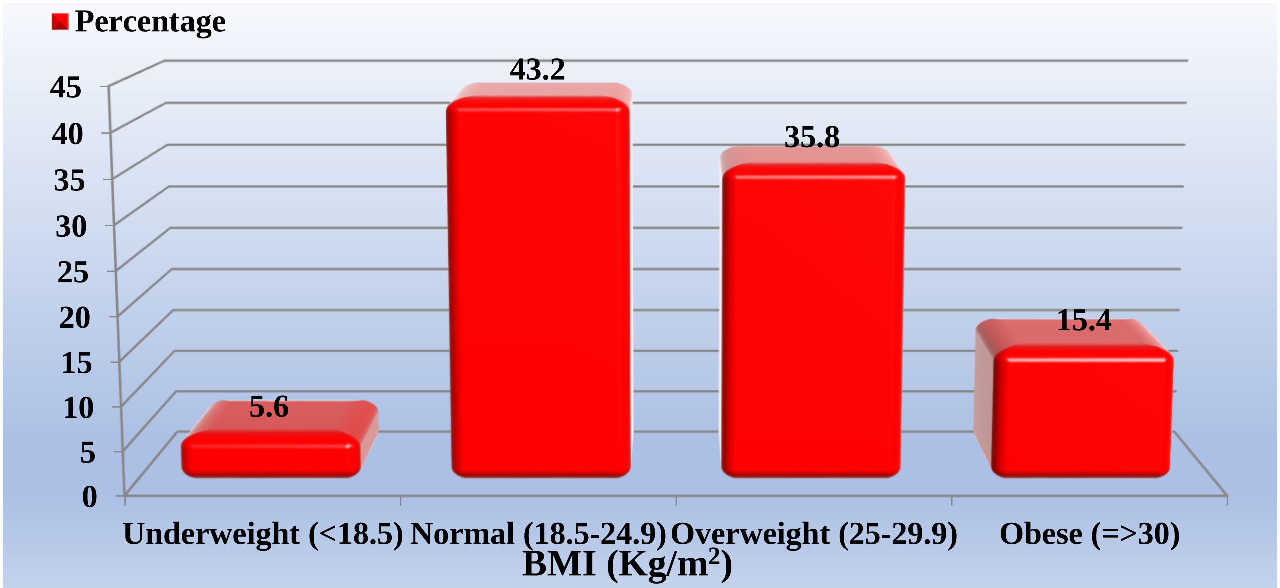

Figure (3.1.) This figure represents the BMI status of the participants, underweight (5.6%), normal (43.3%), overweight (35.8%), and obese (15.4%).

Table (3.2.): Here 43.2% (18.5 to 24.9 kg/m2) of the participants in the normal BMI range are represented in the table. Overweight adults comprised 35.8%, while their BMI was between 25 to 29.9 kg/m2. 15.4% of them have a BMI which was more than 30 kg/m2 hence they were obese. The

BMI was the mean of it (range: 16.3–38.4 kg/m2) which was 25.5 ± 4.5 kg/m2. The average height was around 168.5 ± 9.6 cm, while the weight was 72.7 ± 16.0 kg. The percentage of people without any comorbidity was 93.2. Nearly 4.9% of people had high blood pressure, while 1.9% of them were diabetic.

Table (3.2.): BMI and Anthropometric Measurements, and Associated Co-morbidities

BMI and Associated Co-Morbidities		**No.**	**%**
BMI (Kg/m2)	**Underweight (<18.5)**	9	5.6
	Normal (18.5-24.9)	70	43.2
	Overweight (25-29.9)	58	35.8
	Obese (=>30)	25	15.4
	BMI (Kg/m2) Mean±SD (Range)	25.5±4.5	(16.3-38.4)
	Height (cm) Mean±SD (Range)	168.5±9.6	(132-195)
	Weight (Kg) Mean±SD (Range)	72.7±16.0	(40-115)
Associated co-morbidities	**Hypertension**	8	4.9
	Diabetes	3	1.9
	None	151	93.2

Figure (3.2) Represents the associated co-morbidities of the participants, hypertension 8 participants 4.9%, diabetes 3 participants 1.9%, and those with no co-morbidities were the majority 151 participants 93.2%.

Figure (3.2) The Associated Co-Morbidities of 162 Participants

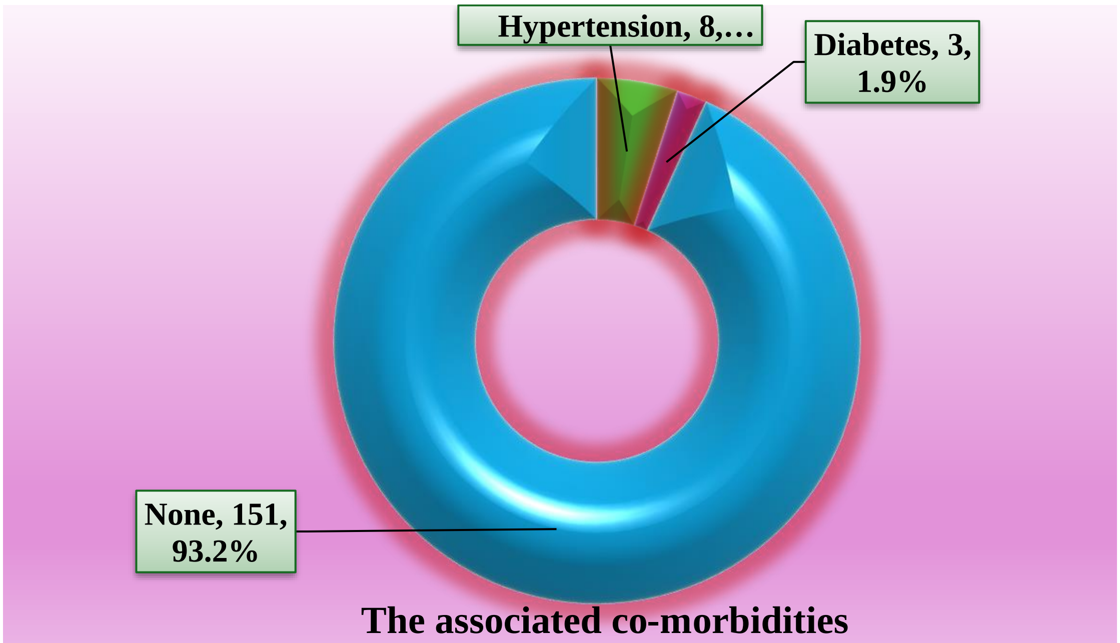

Table (3.3.): The table displays the different presentation of some respiratory or lung-related problems in three groups of people: those with "Normal" lung function, Slight Obstructive Abnormality (Slight Obstruct. Abn.), and those with "Serious Obstructive Abnormality." The table presents the data of the number (no). and percentage (%) of people in each group who were positive for the examples specified also the p-value of a Pearson Chi-square test (2-test) is used to check if the crossings are consistent at the 0.05 level. For the "Asthma" case, the p-value is 0.424 specifying the absence of differences between the three groups of people with asthma at the 0.05 level.

Table (3.3.): Incidence of Respiratory and Lung Disorders Based on Lung Function Status

Ever been diagnosed with any:	Normal		Slight Obst. Abn.		Serious Obst. Abn.		P value
	No.	%	No.	%	No.	%	
Asthma	5	5.7	-	-	4	11.8	0.424
Acute bronchitis	6	6.8	2	5.0	-	-	
Chronic bronchitis	2	2.3	-	-	-	-	
Emphysema	-	-	-	-	-	-	
Pneumonia	2	2.3	1	2.5	1	2.9	
Allergic bronchitis	12	13.6	3	7.5	2	5.9	
Allergic rhinitis	2	2.3	2	5.0	2	5.9	
Pulmonary fibrosis	-	-	-	-	-	-	
Initialism of Interstitial Lung Disease (ILD)	-	-	-	-	-	-	
Cardiothoracic surgery	-	-	1	2.5	-	-	
Chronic Obstructive Lung Disease (COPD)	1	1.1	-	-	-	-	
COVID-19	9	10.2	3	7.5	1	2.9	
None	49	55.7	28	70.0	24	70.6	
***Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.**							

Table (3.4.): The extent of the respiratory illnesses among the three groups with different degrees of obstructive airway abnormalities can be identified by the table comparing the frequency of these illnesses and symptoms. This insight is useful in making the connection between the depth of the Obstructive Airway Abnormalities and the domination of specific respirable diseases and symptoms. The χ^2-test of the Person chi-square, also legislation, was the one that was applied in the problem solving as was given in the footnote at the bottom of the table.

Table (3.4.): The prevalence of Respiratory Symptoms and Conditions According to the severity of Obstructive Airway Abnormalities

		Normal		Slight Obst. Abn.		Serious Obst. Abn.		P value
		No.	%	No.	%	No.	%	
Have experienced the following symptoms in the past 12 months	Yes	68	77.3	33	82.5	23	67.6	0.314
	No	20	22.7	7	17.5	11	32.4	
Cough	Yes	47	53.4	22	55.0	17	50.0	0908
	No	41	46.6	18	45.0	17	50.0	
Shortness of breath	Yes	20	22.7	7	17.5	12	35.3	0.185
	No	68	77.3	33	82.5	22	64.7	
Shortness of breath at rest	Yes	4	4.5	-	-	3	8.8	0.175
	No	84	95.5	40	100.0	31	91.2	
Dyspnea on exertion	Yes	15	17.0	5	12.5	9	26.5	0.281
	No	73	83.0	35	87.5	25	73.5	
Wheezing	Yes	10	11.4	-	-	2	5.9	0.070
	No	78	88.6	40	100.0	32	94.1	
Chest tightness	Yes	9	10.2	4	10.0	4	11.8	0.963
	No	79	89.8	36	90.0	30	88.2	
Fatigue	Yes	4	4.5	3	7.5	-	-	0.283
	No	84	95.5	37	92.5	34	100.0	
Headache	Yes	29	33.0	12	30.0	9	26.5	0.778
	No	59	67.0	28	70.0	25	73.5	
Pulmonary fibrosis (chronic lung conditions)	Yes	2	2.3	-	-	-	-	0.427
	No	86	97.7	40	100.0	34	100.0	

***Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.**

The present study's findings showed that Body Mass Index (BMI) might not always work as the promoting expert secondary factor in the two alternatives of lung function as the secondary factor. The weight difference among the two groups comprised of overweight and obese volunteers was negligible according to the two-tailed independent t-test (p=0.241). Meanwhile, in the previous memorandum, Svartengren et al. (2020) in which obesity was treated as one of the causes of lower lung function and also with this being one of the more common reasons that resulted in the noted difference in lung function [9].

On the other hand, another study carried out by Klepaker et al., (2022) refutes the theory of BMI and lung function as the main factors [22]. The aforementioned piece of research by Sun et al. (2019) similarly found a strong correlation between BMI and lung function in (COPD) patients and the study data displays that this result is supported by the evidence as well [23].

The research of Dixon and Peters (2018) primarily dealt with the study of the BMI and lung function relationship. The research has shown that there was a positive association between an increased BMI and a deterioration in lung function although the heart rate index remained normal which would be a significant result to report as well [24]. There is a distinction between the significance of BMI on lung function in the population or the place of research with more impact on the sex of the individual.

According to the current study, the classification of BMI underweight (<18.5) is found to be about 9 participants (5.6%), normal (18.5-24.9) in around 70 participants (43.2%), overweight (25-29.9) in approximately 58 participants (35.8%), and obese (=>30) nearly (25) participants (15.4%), height (cm) Mean±SD (Range)168.5±9.6 (132-195%), and weight (Kg) Mean±SD (Range) 72.7±16.0 (40115%) were recorded. In comparison to other study conducted in West Nusa Tenggara in 2019–2020 Wanadiatri et al (2023) a study investigated the relationship between BMI and 17 participants (9.44%) with underweight, 82 participants with normal weight (45.56%), 77 participants with overweight (42.78%), 4 participants with obesity (2.22%), height (cm) Mean±SD (Range)180. 161.43±6.99, weight (kg) Mean±SD (Range)180. 62.11±10.07 [25].

The average body height of the subjects in this research is 168.5 cm, which is higher than the subject's weight in West Nusa Tenggara (161.43) Wanadiatri et al., 2023). The height range in the present research, however, was much wider (132-195 cm) than that covered by the study from West Nusa Tenggara. The average weight of the subjects currently under study exceeds heavier before (72.7 kg) and it is lighter compared to the covered findings in one province ie West Nusa Tenggara where the average was, 62.11 kg [25]. This study covered a wider range of weights (40-115 kg) compared to the West Nusa Tenggara one. The results from the BMI distributions, heights, and weights of both studies indicated that there may have been population genetic differences or lifestyle behaviors in these studied regions. The high prevalence of obesity in this study is partly due to differences in diet habits, physical exercise, or family tendency toward obesity compared to the population study conducted in West Nusa Tenggara. The higher mean height and weight in this study may suggest possible dietary or socioeconomic variations.

However, citing research by Tang et al (2022), the experts emphasize the relevance of BMI in COPD care and describe how it influences lung function. This has been suggested for COPD, and BMI is a well-studied determinant here as described [11], adding the specification that moderate obesity might benefit the link. This study suggests no difference between the obese and overweight groups, which means that BMI might not be a major determinant of lung function modifications. The nonsignificance in obesity and overweight subjects led to questioning the relevance of BMI in lung function differences. All this is carried out by very diversified research on the role of BMI in lung function, in some studies such a relationship between spirometric parameters and body weight has not been clearly defined. The disparity in study design, population characteristics lung function, and BMI interaction being considered might also be responsible for these findings. Further work may be required to confirm these results and, if confirmed, explore how BMI impairs lung function across other races.

One study by Sumit et al. The adjusted multivariable logistic regression analysis in 2020 suggests there is no considerable association between Chronic Obstructive Pulmonary Disease (COPD) and weight categories, concerning p-value=0.36 [26]. In the same way, a p-value of 0.241 in this recent research study suggests that no statistical difference exists in lung function and BMI among obese and overweight individuals. The group in the sample stood at an average height and weight of 168.5 cm, 72.7 kg Graphically BMI distribution indicated 15.4% of obesity, 43.2 normal, and underweight was only (5.6%). Both studies provide evidence that body mass index (BMI) might not be a massive factor affecting lung function. The fact that COPD prevalence and lung function did not vary significantly through different BMI groups implies that other variables play a more significant role in determining how well the respiratory system functions.

The comparison of the present study with the research by Tang et al. revealed different insights connected to the relationship between BMI and respiratory health. However, their interpretations can be explained by the different populations involved in the studies. While Tang et al. conducted largescale research among populations at risk for COPD and PRISm [27], the present study involved 162 younger and healthier patients. The study by Tang et al. 2022 showed that slight obesity was even protective for lung function, whereas underweight and severe obesity were related to reduced lung capacity [27]. The present study did not directly link BMI to lung function but instead tried to determine the prevalence of asthma among the three lung function groups. The results showed that asthma prevalence was not significantly different among them, indicating that lung function aberrations are not strongly associated with respiratory conditions within this group. Overall, Tang et al.'s results apply to the influence of BMI on lung health among older and more at-risk populations [27], while the present study provides perspectives on respiratory health in the young, less-affected group. This comparison demonstrates that different populations and health conditions can yield different conclusions regarding BMI and its relevance to lung function.

On the other hand, the study by Abston et al. 2017 found that in a population with COPD, BMI was not correlated with FEV1 but was generally increased with a better FEF25–75/FVC ratio [28]. A higher FEF25–75/FVC ratio has been linked with the subjects' decreased risks for acute exacerbation and death [28]. While this measure is poorly studied, given that FEF25-75 is a more valid measure than FEV1 in predicting such outcomes, it is very important [28]. Abston et al.'s study stands in sharp contrast with this study of 162 younger people, which focused on a population with less disease prevalence and a mean age of 25.5 kg/m ^ 2, mainly in years 20-29. Specifically, 93.2% of the participants in this study had no comorbidities, and a correlation between BMI and lung function was noticed among them. Furthermore, this study did not present significantly different trends regarding the prevalence of asthma groups related to lung function. Thus, the connection between BMI and lung function appears to be heavily context-dependent, somewhat limiting the ability to compare this study with the one conducted by Abston et al. 2017. This detailed information should be considered when examining this aspect of potential effects. The studies by Littleton et al. (2017) and the present one that involves 162 subjects equally deal with the way BMI affects health, nevertheless, they do so in different populations and with distinct focal points. The research of Littleton et al. implies that overweight-deficient subjects without heart-lung disease generate low blood oxygen and diminished lung function [10]. The correlation of obesity with the respiratory system became clear by this direct evidence. On the contrary, the recent research engaged a younger, more physiological group weighing with the majority of the participants' BMI in the normal to overweight range. Although some of them were obese or overweight, almost the entire set of this research group kept their normal lung function. There were no major differences in the asthma rate among various levels of obstructive airway abnormalities. Within the same context, few were affected by comorbidities, therefore, these may be the main reasons for the absence of serious respiratory problems. On the whole, while Littleton et al. prioritize the negative consequences of higher BMI on respiratory health [10], the current study proposes that in younger and healthy individuals, BMI does not damage lung function so much. This inconsistency reveals the different ways in which BMI could affect individuals depending on their age, general health, and the presence of other diseases.

Comparing the research of Zhu et al. (2018) with the current study sheds light on the diverse influences of BMI on health. The research of Zhu et al. was conducted on a large scale and it revealed a negative relation between BMI and lung cancer risk in never-smokers, particularly women, implying probably particular safety for higher BMI [29]. This contrasts with the current work, which covered a younger and smaller sample and focused on respiratory health. It was discovered that most participants who were overweight or obese did not present any significant comorbidities and were not linked to respiratory issues like asthma via BMI, which was another driving force behind the cause. These findings suggest that while a higher BMI might lower the risk of lung cancer in the case of some groups, as Zhu et al. have revealed, that is not always accompanied by the development of respiratory problems in a younger, typically healthy cohort [29]. Thus, it is confirmed that BMI has a complex role in various health outcomes different groups harbor.

A study by Sun et al., 2019, it is pointed out the possible protective role of increased BMI in elderly COPD patients [21]. But, the present study in a younger and less diseased group of people concluded that the influence of BMI on the respiratory health of an individual depends on the age and health condition of the person. The differences, in a way, indicate the need for more studies focusing on the manner BMI influences respiratory health in various age groups and health conditions. Compared with Zhang et al. (2021), the new research that included 162 participants indicates that there exist remarkable differences that include demographics, BMI, and health effects. Zhang's study examined elderly COPD patients and identified the fact that a lower BMI was connected to adverse cardiac remodeling, which in turn comprises a reduction in the ventricular mass and dilation of the right ventricles in patients with "severe" lung defects [30]. Findings of this research unveiled that COPD patients were on average 22.9 kg/m^2, which following the results, stands for a lower BMI in older adults with COPD related to worse cardiac health. On the other hand, the most recent research had younger people (the average age of the youth was 29.7 years old) and with a higher average BMI amount of 25.5 kg/m^2, indicating a higher percentage of patients who suffer from overweight and obesity. This pool had fewer co-existing diseases, and the study registered some respiratory diseases, yet the related statistical work demonstrated no eminent variances in asthma occurrence when comparing different baggage-function groups. Hence, the study infers that BMI may not harm young and healthy people's respiratory health as much as old people with severe COPD. Generally, the study either compared or proved that the age of a person and health status would be connected with how overweight and the patients' health conditions were. In other words, COPD patients' age would give a face to the low BMI associated with heart problems in a group of individuals who are older and more diverse.

The data from 162 samples in this study covers primarily young and male individuals, of whom the average BMI has been recorded to be 25.5 kg/m², with the majority of them being overweight or obese. For the most part, the BMI of the participants was higher, but many of them (93.2%) had no other health issues like high blood pressure or diabetes. The likelihood of having asthma among people with different body mass indexes ranged from 11% to the highest of 12% BMI categories, it could be one of the reasons why BMI is not the sole indicator of the health of the respiratory system. Similar to Gomes et al. (2019), this claim likewise aligns with the finding that body mass index is not enough to measure the segmentation of body and pulmonary function, especially in children with cystic fibrosis. In addition to BMI, other measures such as fat-free mass (FFM) could be added to get a fuller picture of health and nutrition [1]

4. Conclusions

1. BMI and Lung Function: The findings indicate that BMI may not be as important a driver of lung function changes, particularly in younger and healthier subjects.

2. Obesity and respiratory health– The overweight or obese participants did not have any enormous severity of reduced lung function according to the data, despite previous literature associating obesity with a higher prevalence of airway disease.

3. Comorbidity: The majority (93.2%) of subjects did not have any co-existing diseases, suggesting the possible presence of other factors affecting lung functions;

4. Within-population and hazardous effects: the study underlines that genetic or lifestyle differences between populations, thereby confounded with BMI will affect measures of association between them.

5. Recommendations

1. Increase the number in the sample: Expand on the number of participants to make findings more reliable and general.

2. They should represent a wider range of demographic factors, such as different age groups and genders (ethnic background.)

3. Longitudinal Study: Perform a longitudinal study that will assess changes in pulmonary function and body mass index.

4. Food Diaries: Use food diaries to assess diet more comprehensively and track the influences on lung function.

5. Physical activity monitoring: Monitor participants to observe how their physical activities impact lung function, and BMI.

6. Advanced Imaging: Employ advanced imaging tools to enhance the accuracy of assessing body fat distribution.

7. Genetic Factors: Examine genetic factors that may mediate the relationship between BMI and lung function.

8. Comorbidities Evaluation (and impact of other comorbid conditions including but not limited to cardiovascular diseases on pulmonary function.)

9. Environmental Factors: Consider environmental factors such as air quality, and exposure associated with occupation that can compromise lung health.

10. Intervention Studies Conduct Intervention studies to evaluate the effect of weight loss or exercise programs in improving lung function.

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