

Obesity as an independent risk factor for Covid-19 pneumonia severity and mortalitySourabh Jain¹, Akash Mangrole², Vikas Mishra³, Lokendra Dave⁴, Nishant Srivastava⁵, Vishwas Gupta^{6*}¹Tutor, Department of Respiratory Medicine, GMC and Hamidia Hospital, Bhopal, MP, India²PG Resident, Department of Respiratory Medicine, GMC and Hamidia Hospital, Bhopal, MP, India³Assistant Professor, Department of Respiratory Medicine, GMC and Hamidia Hospital, Bhopal, MP, India⁴Professor and Head, Department of Respiratory Medicine, GMC and Hamidia Hospital, Bhopal, MP, India⁵Associate Professor, Department of Respiratory Medicine, GMC and Hamidia Hospital, Bhopal, MP, India⁶RIRD (TB Hospital), Idgah Hills, Bhopal, MP, India

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Abstract

Background- Patients with Covid 19 may have symptoms ranging from asymptomatic to severe pneumonia. Obesity is a significant independent risk factor for the severity of covid 19 pneumonia. **Objective:** The aim of this research is to see whether obesity is an independent risk factor for covid 19 pneumonia severity and mortality. **Methodology-** A cross-sectional observational study was conducted at Gandhi Medical College Bhopal, a tertiary care centre, between May and July 2020. Obese patients with a BMI greater than 24.9 kg/m² were included in the study among all hospitalizations during this time period. **Results-** There are 68 patients in total, with 43 men and 25 women. The median age is 56 years. Mild disease was found in 48% of female patients, and severe disease was found in 62.79% of male patients (p value significant 0.001). Obesity was a significant risk factor for death in patients with COVID-19, especially in the most serious cases according to the study's results. Total mortality was 39.28%, with a longer ICU stay as well. **Conclusion-** Obesity, according to our findings, is a significant independent risk factor for disease severity and mortality. Patients who are more obese have a higher severity, mortality, and length of stay. Obese patients should be closely monitored for serious diseases and prioritised by nurses and intensivists.

Keywords: Covid 19, obesity, observational, poor outcome.

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Introduction

The first case of coronavirus disease 2019 (COVID-19) Detected from Wuhan, China in December 2019 and declared as a pandemic by the World Health Organization in March 2020[1]. The global mortality rate was approximately 0.5 million out of 13 million cases. There were approximately 22000 deaths in India out of approximately 1 million confirmed cases[2]. The majority of people infected with COVID-19 tend to develop a mild to moderate illness characterized by fever, dry cough, fatigue and recover without the need for hospitalization, but in a few cases, serious conditions such as pneumonia and respiratory failure may develop[3].

According to preliminary data, approximately 3–10% of patients will require ICU admission chronic kidney disease, COPD, cardiovascular disease, cancer, smoking, immunocompromised state, pregnancy, and metabolic syndrome are all risk factors for severe covid pneumonia[4]. Obesity is an important component of metabolic syndrome that is also associated with severity. It affects the majority of physiological processes and modifies the functions of nearly all systems, including the immune system. Obesity is not only a direct risk factor for the severity of covid 19 pneumonia, but it also influences other risk factors such as diabetes, hypertension and sleep apnea. Obese patients are notoriously difficult to ventilate in the ICU due to difficulties with intubation, compressed airways, and decreased chest wall compliance. They are even more likely to develop bed sores. In such patients, prone ventilation is often difficult.

Owing to the high volume of distribution, calculating medication doses and dietary requirements are often difficult[5].

Adipose tissue secretes chemokines and cytokines, which influence metabolism and the immune system. The hyperactivation of the immune system in obese patients causes a "cytokine storm" which is one of the mechanisms responsible for the severity of COVID-19. In obesity, macrophages play a key role in the initiation of a chronic inflammatory state that leads to insulin resistance[6].

Past experiences with other respiratory diseases such as ARDS, we have observed that obesity has a higher mortality rate than non-obese people. Obesity reduces protective cardiorespiratory reserve while also enhancing immune dysregulation[7].

Similar research has been conducted in other countries, and it appears that there is a link between obesity and the severity of covid 19 pneumonia[8]. As a result, the purpose of this study is to investigate obesity as an independent risk factor for severe covid19 pneumonia and as a mortality parameter in covid 19 pneumonia.

Material & methods

After receiving approval from the ethical committee, a cross-sectional observational study was carried out at Gandhi Medical College Bhopal, a tertiary care centre, between May to July 2020. Obese Patients with a BMI of more than 24.9 were included in the study among total hospitalization during this time span. Patients under the age of 18 and comorbidity like diabetes, hypertension & coronary artery disease were excluded from the study.

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E-mail: vishwas.mgm@gmail.com**The classification of person's BMI is as follows**

BMI	WEIGHT STATUS
<18.5	Underweight
18.5-24.9	Normal weight

25-29.9	Overweight
30-34.9	Obesity class I
35-39.9	Obesity class II
>40	Obesity class III

The days between the first presentation at a health facility and the first day of any covid symptoms were counted. The outcome was discharge, ward transfer, LAMA, and death. The total days of ICU stay was also calculated in this study.

Statistical Analysis

Pearson Chi-square test was performed using Statistical Package for the Social Sciences (SPSS) version 23. 5% probability level was considered as statistically significant i.e., p<0.05.

Results

After applying inclusion and exclusion criteria, data from 68 patients was collected. The severity of diseases was classified as mild, moderate and severe .as per ICMR guidelines mild disease is Spo2->94% in room air,RR-<24/min, moderate disease is Spo2-90-94%,RR-24-30/min and severe disease is Spo2-<90%,RR->30/min.

The mean age was 56 years. 22 patients were overweight, 20 were class 1 obesity, 14 were class 2 obese and 12 were class 3 obese. Severe disease was more common in the class 3 obese group (8 out of 12), compared to class 2 (7 out of 14), class 1 (9 out of 20) and overweight (8 out of 22).

Table 1: Distribution of patients according to BMI and severity

Obesity class	Disease severity Mild/mod/severe	No of pt out of total	%	Duration of Hospital stay(days) Mild/mod/severe	Mortality in mild/mod/severe
Overweight	10/4/8	22/68	32.35	7/10/15	0/1/1
I	6/5/9	20/68	29.41	8/12/17	0/0/3
II	2/5/7	14/68	20.58	8/13/20	0/1/2
III	1/3/8	12/68	17.64	10/15/27	0/0/4
				Avg-8.25/13.75/19.75	Avg-0/0.5/2.5

Table 2: Association between severity of disease and mortality

SEVERITY	MORTALITY		TOTAL	Result
	NO	YES		
MILD	19(33.93%)	0	19(27.94%)	Chi sq-8.55 Df – 2 P value- 0.0139
MODERATE	15(26.79%)	2 (16.67%)	17(25.00%)	
SEVERE	22 (39.28%)	10 (83.33%)	32 (47.06%)	
TOTAL	56(100.00%)	12 (100.00%)	68 (100.00%)	

Df= degree of freedom, as p value is <0.01 it is highly significant

Table 3: Distribution of disease severity on the basis of gender

SEVERITY	SEX		TOTAL	Result
	FEMALE	MALE		
MILD	12(48.00%)	7(16.28%)	19(27.94%)	Chi sq-12.61 Df – 2 P value- 0.001
MODERATE	8(32.00%)	9(20.93%)	17(25.00%)	
SEVERE	5(20.00%)	27(62.79%)	32(47.06%)	
TOTAL	25(100.00%)	43(100.00%)	68(100.00%)	

Df= degree of freedom, as p value is <0.01 it is highly significant

Single Table Analysis

Table 4: Association of BMI with severity

Obesity	Severity			Total	Result
	Mild	Moderate	Severe		
Class 1	6(31.58%)	5(29.41%)	9(28.13%)	20(29.41%)	Chi sq-8.75 Df – 8 P value- 0.36
Class 2	2(10.53%)	5(29.41%)	7(21.88%)	14(20.59%)	
Class 3	1(5.26%)	3(17.65%)	8(25.00%)	12(17.65%)	
Overweight	10(52.63%)	4(23.53%)	8(25.00%)	22(32.35%)	
Total	19(100.00%)	17(100.00%)	32(100.00%)	68(100.00%)	

Table 5 : Association of disease severity with days of presentation

Severity score	days of presentation				Total
	1 -5 days	6 to 10 days	11 to 15 days	>15 days	
Mild	10	5	3	1	19
	55.56%	18.52%	14.29%	50.00%	27.94%
Moderate	3	8	6	0	17
	16.67%	29.63%	28.57%	0.00%	25.00%
Severe	5	14	12	1	32
	27.78%	51.85%	57.14%	50.00%	47.06%
TOTAL	18	27	21	2	68
	100.00%	100.00%	100.00%	100.00%	100.00%

Discussion

Mild disease was found in 48 percent of all female patients, and more severe disease was found in 62.79 percent of all male patients (p value significant 0.001). Obesity was a significant independent risk factor for mortality in patients with COVID-19 mortality seen in more serious cases, according to the study's results. Total mortality was 39.28%, with a longer stay as well. Obesity lengthens hospital stays and increases mortality rates. Obese people have a higher rate of ICU stays and mortality, according to other study also[9].

Similar studies have been conducted in other countries, where 30-40% of hospitalised patients with laboratory-confirmed influenza are diagnosed with acute pneumonia[10].

This is most likely due to the fact that patients with obesity are known to have a faulty immune system, making them vulnerable to a type of infection that requires a prompt cellular immunity response.

Class 3 obesity had fewer days of presentation (<5 days) than lower class obesity. The severity is greater in obese class 3 than in other classes and the greater the severity of the obesity, the longer the ICU stay & higher mortality.

This may be due to a reduction in immunity. Obesity is caused by a disruption of energy balance, which contributes to weight gain and metabolic disturbances, which cause tissue stress and dysfunction and the abundance of proinflammatory mediators in adipose tissue promotes even more dysfunction, which leads to lowered immunity[11].

Conclusion

Obesity is a significant independent risk factor for disease severity and mortality, according to our findings. However, comorbid factors such as diabetes, hypertension and coronary artery disease, which are significant risk factors in assessing mortality, have not been studied. For a more detailed analysis, a larger multicentric study is needed.

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Ethical approval

Ethical clearance was obtained from the institutional ethical committee for the present study.

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