

# Obesity and Disease Severity among COVID 19 Cases: A Hospital Based Study

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## ABSTRACT

**Introduction:** According to World Health Organization report obesity has tripled between 1975 and 2016. The COVID-19 pandemic has occurred at a time when the prevalence of individuals with overweight/obesity is increasing at an unprecedented rate throughout all the continents.

**Objectives:** This research aims to explore increased BMI (obesity) as a potential cause for COVID -19 disease severity in hospitalized patients by looking at the association between these two variables.

**Methods:** It is a cross sectional analytical study which aims to assess the association between obesity and COVID 19 case severity in hospitalized patients of Hetauda Hospital.

**Results:** 30.4 percent of the COVID 19 hospitalized cases had normal weight, 44.6 percent of them were obese, 17.4 percent were overweight whereas 7.6 percent of the admitted patients were underweight. Only 1 was mild case (1.1%), 52 participants (56.52%) were moderately severe cases and 39 (42.39%) cases of the 92 research participants were critically severe. Fisher Exact tests were performed to find the association between BMI and disease severity as categorical variables which showed that there was no significant association between the two variables (Fisher exact value=0.665).

**Conclusions:** This study concludes that there is no association in between obesity and COVID 19 disease severity. However, this relationship should be further explored by research studies with more sample size.

**Keywords:** BMI; COVID-19 disease severity; COVID-19 hospitalizations obesity.

## INTRODUCTION

According to the World Health Organization report, obesity has tripled between 1975 and 2016. More than 1.9 billion adults of 18 years and older were overweight in 2016.<sup>1</sup> The global burden of disease contributed by obesity in 2017 was 2.4 million.<sup>2</sup> In Nepal, STEPS survey done in 2019 estimated that the prevalence of overweight is at 20 and the prevalence of obesity is at 4.3 percent in adults aged 15-69.<sup>3</sup>

Previous research in SARS influenza virus and MERS virus have indicated that obesity is an independent risk factor for influenza morbidity and mortality.<sup>4</sup> According to Popkin et al, higher need for assisted ventilation beyond pure oxygen support (invasive mechanical ventilation or non-invasive ventilation) and a higher admission to intensive or semi-intensive care units were observed in patients with overweight and obesity.<sup>5</sup> Similarly, the influenza pandemic of 2009, caused by an outbreak of the upper respiratory influenza A H1N1 virus, linked obesity as an independent risk factor for severe influenza morbidity and mortality.<sup>6</sup>

Moreover, the body mass index (BMI) is strongly correlated with severe COVID-19 outcomes, with recent studies suggesting an increase in hospitalization risk of 5-10% per kilogram beyond the normal range.<sup>7</sup>

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### Citation

Dahal A, Karki N: Obesity and Disease Severity among COVID 19 Cases: A Hospital Based Study. Nepal J Health Sci. 2022 Jul-Dec;2(2): 40-4.

In Nepal however, no studies have been done to find out the links between obesity and COVID19 disease severity so far. If any links direct or indirect could be established between these two factors a lot of resources that go into COVID-19 disease management could be saved and invested in public health intervention to bring the rates of obesity down.

## METHODS

It is a cross sectional quantitative study. For the purpose of data collection, Hetauda hospital, a provincial hospital in Hetauda city of central Nepal was chosen because of its feasibility.

The hospital's COVID isolation center, Intensive care unit (ICU) and high dependency units (HDU) were visited for data collection. Measurements for BMI and clinical features of the admitted patients was taken by the help of nurses who were previously oriented about the study.

The study participants were both male and female of the age between 18 years and above. Similarly, unconscious patients whose BMI measurement was not possible physically and those patients whose records were not found in the patients care units were excluded from the study.

Data of all the hospitalized COVID 19 patients were taken by census enumeration method. Data for this study was taken in between Sep 2021 to May 2022 during the second wave of COVID 19 disease in Nepal. Initially, the study sample size was 200 participants but as the cases dropped swiftly from June 2022, the number of hospitalization of COVID 19 dropped drastically. Therefore, the study had to be concluded with data from just 92 hospitalized participants.

Data regarding demographic characteristics of the patients were taken from the patient records. Data regarding temperature and other clinical characteristics were taken for the assessment of the COVID 19 disease severity of the patients. These data were finally collected on a paper based questionnaire developed and pretested by the Principal Investigator.

For BMI calculation, weight and height of the patients was measured by the help of digital weighing machine and stadiometers respectively. These measurement materials were provided by Madan Bhandari Academy of Health Sciences, Nepal.

Ethical Approval was taken from Nepal Health Research Council(NHRC)(Ref No: 3645). Written Informed consent of the patients was taken and his/her closest relative was taken if the patient was unconscious. For unconscious patients' data were collected from records of hospital center. If the records were unavailable and could not be collected by any measures, the patient was excluded from the study. Permission letter was obtained from the Hospital Manager of Hetauda Hospital. Participants' confidentiality was maintained and they had the right to reject or discontinue from the research study at any time.

COVID 19 disease severity classification guidelines and BMI of the patients was categorized as WHO's standards for BMI classification. The data was entered and cleaned in Ms. excel and exported and analyzed in SPSS version 21. The data was analyzed by using descriptive analysis for demographic variables. Chi-square tests were applied in between BMI categories and disease severity as categorical variables.

## RESULTS

In this study, 51 percent of the participants in the study were male and 49 percent of the study participants were female. (Table 1). Likewise, 21.73 percent of the study participants were farmers, 34.8 percent of them were housewives, 7.60 percent jobholders (both private and public) were and 35.86 percent belonged to other categories. (Others include occupations like drivers, tailors, shopkeepers, miners and so on). Only 3 patients (3.26%) of the patients were asymptomatic cases and 89 patients (96.73%) of the cases were symptomatic cases.

43 of the patients (46.74%) were already vaccinated and out of these vaccinated individuals 33 had taken both doses of vaccines.

**Table1: Demographic characteristics of the study participants.**

Demographic Variables	Frequency(N=92)	Percent(%)
Male	51	55.43
Female	45	49
<b>Occupation</b>		
Farmer	20	21.73
Housewives	32	34.8
Jobholders	7	7.60
Others	33	35.86
<b>Age Group(in years)</b>		
Below 20	4	4.34
20-30	5	5.43
30-40	11	11.95
40-50	10	10.86
50-60	8	8.69
Above 60	53	57.60
<b>COVID-19related variables</b>		
Asymptomatic	3	3.26
Symptomatic	89	96.73
<b>Other comorbidities</b>		
Fever	89	96.73
Hypoxia	30	32.60
Tachypnea	38	41.30
Difficulty in breathing	54	58.69
Septic Shock	1	1.08
<b>Vaccination Status</b>		
Vaccinated	43	46.74
Received both doses of vaccines	33(n=43)	76.74

We found that 30.4 percent of the COVID 19 hospitalized cases had normal weight (BMI 18.5-24.9), 17.4 percent were overweight (BMI 25.0-29.9) and 44.6 percent of them were obese (BMI 30.0 and over)-whereas 7.6 percent of the admitted patients were underweight. (BMI below 18.5)

Severity was classified as defined by Department of Pulmonology and Critical Care Medicine, TUTH (Tribhuvan University Teaching Hospital) was be used for this study. (Table 3)

**Table 2: BMI classification of the study participants.**

BMI categories	Frequency	Percent
Obese	41	44.6
Normal	28	30.4
Overweight	16	17.4
Underweight	7	7.6
Total	92	100.0

**Table 3: Classification of COVID 19 Disease Severity.**

Comorbid conditions	COVID 19 Severity category
Fever< 6 days Hypoxia SPO2<92% persistent) Shortness of breath	MILD SEVERITY
Fever (≥ 100.4° C) Tachypnea RR(≥ 24/min) Hypoxia (SPO2 <92% persistent) Shortness of Breath	MODERATE SEVERITY
Fever (≥ 100.4° C) ≥ 6 days Tachypnea Hypoxia (RR> 30/ min) Hypoxia (SPO2 <90% in RA)	CRITICAL SEVERITY

**Table 4: Classification of COVID 19 Disease Severity.**

Disease severity classification	Frequency	Percent
Critical	39	42.39
Mild	1	1.08
Moderate	52	56.52
Total	92	100.0

In the research study, only 1 was mild case (1.1%), 52 participants (56.52%) were moderately severe cases and 39 (42.39%) cases of the 92 research participants were critically severe.

Chi-square tests were applied to find out the association between COVID 19 disease severity

classification and BMI categories. Statistical significance was set at P value <0.05. As more than 20 percent of the cells had values of less than five. Hence, Fisher Exact tests were performed to find the association between BMI and disease severity as categorical variables.

**Table 5: Association between Obesity and COVID 19 disease severity.**

BMI Categories	Disease Severity			Total	Fisher Exact
	critical	mild	mod		
Normal	14	1	13	28	
Obese	15	0	26	41	
Overweight	7	0	9	16	
Underweight	3	0	4	7	0.665
Total	30	1	52	92	

## DISCUSSION

The study was done with the objective of finding association between COVID 19 severity status and BMI among the hospitalized patients who were admitted in Hetauda hospital, which is also one of the thirteen provincial hospitals of the Bagmati Province.

Frequency table of age group wise distribution of the cases showed that most of the hospitalized cases were in the age group above 60 years of age. This finding is in line with most of the studies which conclude that COVID 19 severity is seen in higher age groups.<sup>8</sup> This could be attributed to lower immunity levels and prevalence of co-morbid conditions in that population group.

Furthermore, frequency analysis of BMI categories of the study participants showed that 26 of the 92 participants who were obese fell in moderately severe category and 15 of the obese patients them fell in critically severe category. These finding hint that obesity could be a factor to aggravate the COVID 19 condition.

However, the Fisher exact analysis showed that there was no association in between the COVID 19

severity levels of the hospitalized cases with their BMI levels(0.665). This finding does not align with the findings of the previous studies which have shown strong correlation in between these two variables.<sup>9,10</sup> This difference in results between studies from other countries and this particular research study could be because of the difference in sample size of the research participants.

Sample size of the study is the biggest limitation of this study which can be corrected by finding correlations among these variables with greater sample sizes in the future.

## CONCLUSIONS

Hence, this study showed that there is no association in between BMI categories and COVID 19 disease severity status of individuals. Since, this study is the first of its type to be done in Nepal, more of such studies exploring the relationship between obesity and COVID 19 disease severity must be done in our setting and moreover, to explain the pathways of disease severity in obese individuals.

**Conflict of Interest:** None

NJHS

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