

A cross sectional study on Nutritional status of COVID-19 patients admitted in tertiary care hospital

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Abstract:

Background: COVID -19 has reached to pandemic status worldwide and affected all the age groups, some of the factors like comorbidities, nutritional status and lifestyle can be the risk factor of covid-19. There is a need to study the characteristics of COVID-19 patients to formulate the healthy guidelines.

Objectives: The study has been planned to assess the nutritional status of Covid-19 patients.

Study setting: The study has been conducted in a tertiary care hospital of Navi Mumbai. Mild and moderate COVID-19 patients admitted in the hospital in the month of November had been included in the study.

Study Design: It was prospective cross-sectional study.

Material and methods: The sociodemographic profile of the subjects have been assessed through general questionnaire, height and weight have been measured by standardized methods. The disease related history, sign and symptoms vitals and biochemical parameters have been recorded and enquired by the help of standardized questionnaire. The three days diet intake during hospital stay have been recorded through 24-hour diet recall method and nutrient intake was calculated. Student's t-test and chi-square test were used to compare different variables between two groups. Any p-value < 0.05 was considered statistically significant. Data analysis was performed using SPSS statistical software, version 24.

Results: There was total hundred patients (mild and moderate) admitted in duration of 15th October to 15th November 2020, from them 64 percent were in the age of above forty-five and 36 were of below forty-five. There were 73% males and 27% per cent females admitted in the hospital. All were from lower middle-income group. Sixty percent of the subjects were preobese, obese class 1, or three categories. Age wise there was no significant difference between the height, weight, BMI, blood pressure, oxygen saturation temperature, haemoglobin and serum albumin levels, of the patients. Majority of the patients experienced

the symptoms like generalized weakness, muscle pain, head ache, cough, chest pain, nausea, vomiting and loss of appetite. The total 68% of the patients were having comorbidities 56% of patients were having hypertension followed by 49% diabetic patients. Most of the patients were not having food properly because of loss of appetite, nausea and vomiting therefore the nutrient intake was inadequate and this may lead further malnutrition. The protein intake of below forty-five patients were significantly higher than the above forty-five patients, rest of nutrients intake was almost similar. There was insignificant relationship between age and severity of disease, BMI, blood pressure, pulse rate, respiratory rate, temperature, SPO₂, haemoglobin and serum albumin. Overall, the age, comorbidities and obesity can be the reason of occurrence of COVID-19 but to assess the relationship of age with severity and other parameters and signs and symptoms further studies are recommended.

Keywords: COVID-19, Nutritional status, risk factors, Nutrient intake, malnutrition, comorbidities.

INTRODUCTION:

Corona virus disease has reached to pandemic status worldwide. Elderly individuals and the patients having comorbidities such as obesity, hypertension show higher risk of mortality by COVID -19. Nutritional status of host plays an important role in the outcome of a variety of infectious diseases. Our immune system is highly affected by malnutrition, it decreases the immune response and can increase disease severity.

The COVID-19 outbreak has brought a great challenge for all communities and health care systems worldwide. Changes in dietary habits and lifestyle parameters, due to quarantine and social isolation, may lead to an impaired nutritional status. Obesity and related comorbidities are associated with physiological alterations leading to higher susceptibility to infection and pathogenicity and transmission of COVID-19. Moreover, with no imminent end to the pandemic, people should be encouraged to improve their lifestyle to lessen the risks both in the current and likely subsequent waves of COVID-19.

The global outbreak of highly contagious coronavirus has led the nations' medical, psychological, and socio-economic conditions to a challenging situation that they never thought before. Possibly COVID-19 is one of the greatest threats in this century that the countries have to tackle. Thus, scientists are trying to understand the pathogenesis, clinical implications, and develop novel preventive strategies. There is need to explore the characteristics of COVID-19 patients to formulate guidelines. Our anticipation that this study will be helpful to understand characteristics of the patients and prevention, treatment and management of pandemic.

METHODOLOGY:

In this cross-sectional study, a convenience sample of consecutive patients with mild and moderate COVID- 19 were prospectively recruited between 15th October to 15th November 2020, sample size was dependent on the number of patients admitted in one of the tertiary care hospital, Navi Mumbai, India, the general profile of the subjects was taken by the structured questionnaire. Information about the disease signs and symptoms have been taken. The haemoglobin level and serum protein were also estimated. Dietary intake of the patients was assessed by taking 24-hour diet recall during hospitalisation.

Student's t-test and chi-square test were used to compare different variables between two groups. Any p-value < 0.05 was considered statistically significant. Data analysis was performed using SPSS statistical software, version 24.

The study was conducted after taking ethical approval from the Institutional Ethics Committee. The data was collected after taking the oral consent from the patients.

RESULT:

In the duration of one month total hundred mild and moderate COVID cases were recruited for the study, from them 73 were male and 27 per cent were female. Thirty-six per cent were below forty-five and 64 per cent were above forty-five years of age. All the data has been distributed in two groups below 45 years age group and above 45 years of age. In below forty-five 69.4% were male followed by 30.6% were female. Majority of the participants (57%) were literate in both the groups they were secondary passed and indulged in business.

Table 1: Sociodemographic profile of the Covid-19 patients

Variable	≤45 Years (n=36)	≥45 years (n=64)	Total (N=100)
Male	25(69.4)	48(75)	73(73)
Female	11(30.6)	16(25)	27(27)
Literate	36(100)	59(92.2)	95(95)
Illiterate	-	5(7.8)	5(5)
Primary	4(11.1)	19(20.7)	23(23)
Secondary	25(69.4)	38(59.4)	63(63)
UG	5(13.9)	6(9.4)	11(11)
PG	1(2.8)	-	1(1)
Vocational	1(2.8)	1(1.5)	2(2)
Occupation			
Private job	11(30.6)	18(28.1)	29(29)
Government job	3(8.3)	2(3.1)	5(5)
Business	21(58.3)	36(56.3)	57(57)
House wife Retired	1(2.8)	-	1(1)
Yearly Income			

<50000	7(19.4)	-	7(7)
50,000-100000	25(69.4)	48(75)	73(73)
>100000	4(11.1)	16(25)	20(20)

Number in the parenthesis indicates percentage

Table 2 portrays the symptoms of patients. It was found that 58 patients were having moderate and 42 were mild Covid. In below forty-five age group 63.8 % were moderately suffering from COVID-19 followed by 45% in above forty-five age group. Total 93 per cent of patients were complained fever. Eighty four percent of the subjects were complaining cough, 82% were having head ache followed by muscle pain and weakness. More than fifty per cent of the subjects were having comorbidities in both the groups but comparatively it was 20% higher among the above forty-five years of age group. Fifty six percent of the patients were suffering from diabetes in above forty-five years of patients.

Table 2: Disease related symptoms among patients

Variable	≤45Years (n=36)	>45years (n=64)	Total (N=100)
Mild	13(36.1)	29(45.3)	42(42)
Moderate	23(63.8)	35(54.6)	58(58)
Symptoms			
Fever	34(94.4)	59(92.2)	93(93)
Sore Throat	11(30.6)	22(34.4)	33(33)
Sneezing	17(47.2)	21(32.8)	38(38)
Breathlessness	21(58.3)	29(45.3)	50(50)
Chest pain	16(44.4)	19(29.7)	35(35)
Cough	30(83.3)	54(84.4)	84(84)
Generalised weakness	26(72.2)	42(65.6)	68(68)
Headache	31(86.1)	51(79.7)	82(82)
Muscle Pain	29(86.1)	48(75)	77(77)
Ocular Complain	2(5.6)	7(10.9)	9(9)
Comorbidities			

Yes	22(52.3)	46(71.9)	68(68)
Diabetes	13(36.1)	36(56.3)	49(49)
Hypertension	18(50.0)	38(59)	56(56)
Cardiovascular disease	4 (11.1)	11(17.2)	15(15)
GI Diseases	4(11.1)	11(17.2)	15(15)
Tuberculosis	9(25.0)	12(18.8)	21(21)
Malignancies	1(2.8)	4(6.3)	5(5)
Renal disease	3 (8.3)	10(15.6)	13(13)
Chronic lung disease	6(16.7)	5(7.8)	11(11)
Liver disease	6(16.7)	4(6.3)	10(10)
Hypothyroidism	2(5.6)	1(1.6)	3(3)

Number in the parenthesis indicates percentage

Table 3: Mean value of Anthropometric, Biophysical and Biochemical parameters

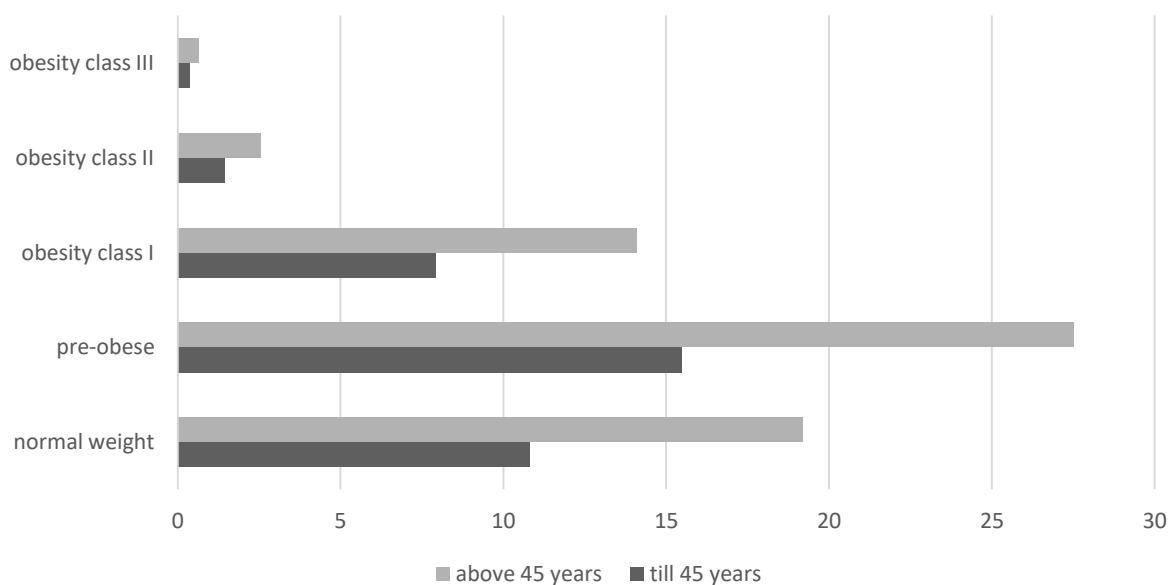
Variable	≤45 Years (n=36) Mean ±SD	>45 years (n=64) Mean± SD	Total (100) Mean ±SD	P Value
Height	162.58±5.68	161.5±6.9	161.8±6.48	0.42
Weight	73.8±10.5	71.6±10.5	72.4±9.5	0.32
BMI	27.9±3.94	27.5±4.3	27.6±4.16	0.66
Systolic blood pressure	125.83±10.79	129.68±11.9	128.3±11.6	0.11
Diastolic blood pressure	87.5±11.55	88.8±9.7	88.3±10.3	0.54
Pulse rate	94.1±2.31	95.6±2.59	95.0±9.8	0.02*
SPO ₂	96.6±2.59	95.1±2.12	96.1±2.31	0.13

Temperature	98.5±1.13	98.4±1.19	98.5±1.16	0.78
Respiratory Rate	24.8±10.9	27.8±9.29	25.8±6.9	0.03*
Haemoglobin	13.9±1.8	13.4±1.6	13.5±1.7	0.22
Serum Protein	7.19±0.62	7.11±0.9	7.14±0.8	0.66

Table 3 shows the mean values of anthropometric measurements, blood pressure, temperature, pulse rate, SPO₂, haemoglobin, and albumin. The overall mean height, weight and BMI was 72.4±10.5 and 27.6±4.16 respectively. The mean value of oxygen saturation and pulse rate was 95.1±2.12 and 95.6±2.59 respectively for above forty-five age group. There was no significant difference between height, weight, BMI and blood pressure of the patients. Only the pulse rate and respiratory rate was significantly lower among the above forty-five age group.

The weight status of the participants was assessed on the basis of BMI cut offs given by WHO. The figure 1 shows that 43 % of patients were preobese, 22% were obese class 1 and 5% were obese class II and third category (Figure 1).

Figure1 : Weight Status of Covid-19 Patients



Majority of the patients from both the groups were non vegetarian (83%) taking three meals in a day (67%). Among above forty-five years patients total 18% were indulged in smoking or tobacco consumption. Majority of the patients were not having hospital food properly and also complained nausea, vomiting or anorexia (Table 4).

Table 4: Lifestyle of Covid-19 Patients

Variable	≤ 45 Years (n=36)	>45Years (n=64)	Total (N=100)
Food Habits			
Vegetarian	7(2.7)	10(15.6)	17(17)
Non vegetarian	29 (80.6)	54(84.4)	83(83.0)
Meal pattern			
Twice	-	11(17.1)	11(11.0)
Thrice	27(75.0)	40(62.5)	76(67.0)
Four times	9 (25.0)	12(33.3)	21(21.0)
>Four	-	1(1.56)	1(1.0)
Smoking			
Tobacco	5(13.8)	7(10.9)	12(12.0)
	-	5(7.8)	5(5.0)
Smoking+tobacco+alcohol	1(2.8)	-	1(1.0)
Having hospital diet properly			
Yes	12(33.3)	9(14.1)	21(21.0)
No	24(66.7)	55(85.9)	89(89.0)
Reduced appetite			
	30(83.3)	47(73.4)	77(77.0)
Dysphagia			
	-	1(1.6)	1(1.0)
Diarrhea			
	-	5(7.8)	5(5.0)
Nausea			
	13(36)	35(54.7)	48(48.0)
Vomiting			
	9(25)	16(25.0)	25(25.0)
Anorexia			
	2 (5.6)	8(12.5)	10(10.0)

Number in the parenthesis indicates percentage

The nutrient intake was inadequate among all the patients. There was significant difference between the protein intake of below forty-five and above forty-five aged patients. Except

protein the dietary intake of all the nutrients was almost same among patients there was no significant difference (Table 5).

Table 5: Nutrient intake of COVID -19 patients

Variable	≤45Years (n=36) Mean ±SD	>45 Years (n=64) Mean ±SD	Total (N=100) Mean ±SD	P value
Energy (kcal)	1147±125.1	1184 ±127.3	1171±127.2	0.16
Carbohydrates (gm)	156.5 ±18.7	161.2 ± 23.9	159.50±22.2	0.28
Protein (gm)	36.7 ±3.4	32.0 ± 3.0	34.59±3.3	0.05*
Fats (gm)	23.6±4.20	22.5 ±4.0	22.91±4.1	0.20
Vitamin A	282.5± 59.9	288.4±56.3	286.31±57.4	0.62
Iron	7.24±1.1	7.1±1.0	7.15±1.0	0.54
Calcium	552.6±98.1	571.0±130.3	564.39±119.5	0.46
Thiamine	1.0±0.1	0.9±0.1	0.99±0.10	0.25
Riboflavin	1.8±0.21	1.8±0.2	1.8±0.2	0.86
Niacin	10.6±0.8	10.7±0.8	10.72±0.8	0.11
B6	1.3± 0.4	1.4±0.3	1.36±0.4	0.20
Vitamin C	37.2±3.5	37.1±5.2	37.1±4.8	0.88
Folate	148±17.8	147.8±17.4	149.4±16.9	0.20
Vitamin B ₁₂	1.90 ±0.2	1.8±0.1	1.8±0.1	0.57
Sodium(mg)	1226 ±191.3	1275 ±184.6	1258±187.6	0.20
Potassium (mg)	2037 ±256.1	1996±233.0	2011± 241	0.42
Zinc(mg)	10.86 ±1.3	11.09 ±1.4	11.0±1.4	0.42
Vitamin D	183.8±54.3	193±63.5	197.3±61.2	0.09

The chi square had been conducted to find out the association between age categories and severity of disease, there was no significant association (0.37) between age and severity, means the severity of the disease was not because of age. There was no significant association (0.08) between weight categories and age. In both the groups more than half of the subjects were non vegetarian. It was found that more than half of the patients from both the groups (66.7 & 85.9%) were not taking hospital food properly and majority of them have reduced appetite.

DISCUSSION:

Majority of the patients admitted in the hospital during the data collection were pre obese or obese category in both the groups below forty-five and more than forty-five years of age. The obese adipose tissue is characterized by a markedly deregulated production of adipose tissue-derived factors, i.e., adipokines, they play an important role not only in energy metabolism but also in inflammation and immunity and increased obesity leads low grade inflammatory state^{1,2}. In both the group's majority of the patients were suffering from hypertension and type 2 diabetes, may be because of obesity they were diabetic or hypertensive, all these give compound negative effect to immunity. All the patients have complained the common symptoms i.e., muscle pain, coughing, general weakness chest pain etc. Age wise there is no difference in the symptoms of COVID -19.

The risk of malnutrition among COVID-19 patients is related to chronic pathologies and the reduction of food intake caused by nausea, diarrhoea, and the loss of appetite.

In the present study 64% patient were above forty-five years of age. According to the data published by Italian Health Council regarding infections in Italy, about 40% of those infected by COVID-19 are over 70 years old or more. Though the number of admitted patients of above forty-five age was higher but there was insignificant association between age and severity of disease. Similarly in the Meta analysis the impact of age on severity found no significant association. More than half of the patients were having co morbidities including diabetes, hypertension, heart disease etc. Among 10014 COVID-19 patients, 51.14% had at least one comorbidity in severe groups, and other most common comorbidities in severe cases were hypertension (36.47%), diabetes (21.19%), cardiovascular disease (18.76%), cerebrovascular disease (11.83%) and chronic kidney disease (10.63%). All the pre-existing comorbidities are

associated with the increased severity in the COVID-19 cases ($p < 0.05$) in the meta-analysis³. A similar finding was also reported earlier in some other studies^{4,5}. In the study majority of patients 73% were male. A study conducted in Spain reported that men are more vulnerable than women because of their irresponsible attitude toward the risk of COVID-19 pandemic.⁶ Another Spanish study revealed that the severity and case fatality rate (CFR) are higher in males and old aged people⁷. Moreover, in females higher resistance is observed, which might be due to female sex hormones, whereas men have lower resistance because of high expression ACE2 receptor to which coronavirus binds easily⁸.

The mean value of systolic and diastolic blood pressure was higher side among both the groups may be because most of the patients (56%) were hypertensive. Some studies also reported an association of hypertension and other cardiovascular diseases with COVID-19^{9,10}. Innate immunity response, macrophage, and lymphocyte function are decreased in the presence of comorbidities, which may be more susceptible to the pathogenesis of COVID-19.¹¹

The Patients were reported fever, cough, chest pain, headache, breathlessness, muscle pain, generalized weakness, nausea and vomiting. Several clinical researchers found that the common clinical manifestations of COVID-19 patients are fever, cough, headache, fatigue, myalgia, nausea, diarrhea, and sputum.¹²

The mean pulse rate and respiratory rate was significantly higher among the above forty-five age group. Body temperature oxygen saturation, serum protein was on normal range for both the groups.

The patients were complaining nausea, vomiting and diarrheal problems, therefore, majority of patients have reduced appetite and they were not having food properly the nutrients intake of the patients were also inadequate. The protein intake was significantly higher among the below forty-five aged patients, though it was also inadequate. The energy intake, vitamins and minerals intake were lower among both the age groups. Further the reduced intake may lead malnourishment among the patients. Malnutrition during COVID may affects the recovery of the patients. Therefore, if needed the nutritional care should also be provided to the patients though they were in mild and moderate COVID patients.

CONCLUSION:

COVID-19 is affecting both the age groups from below 45 to above 45 years of age. The comorbidities were prevalent among both the age groups and may be one of the reasons for increasing severity and complications. Because of the gastro intestinal related symptoms the appetite was on lower side, long term reduced intake may also lead malnutrition and malnutrition can lead delayed recovery and complications. The nutrient intake was inadequate during hospitalization. Furthermore, the detailed nutritional status assessment of Covid-19 patients is recommended to formulate the dietary guidelines for the betterment of the COVID-19 patients.

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